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Prologue

In April 2015 the Department of Public Finance organized already the 20th International Conference "Theoretical and Practical Aspects of Public Finance" with over 110 participants from the Czech Republic, Slovakia, Russia and Turkey.

The conference took place for the first time in March 1995 and since then it gained a significant position among similar events in both the Czech Republic and Slovakia. It is first of all a scientific conference, but it is relevant for practicioners and policy makers as well. The number of participants in the last years is stable even when the number of similar conferences organized by other Czech universities is growing.

The conference tries to offer enough space for young scholars including graduate students. The day before the conference starts there is organized a students´ competition. Partecipation of students at the conference is highly encouraged so that 20 out of 52 papers included in this proceedings are authored or co-authored by graduate or doctoral students. It is a promising number for the future, almost doubled comparing to 2014, meaning that a new generation of scholars grows and that it is going to bring new research quaestions and new approaches into our discipline.

The focus of the papers presented during the conference shows that after a few years when the center of attention were the challenges in the area of public finance caused by the European debt crisis and the continued slow economic recovery, we are back in lets say normal times when the papers deal with broad range of topics.

The contributions were at the conference presented in four sessions: Tax Policy, Public Expenditure Programs, Public Budgets, Public Policies and Public Finance. This volume includes 52 papers from the conference out of the total of 71 submitted papers. All contributions and conference details are available at the web site of the conference at *http://kvf.vse.cz/vyzkum/konference-tpavf/*.

About a half of the papers deals with the tax policy or tax system. This clear dominance of the tax topics is caused by the weight taxes play in the political discussion and the frequency of tax law changes in the recent years. Several papers deal with the distribution of the tax burden and with the burning issue of tax fraud and tax evasion. The remaining papers deal with a great variaty of topics: Seven papers deal with old-age pensions and health care systems and five papers deal with public procurement, especially with the competition effect and keep confirming that the number of bidders matters. The rest of the papers touches other important topics such as local government finance or higher education.

Regarding the applied methodological approaches we can see a positive trend as the number of empirical papers which apply modern econometric methods grows. At the same time there are papers which present original primary data or have clearly interdisciplinary roots.

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Are High Frequency Time Series in Forecasting of the Tax Revenues More Accurate? Case of the Czech Republic

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Abstract. The paper deals with the issue of whether, in the case of estimating tax revenues, is preferable to use a longer quarterly or shorter yearly time series. This issue is tested on revenues of income taxes in the Czech Republic from 2002 to 2013. The methodology includes the creation of predictive regression models using multiple linear regression analysis and design of dynamic ex-ante forecasts. The very first part of the article describes how input data were modified and discusses the development of monitored variables. The second part is devoted to methodology of regression analysis, and the third part documents the results. The actual results are quite interesting, because it is obvious that the shorter time series in the case of tax revenues are slightly more accurate than longer time series.

Keywords: regression analysis, tax revenues, forecasting, time series.

JEL Classification: H20

1   Introduction

The paper deals with the possibility that for the estimation of tax revenue is not necessary to select the longest possible time series. The actual main idea is based on two opposing econometric claims. The first claim is that when estimating econometric is better to have the longest possible time series. The second argument is that for the quality econometric estimates is needed most stable development of the variables. In the case of tax revenue is a total contradiction evident because of a relatively large amount of minor legislative adjustments for various tax revenue is made over one year,

The aim of this article is to test whether the "artificial" extended the time series of tax revenues, using quarterly data are more accurate than using annual time series. To achieve this, the method of multiple linear regression analysis was chosen. The purpose of the chosen methodology is to develop predictive models for direct income taxes in the Czech Republic, both on a quarterly basis, and based on annual time series. Subsequently was tested the predictive power of both models using virtual shortening of the time series and estimating the well-known result.

The actual problems of econometric modeling deals number of publications. Klazar (2003) in his work creates econometric estimation models of Czech tax revenues. A similar issue deals also Bezděk and Stiller (2000). Construction of predictive models based on GDP deals Jenkins et. al. (2000). Creedy and Gemmell (2006) study the factors affecting the growth of tax revenues.

The paper is divided into three parts. The first part deals with the adjustment of input data and the method of regression analysis. The second part describes the findings of fact based on econometric models. The third part is devoted to the final conclusion.

2   Data and methodology

This part describes the basic input data and their subsequent statistical adjustments. Second part of this subchapter is description of the method of multiple linear regression analysis, restriction and different statistical tests. In conclusion of this subchapter is described the method of dynamic ex-ante predictions.

2.1   Data

Generally, the econometric model is as good as the quality input data. For this contribution was used database ARAD of Czech National Bank. The advantage of this database is that the data are adjusted by the same methodology. In this database were obtained explanatory and response variables. The actual data are obtained on cash principle, when it is possible to accurately track the status of national accounts for a certain period of the year. Data are monitored to the fullest extent - from 2002 until 2013.

In the case of quarterly time series it was necessary to decumulate obtained data into the incremental form; otherwise the values obtained were not consistent with the annual time series. After this treatment, data from quarterly time series still have to be rid of the influence of seasonality. For this adjustment method X12ARIMA was chosen.

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In the case of this paper are as dependent variablesused the revenues from direct taxes. The progress of the response variables is documented in Figure 1.

Figure 1: Annual direct tax revenues (bill. CZK)
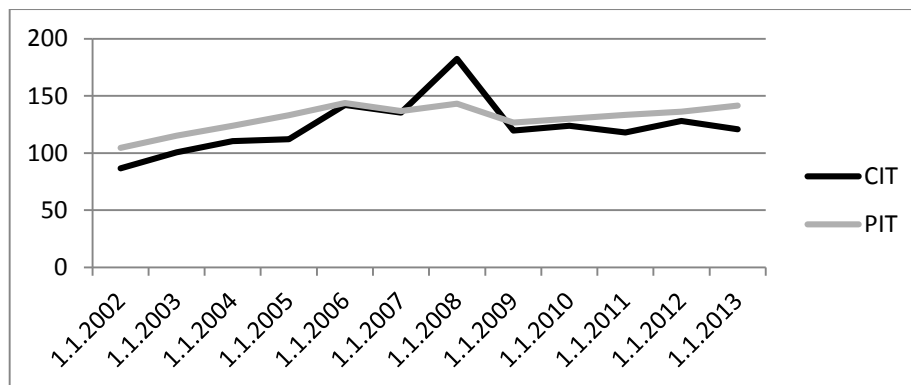
Source: ARAD(2015)

It is seen that in the case of direct taxes can be partly talk about the relative stability of development, except for the period from 2006 to 2010. Here is evident a significant impact of exogenous factors on corporate tax revenue. Specifically, there is a period of relatively rapid economic growth from 2005 to 2009 and followed by the impact of the economic crisis in 2010. In the case of tax revenues, it is clear that adapting to economic trends is delayed by one period. Another possible factor acts on the volatility of the variables may be different legislative changes to the tax algorithm.

In the case of explanatory variables is quite difficult to incorporate into models all relevant variables. The result would be an extremely complicated model, which would be very susceptible to potential bias. Therefore, as the first variables considered was elected gross domestic product (GDP). This variable is considered the best available universal explanatory variable in the case of tax revenues, as evidenced, for example, (Jenkins et. al., 2000) and Klazar (2003). The issue of the use of GDP lies in the possibility of the occurrence of autocorrelation and multicollinearity. For multiple regression models is in fact, difficult to find other explanatory variables that are not correlated with the development of the economy. Fortunately, you can eliminate multicollinearity by selecting appropriate adjustments to the data. The actual development of the GDP at current prices describes following Figure 2:

Figure 2: Annual GDP in current prices (bill. CZK)
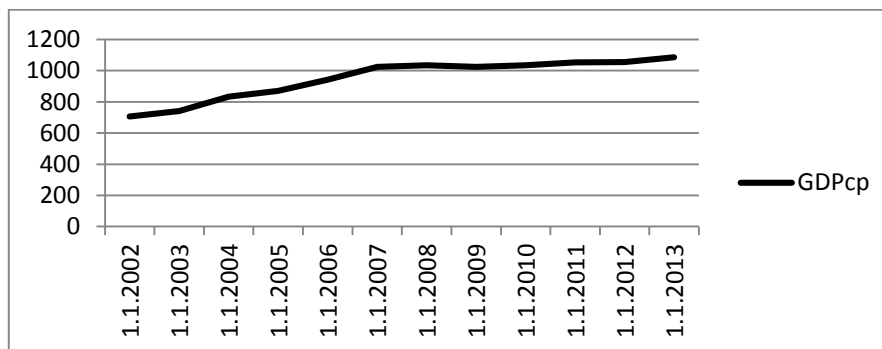
Source: ARAD 2015

Of course the graph it is clear that a period of great economic growth ended with the year 2007. Subsequently, the overall economic development has stagnated during the economic crisis, but from 2012, again beginning to see a possible improvement in the economic situation. If we compare this graph with the development of explanatory variables, so we can say that GDP behaves relatively similarly. From the logic of the tax algorithm is quite obviously, that at higher economic growth are increased wages or corporate profits, and thus is increased the tax base.

Another explanatory variable is the unemployment rate, where you can expect a negative correlation with the development of the personal income tax. In the case of rising unemployment rate reduces the tax base arising from the personal income tax, as taxpayers become unemployed. Influence unemployment rate for corporate tax is not so clear. In the case of the high unemployment rate might be able to hire workers at lower wages and thus reduce labor costs. Theoretically, companies should have a higher profit. The question is, whether this reduction in costs is not reflected in the price reduction for provided products and services, and hence lower profit of corporations.

Furthermore, the increase in unemployment may cause a decline in consumption and therefore decline in demand for private goods and services associated with a decline in corporate profits. Therefore, it cannot be clearly estimated the effect of the unemployment rate for tax revenues from corporate income. The actual unemployment rate is documented in Figure 3.

Figure 3: Unemployment rate in %
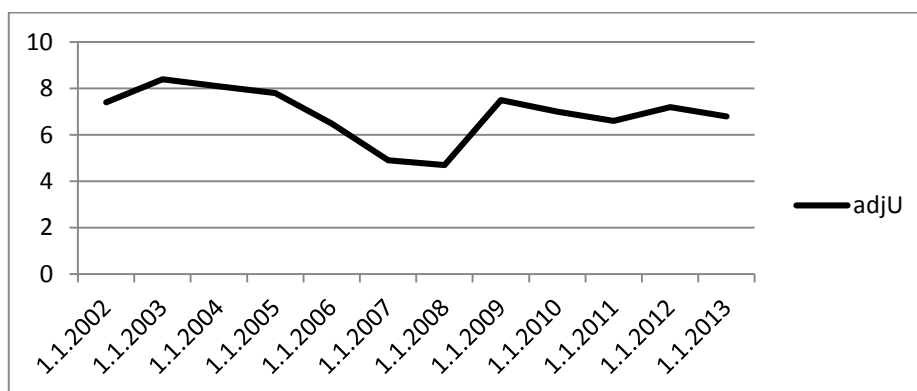
Source: ARAD 2015

Here is seen a similar trend as in other selected variables. The rate of unemployment fell over the period of economic growth and in 2008 with the arrival of recession reached its local maxima. The problem of explanatory variables is that it is relatively dependent on economic developments, and here can be expected to occur multicollinearity in models using GDP.

The last selected explanatory variable is the average wage. This explanatory variable should have the ability to better describe the evolution of the personal income tax revenues. With increasing average wage should be aggregated basis of personal income tax higher. In the case of corporate taxes is not clear the relationship between the average wage and income taxes. Higher average wages may lead to higher wage costs and therefore the subsequent decrease in the aggregate tax base. On the other hand, higher average wages may reflect the increased consumption and therefore boost the profitability of companies. Which of these factors outweigh can not be clearly quantified. The actual average wage has also the problem of a certain distortion, as for example in the Czech Republic, more than half of payers not reach the average wage. The actual development in average wage shows the Figure 4.

Figure 4: Average wage (in CZK)
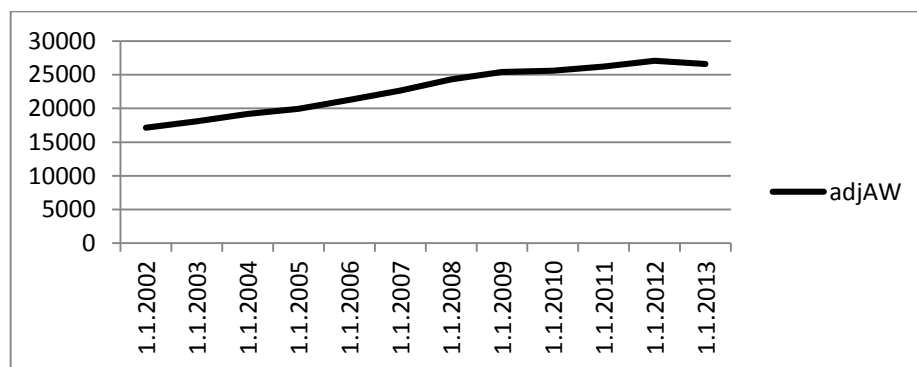
Source: ARAD 2015

The average wage corresponds with an increasing linear trend. Again, it is seen here a slowing as a result of economic crisis. An interesting development is the decline in the average wage since 2012. This fact can be caused by almost deflationary developments in the price level in the Czech Republic.

2.2 Regression analysis

Regression analysis is an econometric method, where one variable (explained) is explained using functional relationship with the other explanatory variables. Regression analysis itself can be both linear and nonlinear. Alternatively, regression analysis can be divided into multiple or simple by the number of variables. In the case of this article a multiple linear regression analysis is used.

The purpose of regression analysis is the best possible way to explain the variance of observed variable. In the case of multiple linear regressions analysis looks derivative function as follows:

$$Y = \alpha_0 + \alpha_i X_i + \alpha_j X_j, \tag{1}$$

where
- Y = dependent variable,
- α_0 = regression constant,
- $\alpha_{i,j}$ = regression parameters,
- $X_{i,j}$ = independent variables,

In the case of this paper was used the method of ordinary least squares (OLS) to estimate the regression parameters. The actual evaluation of the quality of regression is subject to statistical testing. The fundamental test is F-test, which tests on the selected significance level model as a whole. If the model fails the F-test is necessary to use a different model.

Another important indicator of the statistical significance is the t-test. This test is used in the case of multiple regressions to test the significance of individual explanatory variables. In the event that the test variable fails to determine the level of significance needs to be excluded from the model. It may happen that the originally planned multiple regression function arises only simple regression, since other partial variables do not pass the t-test.

The actual quality of the model values the coefficient of determination (R^2), which indicates how many variance of observed variable is explained by the model.

In case of any econometric methods must be taken into account econometric elementary requirements (Gauss-Mark) which when broken, can distort the results.

The first possible case of distortion is apparent regression that arises when using non-stationary time series. For the determination that the selected time series are stationary is used unit root test using the modified Dickey-Fuller test (ADF). This test tests the minimum level of difference of time series to be stationary. Generally, most econometric time series just used the first difference. Another option is to use seasonally adjustement, which also, under certain conditions can stationarite time series. All variables used in this paper were stationary at a significance level of 10%. The selected level of significance is due to the relatively short time series of annual data, it is evident influence of the length of the time series on the quality of tests.

Another problem is the distortion caused by the dependence of individual explanatory among them - multicollinearity. This phenomenon distorts the meaning of t-tests. A simple test to detect multicollinearity is to use a simple correlation matrix of explanatory variables. It is proved that the selected variables are not correlated with each other - just in case *GDPbc* and *adjAW* was not clearly the presence multikolinerity disproved because the value of the correlation coefficient reached 0.65, which shows the possible presence of multicollinearity. Due to the length of the reference period for the annual series was supposed bias of this test related to inadequate length of the time series.

The actual dependence explanatory variable to their values in previous periods is called autocorrelation. Her presence distorts the coefficient of determination. To identify the presence of autocorrelation is used Durbin-Watson test. This test is able to reject the hypothesis of the presence of autocorrelation if the test result is a value close to 2. Unfortunately, this test is biased by the initial length of the time series. If in doubt it could be used graphical analysis of autocorrelation function of residues (ACF) or partial autocorrelation function of residues (PACF) for more details see Arl and Arltová (2009).

Another violation of Gauss-Markov assumptions have not been tested because is subject of multivariate time series.

2.3 Dynamic ex-ante forecasting

In the dynamic ex-ante prediction is about testing the predictive ability of the model. The whole procedure is quite simple. The model itself is reduced by a number of observations whose values are already known. Subsequently, the prediction is made using the model chosen for this observation. The resulting values are compared with the actual condition and it is possible to estimate the quality and deviations of the model.

3 Observations and results

The following section is devoted to the facts found. For clarification is necessary to define abbreviations that uses econometric program PcGive. In the case of seasonal adjustment methods using X12ARIMA variables are referred to in the shape SAXYZ where SA stands for seasonally adjusted and XYZ is the name of variable.

The first models were derived tax revenues based on quarterly time series. The actual models are described in Table 1.

Table 1: Quarterly regression models

Variable	Equation	R^2	DW
CIT	SACIT = + 9.157 + 0.08955*SAGDPcp	0.12	2.08
PIT	SAPIT = + 18.91 + 0.05705*SAGDPcp	0.33	1.84

Source: Data ARAD(2015) + Author

Here it is seen that the originally intended multiple regression analysis created simple regression. As the only statistically significant explanatory variable was chosen *GDPcp*. In the case of the model for estimating tax revenues corporate tax model has a very low coefficient of determination. Author expected higher coefficient of determination

In the case of CIT there could be a very significant fluctuation during the period when extremely high and low values are alternated in the wake of the crisis (Chart 1). Or it can be caused by exogenous factors, for example, a relatively large change in legislative regulations in the period. A third possibility for such a low coefficient of determination is bad seasonal adjustment, when it might be appropriate to choose a other method than X12ARIMA.

For personal income tax revenues are estimated coefficient of determination quite solid. In general, estimates of direct taxes are not usually so accurate.

Models based on the basis of annual time series are summarized in Table 2.

Table 2: Annual regression models

Variable	Equation	R^2	DW
CIT	CIT = + 238.6 - 16.68*adjU	0.64	2.28
PIT	PIT = + 55.8 + 0.1874*GDPcp - 4535*adjAW	0.8	2.34

Source: Data ARAD(2015) + Author

In the case of annual time series resulting models are superior in terms of the coefficient of determination. On the other hand, after various modifications of the input data for the stationarity reasons, only ten observations entered into the model. This small number of observations can distort the results. To confirm whether the small number of observations does not distort the DW test was performed and graphical analysis of ACF and PAFCs functions. Using graphical analysis has been shown that the autocorrelation doesn't exist in the models.

The actual results in the case of corporate taxes are quite surprising. As an explanatory variable here came only the unemployment rate with a negative sign. It follows that the unemployment rate negatively affects corporate tax revenue. Here it is possible that the unemployment rate reflected strongly in the current decline in consumption of goods.

In the case of personal income tax revenue results are also very interesting. The author hypothesized positive relationship rather proceeds of this tax and average wages. It appears that the average salary is rather an additional indicator of GDP in this case. Or most taxpayers have longer fixed wages and this variable is too dynamic.

A final observation is focused on testing whether the longer time series are creating more accurate prediction. The results derived using dynamic ex-ante analysis, are summarized in Table 3.

Table 3: Results of dynamic ex-ante forecasting

Time	Variable	Q1/2013	Q2/2013	Q3/2013	Q4/2013	total abs. deviation	total rel. deviation
quartal	CIT	-3.79258	-5.21705	-3.98197	-1.16809	-14.15969	-0.1172937
	PIT	1.1413	1.26096	1.36369	0.989312	4.755262	0.03357525
annual	CIT	-4.86608				-4.86608	-0.0403088
	PIT	2.98291				2.98291	0.02106129

Source: Data ARAD(2015) + Author

Generally, the models are very good. The table shows that the estimated revenues from corporate taxes are much more difficult to forecast. This phenomenon can be caused by a system of continuous paying taxes, or the possibility of some creative accounting adjustments in the last quarter. On the other hand, results in personal income taxes are excellent. Here it may be due to the relatively evenly distributed payments for advances on tax credits from the tax algorithm.

The actual results comparing the relationship of the length of time and the quality of models is obvious. Shorter time series here perform better, this is especially evident in the error estimates for corporate tax. CIT estimates based on annual data are approximately four times more accurate than the estimates on a quarterly basis. Thus it can be argued that in the case of estimating the tax revenue is better to use a relatively short time series, or that are at least equivalent. On the other hand, the author here had some problems with too short a time series.

4   Conclusions

The aim of the article was to test whether they are better annual or quarterly time series for estimating tax revenues. Specifically juxtaposing the two generally accepted econometric claims. The first claim argues that the more observation, more accurate model. The second argument claims that the estimated system should be as stable as possible. The present results indicate that in case of tax revenue is used more second claim. Alternatively, you can

mark both ways as equivalent. Of course it could not be said that only after testing two tax revenues these findings are always valid.

Furthermore, the results of this work may be controversy over the fact that it is not still necessary in the context of compliance with all econometric standards to artificially stretching the input data series (at least for the time series of tax revenues). From the principle of calculating tax revenues, it is clear that these dependent variables are exposed to many legislative exogenous influences during the reporting period, and it is perhaps better to choose a relatively short time series. On the other hand, the length of the input time series should be sufficient for at least some basic econometric tests. Future extensions of this paper can be looking for the optimum length of the time series, possibly by trying other explanatory variables or other methodology.

Acknowledgements

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The Role of Spa and Recreational Stay Fee in the Budgets of Spa Municipalities in the Czech Republic

Jiří Bečica[*]

Abstract. This paper characterizes local fees under Act no. 565/1990 Coll ., Local fees with focusing on evaluation of the role of the spa and recreational stay fee in the budgets of all spa municipalities in the Czech Republic in 2001-2014.

The aim of this paper is to show stagnant or decreasing tendency of tax revenue of spa and recreational stay fee in budgets of all spa municipalities in the Czech Republic. The fee is assessed in relation to tax revenue and total income of selected municipalities. These municipalities are divided into six categories according to the size and the number of inhabitants in particular municipality. The relationship of Spa and recreational stay fee, for the purpose of this paper, is not evaluated relative to expenditures to so-called functional infrastructure of towns and cities, which forms suitable aesthetic and natural environment and ensuring of the possibility of socio-cultural and sports activities. The mentioned areas of expenditure are usually paid from budget of particular municipality, but they are not optimally sorted in the expenditure structure of the budgets of surveyed municipalities, moreover, the methodology of their integration has changed during observed years, so it would not be objective during the juxtaposition of spa municipalities which are listed in the paper and to the identified outputs. The result is the finding that the role of spa and recreational stay fee is constantly decreasing in the budgets of spa municipalities in the years 2001-2014 and the role of this fee declines in almost all observed municipalities budgets.

Keywords: Municipal Budget, Local Fees, a Fee for Spa and Recreational Stay, Tax Revenue, Total Revenue

JEL Classification: H 76

1 Introduction

One of the basic tools of financial management of the municipalities in the Czech Republic is approval and managing according to their own budget. Elected members of municipal councils may affect some kinds of incomes by their decision, these incomes flow into budget of managed municipality. We also include, so called assigned taxes, which include the local fee issue here. Municipal council may establishes local fees under Act no. 565/1990 Coll., as amended, through the adoption of general binding regulations, that regulate particular local fee and its collecting in the territory of municipality which approved it.

The Czech Republic has returned to the situation that was, for the first time, given to municipalities in 1848 by adopting of this act. It was adopted so called Kroměříž contract at that time, which ensure independence in making decision about local fees for municipalities. This independent decision concerned e.g. The existence of local police, public meetings of municipal bodies and collection of certain local taxes that meet with the requirements for local fees more than the term fee, by their characteristics even if they are called fees according to the valid law.

The importance of independent powers for municipalities and associated ability to influence certain degree of their income can also be demonstrated by the words „ Free municipality is the foundation of the State." That was used in the Austro – Hungarian Constitution of 1848 for the first time. Every municipality in the present Czech Republic ensures by their operations life in the municipality and follow its development and well-being of its population. It exert a number of duties, especially in the context of separate and sometimes also delegated powers, as for instance states Vrbánková (2012a, 2012b). It shows that municipality needs certain level of funding to its run and to ensure of covering current and capital expenditures from assigned powers of municipalities, as it is stated e.g. by Tománek (2009) or Peková (2008) or Kadeřábková (2012). Ochrana (2014) evaluates savings of scale in the maintenance of municipal property, where there can be included assets in the form of material and technical equipment of the municipalities, which is necessary to acquire the status of a spa municipality in the Czech Republic, where according to the decision of the Ministry of Health for example belong accomodation and catering capacity and functional infrastructure of towns and cities - roadways, pavements, education, healthcare, public transport, further appropriate aesthetic and natural environment - orchards, parks and assets ensuring socio-cultural (theaters, museums, cinemas) and sports activities (playgrounds and sports facilities) for the residents and visitors of spas.

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The aim of the paper is to show the role of local fee for spa and recreational stay in budgets of spa municipalities in the Czech Republic in 2001-2014. The relationship of Spa and recreational stay fee, for the purpose of this paper, is not evaluated relative to expenditures to so-called functional infrastructure of towns and cities, but in relation to the total income and tax income of spa municipalities (Binek, 2008; Břeň 2013), because the expenditure structure of the analyzed municipalities varies greatly (because of the size of municipality) and individual items of expenditure are not optimally sorted, moreover, the methodology of their integration has changed during observed years, so it would not be objective during the juxtaposition of spa municipalities which are listed in the paper and to the identified outputs. The issue of tax and total incomes is given by budget structure and their structure is binding for all municipalities, therefore a share of the spa or recreational stay fee in relation to these incomes testifies about many thing (Schneider, 2014; Pelc, 2013). The fee is assessed in relation to tax revenue and total income of all municipalities with the status of spa in the Czech Republic. They are, because of need of comparison, divided into six size categories.

The possibility to influence income for municipalities was enabled them by gradual decentralization of responsibilities from the state to local governments, which it needs to go hand in hand with decentralization of making decision on funding from the state to local government, as it is described in literature of theory of Fiscal Federalism. There are many different approaches and definitions to Fiscal Federalism, e.g. . Mr and Mrs Musgrave (1994) understand Fiscal Federalism as a system whose purpose is to enable different groups living in different countries to express different preferences for public goods, which inevitably leads to differences in the level of taxation and public services that are supplied to inhabitants in a given territory. Peková (2008) or Tománek (2013) state that fiscal federalism deals inter alia with theoretical justification of optimal allocation of public revenue and public expenditure of budgets of each government level, including optimization of relations between them in practical fiscal policy in order to increase allocation efficiency.

The Czech Republic also entered and embraced the European Charter of Local Self-Government in 1998 which has been considered to be a standard law for local self-government in the territory of Council of Europe since 1985 and creates a common and internationally binding framework for the protection of local democracy. The scope of the European Charter of local government can also include the issue of financial independence of local government at the central level, contained in Article 9, which has 8 paragraphs and the first one state that local authorities have the right to their own financial resources which they can, within their powers, dispose freely with. There are other passages following where there is stated in one of them that at least part of the financial resources of local authorities comes from local taxes and fees that can be determined by local authorities in the limits of the law.

Municipalities in the Czech Republic have the opportunity to influence the amount of so called assigned taxes, where there are among such a tax resulting in the municipal budget corporate income tax if the legal entity is the municipality, Real estate tax and revenue of various types of fees, for example, administrative and local fees and fees associated with the environment. The other passages are devoted only to the issue of local fees for spa and recreational stay due to focusing of the contribution.

The issue of local fees falls within the budget classification in tax revenues. Many municipalities use the opportunity to introduce local fees because in addition to real estate tax, it is one of few tax revenue that amount may municipality influence by their decision. The use of this option becomes a fiscal instrument of municipal policy. Sedmihradská (2013) shows the impact of increased of fiscal autonomy in tax revenues of municipalities in the case of Real Estate Tax.

2   Data and methods

The analysis uses data from the system of Ministry of Finance - ARIS, ÚFIS and IISP - Moniotor agregating all public incomes in thousands of CZK for all municipalities in the Czech Republic in the years 2001-2014. Only data of all spa municipalities in the Czech Republic are analyzed for the purpose of this paper, the juxtaposition of spa municipalities are classified into six size categories – spa municipalities of 500 inhabitants, 501 to 2 thousand inhabitants, 2-5 thousand inhabitants, 5-10 thousand inhabitants, 10-50 thousand inhabitants and over 50 thousand inhabitants. Population data are based on data from Czech Statistical Office on 31st of December 2009 and number of inhabitants who are in the municipality registered for permanent residence are taken into account.

Municipalities levy local fees on the basis of the mentioned Act no. 565/1990 Coll., on local fees, as amended. Municipalities introduce these fees through the approval of general binding ordinance by the municipal council. They may levy a local tax on dogs; spa and recreation stay fee; for the use of public space; from admission; accommodation capacity; on driving a motor vehicle into selected areas and parts of the municipalities, for the operation of the system for collection, transport, sorting, use and disposal of municipal waste (fee for municipal waste) and the fee for evaluation of building plot, its possibility of connection to the construction of water supply and sewerage.

For the purpose of this paper it is evaluated only local spa and recreational stay fee, which overlaps with local fee of accommodation to some extent, which is paid by accommodation provider for the people, who stay by him and regardless of the purpose of the stay. This fee is the max. amount to 6 CZK for each occupied bed per day,

however there are exempt accommodation for temporary accommodation of students and spa and health facility from this fee. Therefore, from this follows, that in the case of a spa stay the fee of accommodation is not paid and it is paid only a spa and recreation stay fee, which is paid by people, which temporarily and for a fee stay in spas and in places of concentrated tourism for treatment or recreation. This fee is paid to landlord, who leads registration book. The provider of the service pays this fee to the municipality on the basis of these data. Fee rate us up to 15 CZK per a day of stay. The payment is always for the started day of a stay. The taxpayer is the landlord and the municipality may these payments established as flat rate and thus weekly, monthly or yearly or not to levy them at all.

The relationship of Spa and recreational stay fee, for the purpose of this paper, is not evaluated relative to expenditures to so-called functional infrastructure of towns and cities, but in relation to the total income and tax income of spa municipalities, because the expenditure structure of the analyzed municipalities varies greatly (because of the size of municipality) and individual items of expenditure are not optimally sorted, moreover, the methodology of their integration has changed during observed years, so it would not be objective during the juxtaposition of spa municipalities which are listed in the paper and to the identified outputs.

3   The role of spa and recreational stay fee in the budget of spa resorts

Spa resort means the territory or part of territory of the municipality or more municipalities where there are natural spas asset as spa resort by Act no. 164/2001 coll. The main prerequisite for existence of natural health spas and the decision of Ministry of Health about their use for spas are natural healing resources and conditions. In addition to these two main conditions there must be met in the resort e.g. a fundamental hygiene requirements in terms of quality of air, water and soil condition for development of spa facilities, which may include the existence of natural healing resources; used spa-treatment facility; the presence of other components of the material and technical equipment – accommodation and dining facilities; functional infrastructure of place – town, city; suitable aesthetic and natural environment and ensuring of socio-cultural and sports activities.

There are listed spa resorts of the Czech Republic according to their territorial jurisdiction within the regions in the Czech Republic in the tables. There is also, in addition to the list of spa resorts in the Czech Republic, given a title used by the spa municipality in the tables i.e. Municipality (M), Township (Ts), Town (T) and City (C). There is also the number of inhabitants (NI) to 31st of December 2009 and the share of fee for spa and recreational stay (RS) on tax revenues (TR) and total income (TI) in the tables in 2001-2014. The spa resorts are divided according to population and in alphabetical order in the appropriate size category.

Table 1: Spa resorts of the Czech Republic with the number of inhabitants 0-500

Name	Title - NI	Region	2001	2006	2010	2011	2012	2013	2014
			Share of RS on TR in % in a year						
			Share of RS on TI in % in a year						
Karlova Studánka	M-205	MSK	44.71	37.48	35.65	33.85	32.51	24.02	20.75
			12.93	20.64	9.71	8.41	8.20	8.30	7.66
Lázně Libverda	M-453	LB	16.79	20.12	18.44	8.10	11.57	7.67	6.96
			5.99	6.08	5.56	1.26	1.86	1.67	2.25
Skalka	M-243	OL	0.00	0.19	1.24	1.09	0.88	0.71	0.63
			0.00	0.06	0.39	0.43	0.50	0.35	0.13
Teplice nad Bečvou	M-334	OL	20.72	16.13	11.61	8.60	10.14	7.75	8.31
			5.28	5.93	4.86	5.40	6.15	4.64	4.76
Vráž	M-280	JČ	17.82	13.11	13.81	14.36	14.58	2.88	10.18
			10.28	10.50	11.45	7.95	4.37	2.28	8.00

Source: Own processing of data from information system Aris and Monitor of Ministry of finance of CZE.

As we can see in Table 1, The spa fee is about 1- 45% of taxes revenues and 0 -21% of total income in spa resorts with maximal 500 inhabitants and there is a noticeable decline of the role of income in the period of 2001-2014, both at the level of the tax and total income. The fee has the greatest role in municipality Karlova Studánka in the Moravian-Silesian Region among surveyed municipalities.

There are nine spa municipalities with the number of inhabitans between 501 – 2 thousand in the Czech Republic and the spa fee creates 1-28% of tax revenues and 0-21% of total income. The role of fee in the budgets of individual spa resorts is diverse but we can register annual decline in all of them. The fee has greater influence only in Town Janské Lázně and Township Pozlovice.

Table 2: Spa resorts of the Czech Republic with the number of inhabitants 501-2 thousand

Name	Title – NI	Region	2001	2006	2010	2011	2012	2013	2014
			Share of RS on TR in % in a year						
			Share of RS on TI in % in a year						
Janské Lázně	T-821	HK	27.20	25.31	21.08	21.76	18.60	12.61	15.15
			17.56	16.12	11.13	12.74	8.63	6.00	8.19
Konstantinovy lázně	M- 946	PL	17.49	7.60	5.28	5.59	7.04	4.45	6.31
			7.57	2.88	1.14	2.38	4.00	1.65	3.07
Lázně Kynžvart	T-1,570	KV	1.27	2.32	1.95	1.88	1.73	1.28	1.53
			0.87	1.36	1.29	1.38	1.28	0.99	0.91
Mšené-lázně	M-1,755	UL	2.15	1.64	1.37	1.18	1.10	0.77	0.79
			1.08	0.37	0.87	0.65	0.83	0.63	0.67
Lázně Toušeň	Ts-1,178	SČ	1.18	0.58	1.21	0.91	0.68	0.44	0.42
			0.59	0.19	0.52	0.43	0.43	0.29	0.24
Osečná	T-1,066	LB	1.28	1.16	1.18	1.11	1.09	0.52	0.56
			0.66	0.26	0.59	0.64	0.53	0.21	0.17
Pozlovice	Ts-1,168	ZL	28.35	17.30	15.93	12.18	12.70	11.41	11.49
			21.65	10.31	2.68	8.19	6.59	6.67	7.27
Slatinice	M-1,497	OL	3.67	1.89	2.14	2.56	2.91	0.72	2.70
			0.92	1.36	0.56	1.11	2.26	0.55	1.50
Velichovky	M-757	HK	18.70	10.00	14.07	6.72	7.47	1.34	2.51
			12.08	5.02	7.00	3.92	4.69	0.86	1.64

Source: Own processing of data from information system Aris and Monitor of Ministry of finance of CZE.

Table 3: Spa resorts of the Czech Republic with the number of inhabitants 2001 -5 thousand

Name	Title – NI	Region	2001	2006	2010	2011	2012	2013	2014
			Share of RS on TR in % in a year						
			Share of RS on TI in % in a year						
Bludov	M-3,155	OL	0.17	0.11	0.15	0.17	0.15	0.07	0.04
			0.08	0.03	0.10	0.11	0.10	0.05	0.02
Jáchymov	T-3,276	KV	19.19	11.67	10.09	10.12	10.36	7.47	7.88
			9.70	4.62	5.86	4.82	5.47	3.96	4.03
Klimkovice	T-4,059	MSK	3.86	2.34	2.22	2.51	2.08	1.49	0.98
			1.76	1.11	1.41	0.63	0.98	1.06	0.53
Lázně Bělohrad	T-3,751	HK	19.19	11.67	3.58	3.89	3.37	2.20	2.36
			9.70	4.62	2.27	2.62	2.18	1.60	1.62
Lázně Bohdaneč	T-3,348	PA	7.76	6.22	5.94	6.13	4.23	3.10	3.40
			2.54	3.02	1.81	1.60	2.24	1.89	2.24
Lednice	M-2,322	JM	1.76	1.19	3.37	2.09	3.23	2.42	2.98
			0.74	0.63	1.24	1.30	1.89	1.09	0.73
Lipová-lázně	M-2,519	OL	4.28	4.21	3.76	3.21	2.52	2.74	1.59
			1.53	1.39	1.82	1.61	1.59	1.62	0.96
Ostrožská Nová Ves	M-3,360	ZL	0.20	0.79	0.99	1.21	0.64	0.74	0.75
			0.12	0.32	0.72	0.81	0.45	0.50	0.44
Velké Losiny	M-2,803	OL	2.56	2.72	3.92	4.27	3.69	2.53	2.68
			1.40	0.96	2.34	2.27	2.12	1.35	1.29

Source: Own processing of data from information system Aris and Monitor of Ministry of finance of CZE.

For midsize spa municipalities with the population of 2-5 thousand inhabitants is this fee about 2-5% on tax revenues as well as total incomes. The exceptions are Lázně Jáchymov and Bělohrad, where is the role of the fee in the range of 4-20%. Again, we can register the gradual decline of the role of the fee in the budget of given spa resorts.

Table 4: Spa resorts of the Czech Republic with the number of inhabitants 5001 -10 thousand

Name	Title – NI	Region	2001	2006	2010	2011	2012	2013	2014
			Share of RS on TR in % in a year						
			Share of RS on TI in % in a year						
Bechyně	T-5,541	JČ	1.58	2.17	1.85	1.50	1.10	0.67	0.85
			0.40	0.93	0.82	0.46	0.46	0.30	0.49
Dubí	T-8,062	ÚL	0.29	0.27	0.00	0.00	0.00	0.00	0.00
			0.17	0.14	0.00	0.00	0.00	0.00	0.00
Františkovy lázně	T-5,608	KV	11.74	6.22	6.78	6.55	7.19	5.63	5.67
			3.70	3.61	3.24	2.96	3.34	3.71	4.12
Luhačovice	T-5,368	ZL	13.58	8.59	8.70	9.11	8.16	6.07	6.68
			3.99	3.50	2.11	2.32	4.14	3.77	3.71
Třeboň	T-8,782	JČ	3.85	3.86	4.21	4.15	4.12	3.11	3.37
			1.31	1.12	1.11	1.35	1.65	1.42	1.57

Source: Own processing of data from information system Aris and Monitor of Ministry of finance of CZE.

The spa resorts with 5-10 thousand inhabitants in the Czech Republic are Bechyně, Dubí, Františkovy lázně, Luhačovice and Třeboň. The spa fee has almost no role in the municipal budgets of first and second municipality but there is the share of tax revenues about 4-14% and share of total income about 4% in the last 3 municipalities. It is necessary to realize that for example, the amount of collected fee in municipality Luhačovice and Františkovy lázně is about 5 million CZK a year which is far from negligible amount of about 140 milion budget of these municipalities.

Table 5: Spa resorts of the Czech Republic with the number of inhabitants 10 0001 -50 thousand

Name	Title – NI	Region	2001	2006	2010	2011	2012	2013	2014
			Share of RS on TR in % in a year						
			Share of RS on TI in % in a year						
Bílina	T-15,883	ÚL	0.01	0.01	0.01	0.02	0.02	0.02	0.01
			0.00	0.00	0.00	0.01	0.01	0.01	0.01
Hodonín	T-25,687	JM	0.00	0.19	0.37	0.38	0.37	0.28	0.29
			0.00	0.07	0.14	0.16	0.23	0.18	0.18
Jeseník	T-12,096	OL	2.46	2.10	1.97	1.82	2.00	1.09	1.05
			0.83	0.68	0.56	0.55	1.00	0.64	0.68
Mariánské lázně	T-13,758	KV	8.37	6.95	6.16	6.92	7.03	6.12	5.84
			3.06	3.70	2.64	3.08	3.66	3.58	4.01
Náchod	T-20,842	HK	0.03	0.06	0.06	0.05	0.05	0.05	0.04
			0.01	0.03	0.03	0.02	0.03	0.03	0.02
Poděbrady	T-13,788	SČ	2.53	1.69	1.48	1.47	1.02	0.80	0.99
			1.21	0.91	0.66	0.56	0.56	0.56	0.60

Source: Own processing of data from information system Aris and Monitor of Ministry of finance of CZE.

In total, 6 municipalities meet the condition of spa resort with the number of inhabitants 10-50 thousand. The share of spa fee in the municipal budget is, within the exception of Marianské lázně, minimal (1%). This fee is about 12 million CZK a year in Marianské lázně making 5-8 % of tax revenues and about 3-4% of total income of municipality, which normally achieve amounts ranging from 300 to 400 milion CZK in reporting period. Even in this size category there is notable the downward trend of the role of spa fee in total annual budget.

Table 6: Spa resorts of the Czech Republic with the number of inhabitants 50 001and more

Name	Title – NI	Region	2001	2006	2010	2011	2012	2013	2014
			Share of RS on TR in % in a year						
			Share of RS on TI in % in a year						
Karlovy Vary	C-51,459	KV	3.89	2.89	3.12	3.39	3.44	3.12	2.85
			2.18	1.56	1.57	1.99	2.27	1.88	2.02
Karviná-Darkov	C-62,661	MSK	0.53	0.37	0.36	0.40	0.31	0.15	0.19
			0.21	0.19	0.15	0.21	0.18	0.09	0.13
Teplice	C-51,461	ÚL	0.62	0.37	0.03	0.00	0.00	0.00	0.00
			0.29	0.18	0.02	0.00	0.00	0.00	0.00

Source: Own processing of data from information system Aris and Monitor of Ministry of finance of CZE.

In the largest spa municipalities, encompassing the three cities – Teplice, Karviná and Karlovy Vary is the role of spa fee, except of Karlovy Vary, negligible. Due to very small revenue of this fee was this fee cancelled in Teplice during the reporting period. There is the share up to 0.2% of total income and 0.2-0.6% of tax revenues in Karviná. In the case of Karlovy Vary is the share about 2% of total income and approximately 4% of tax revenues. Its annual levy is about 18-24 million CZK.

4   The results and discussion

The Czech Republic is relatively rich in thermal springs and therefore the number of spa resorts. Among the most famos spa municipalities in Bohemia are especially spa facilities in western Bohemia. Especially the Karlovy Vary region in municipality Karlovy Vary, Mariánské lázně or Františkovy lázně Furthermore, there are spa in municipalities Jachymov and Lázně Kynžvart in this area. There are spa municipalities Bechyně, Třeboň or Vráž in the area of South Bohemia. The most famous spa in Central Bohemia is Poděbrady.Norther Bohemia is also quite rich in occurrence of thermal springs and we find many spa municipalities in the Usti, Liberec, as well as in Hradec Kralove region, e.g. Teplice, Bílina, Dubí, Janské Lázně, Lázně Velichovky and Náchod, then spa Libverda and Osečná – spa Kundratice. Spa Bělohrad and spa Bohdaneč are in eastern Bohemia.

Hodonín a Lednice are spa resorts in southern Moravia. Karlova Studánka, Klimkovice and Karviná-Darkov in northern Moravia. You will find the most famous Moravian spa Luhačovice in the Zlin region with nearby township Pozlovice. We find Priesnitzovy spa in Jeseníky in the Olomouc region. There are also spa municipalities Lipová-lázně, Velké Losiny, Skalka, Slatinice, Bludov and spa in Teplice nad Bečvou.

From the tables 1-6 assembled from selected size groups it is evident that the role of spa and recreational stay fee is higher at territorial units with smaller population (e.g. Karlova Studánka, Teplice nad Bečvou, Vráž), thus

with less tax revenues, hence the total income of the budget. The total incomes of small municipalities do not fundamentally differ from tax revenue, as it is in medium-sized municipalities (Třeboň, Jeseník, Náchod, Poděbrady) or in big-sized municipalities (Karviná, Teplice, Karlovy Vary), which perform delegated powers to which is bonded a certain degree of grants from the state budget. The role of spa or recreational stay fee decrease in the budgets of most spa municipalities during reporting period and it also decreases with growing number of inhabitants, hence the increasing amount of total incomes in municipal budgets. It can be stated that in almost all spa resorts the fee for the observed period decreased in 2014 compared to 2001 at least to half, the exception are only well-known spa municipalities Karlovy Vary, Třeboň, Mariánské lázně, where there is noticeable decline of incomes of spa fee, but this decline creates only about one quarter. Growth of incomes can be noticed by newly built spa locations, for example, municipality Lednicem Ostrožská Nová Ves, Velké Losiny or towns Lázně Kynžvart and Náchod, where the fee is slightly increasing or stagnating in relation to tax and total incomes. The city council of Teplice even acceded to abolitions of spa fee in the year 2010, because city council believed that income of such fee is counterproductive, because the costs associated with managing of this fee is higher than fee revenues to the budget.

The spa fee is about 1- 45% of taxes revenues and 0 -21% of total income in spa resorts with maximal 500 inhabitants and there is a noticeable decline of the role of income in the period of 2001-2014, both at the level of the tax and total income. The fee has the greatest role in municipality Karlova Studánka in the Moravian-Silesian Region among surveyed municipalities.

There are nine spa municipalities with the number of inhabitans between 501 – 2 thousand in the Czech Republic and the spa fee creates 1-28% of tax revenues and 0-21% of total income. The role of fee in the budgets of individual spa resorts is diverse but we can register annual decline in all of them. The fee has greater influence only in Town Janské Lázně and Township Pozlovice.

Town Klimkovice represents the mid category of spa municipalities with 2-5 thousand inhabitants. According to the number of inhabitants there are similar spa municipalities, such as Lázně Bohdaneč, Great Losiny, Lázně Bělohrad, Jáchymov or Bludov. In this size category, the share of spa and recreational stay fee varies on tax revenues in the range of 2-5% as well as total incomes. The exceptions are Spa Jáchymov and Spa Bělohrad, where is the role of the fee in the range of 4-20%. Again, we can register the gradual decline of the role of the fee in the budget of given spa resorts.

There are five spa municipalities with the number of inhabitans between 5 – 10 thousand in the Czech Republic and the spa fee creates 0-13% of tax revenues and 0-4% of total income. The tendency of revenue for spa and recreational stay fee is also declining in this size category.

In total, 6 municipalities meet the condition of spa resort with the number of inhabitants 10-50 thousand. The share of spa fee in the municipal budget is, within the exception of Marianské lázně, minimal (1%). Even in this size category there is notable the downward trend of the role of spa fee in total annual budget.

In terms of population, is the largest spa municipality the city Karviná in the Czech Republic. There is spa Darkov on its land register. The revenue of spa and recreational stay fee is in the range of 0.1-0.5% of tax revenues and 0.09-0.21% of total incomes of municipal budget of Karviná city. The city Teplice abolished this fee in year 2010 due to its minimal revenue to the city budget. Our best known spa municipality is Karlovy Vary, but even here, the revenue of fee to tax revenues and to total incomes gradually decline or stagnates and ranges between 1.5-4%. The tendency is declining in reported period and we can also say by this share that in the terms of contribution to the municipal budget it is minimal.

5 Conclusions

By monitoring of all size categories of spa municipalities showed that the role of the spa and recreational stay fee has tendency to decline, which is generally cause by rising of tax revenues and total income of municipalities. The last sharp increase of municipal incomes in the Czech Republic was caused by amendment of the Act on budgetary tax with affect from 2013. If there is no amendment to the Act on local fees, then we can assume that the role of the spa and recreational stay fee will continue to decline in spa municipal budgets. It is worthwhile to consider the amendments of the Act on local fees at the maximum rate, which with the exception of the fee for municipal waste, has not been changed since the introduction of the Local Fees act or to consider, if it would be better, at the level of each municipality council, to go through the way of city Teplice and not collect the local fees due to its administrative demands.

The positive change would also be introducing of change of terminology, because the term of local fee does not match the parameters of fees (voluntary, equivalent and non-refundable income to public budget), but more parameters of local taxes (unequal, involuntary and non-refundable income to the public budget). The revenue of local fees becomes for most municipalities in the Czech Republic symbolic income into municipal budgets then real possibility how to influence the amount in their budgets. This current situation prevailing in municipalities in the Czech Republic does not correspond approaches according to the theory of fiscal federalism, as it perceives many domestic and foreign authors (Peková, 2008; Tománek, 2009; Musgrave, 1994; etc.) and also above-

mentioned European Charter of Local Self-Government, which the Czech Republic has adopted and proudly avows to it. The spa or recreational stay fee is only a local income without a relationship to covering of additional expenses related to the status of the spa locality.

Acknowledgements

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Fiscal Assessment in the Tax–Spending Nexus: A Tale of Central and Eastern European Countries

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Abstract. The purpose of this paper is to investigate the relationship in the government spending and taxes nexus in Central and Eastern European (CEE) countries in the period 1999Q1-2014Q1. Empirical test results show the validity of "tax-spend hypothesis" for Slovenia, the "spend-tax hypothesis" for Estonia, Latvia, and Slovakia, the "fiscal synchronization hypothesis" for Romania and Bulgaria. Finally, there are no causality relationship between taxes and spending for Czech Republic, Hungary, Lithuania, and Poland even at the 10% significance level. After Eurozone crisis, it is vital for controlling the excessive imbalances in the budget deficits. We indicate that the main policy implication is essential to reduce the public spending to continue the balance of public finance.

Keywords: Tax, Spend, Cross Section Dependence, Panel Causality Test

JEL Classification: C33, E62, H61

1   Introduction

The relationship between government spending and taxes heavily debated topic owing to the reoccurrence of large public debts and deficits in both developed and developing countries especially in Europe after the Eurozone crisis. Today, the most of the EU member countries faced with large fiscal deficits. This relationship is crucial for understanding the sustainability of fiscal or budget deficits. The recent Eurozone crisis has aggravated the sustainability of fiscal deficits and its effect to the economic growth. For this reason, the relationship between government spending and taxes in the context of fiscal assessment, has a great importance not only for researchers but also for policymakers in the matter of balanced budget in the long run. Government use taxes and spend that are also the tools of fiscal policy. The adjustments in these tools determine the economic stability, economic growth, unemployment, and investment. Therefore, we need to understand the relationship between taxes and spendings related to the causes and results of fiscal balance.

The aim of this study is to investigate the relationship between the government taxes and spendings to determine fiscal situation within fragile economic structure. To determine the relationship between taxes and spending is vital for satisfying the macroeconomic stability in the framework sustainable budget deficit. The paper contributes to the empirical literature by investigating to as part of existing literature. Especially, the paper contributes to the empirical literature by extending the taxes and spending nexus in CEE countries for the period 1999Q1-2014Q1. Firstly, this will be early attempt to examine on this causality with a panel of CEE countries. Secondly, for we use the panel granger causality approach takes account of time series and cross sectional dependencies, panel data analysis satisfy more powerful empirical results instead of time series method. This method displays high degree of interdependent testing for CEE countries. The method used in the paper is developed by Kónya (2006) that consider cross section dependency and heterogeneity across countries. The remainder of this paper is organized as follows. Section 2 explains the theory and literature, section 3 lays out the data and methodology, and section 4 discusses the empirical results and finally section 5 concludes the paper.

2   Theory and Literature

The government taxes - spending literature focuses on four alternative hypotheses: (i) tax and spend hypothesis, (ii) spend and tax hypothesis, (iii) fiscal synchronization hypothesis and (iv) institutional separation (fiscal independence) hypothesis. Firstly, tax and spend hypothesis is developed by Friedman (1978) which indicate changes in the government taxes causes to changes in government spending. Therefore an increase in government taxes will not bring about lower public deficits. According to this hypothesis, there is an unidirectional causality running from government taxes to spending. Buchanan and Wagner (1977) augmented this hypothesis in the context of fiscal illusion. This view supports that a decreasing in the tax revenue will reduce the government spending. Because of this rationale, a negative unidirectional causality running from government taxes to spending is also called as Buchanan-Wagner hypothesis (Wagner, 1976; Buchanan and Wagner, 1977; Buchanan and Wagner, 1978). Second, spend and tax hypothesis is based on the studies of Barro (1979) and Peacock and

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Wiseman (1979). This approach states that the changes in government spending will lead to changes in government taxes. This hypothesis means that there is a unidirectional causality running from government spending to government taxes. Third, fiscal synchronization hypothesis is credited to Musgrave (1966) and Meltzer and Richard (1981). This hypothesis proposes that government taxes and spending simultaneously determined. Hence, there is bidirectional causality between government taxes and spending. Finally, the fiscal independence or institutional separation hypothesis indicates that there is no relationship between government taxes and spending, government choices taxes and spending separately (Wildavsky, 1988; Sheffrin, 1992; Baghestani and McNown, 1994). For several studies, we can add to empirical results for previous literature.

Table 1: Papers about Taxes and Spending in the Past Literature

Papers	Data Span	Country	Methodology	Empirical Results
Anderson et al. (1986)	1946-1983	US	Granger Causality	$S \rightarrow T$
Manage and Marlow (1986)	1929-1982	US	Granger Causality	$S \leftrightarrow T$
Ram (1986)	1929-1983	US	Granger Causality	$S \rightarrow T$
Blackley (1986)	1929-1982	US	Granger Causality	$T \rightarrow S$
Ahiakpor and Amirkhalkhali (1989)	1926-1985	Canada	Granger Causality	$T \rightarrow S$
Bohn (1991)	1792-1988	US	ECM	$T \rightarrow S$
Baghestani and McNown (1994)	1955-1989	US	ECM	$T \nleftrightarrow S$
Hondroyiannis and Papapetrou (1996)	1957-1993	Greece	Granger Causality	$S \rightarrow T$
Payne (1997)	1950-1994	Canada	ECM	$T \rightarrow S$
Hasan and Lincoln (1997)	1961-1993	UK	ECM	$T \rightarrow S$
Darrat (1998)	1967-1994	Turkey	Granger Causality	$T \rightarrow S$
Li (2001)	1950-1997	China	ECM	$T \leftrightarrow S$
Hussain (2004)	1973-2003	Pakistan	Granger Causality	$T \rightarrow S$
Al-Quadir (2005)	1964-2001	Saudi-Arabia	ECM	$T \leftrightarrow S$
Young (2009)	1955-2005	US	Granger Causality	$T \rightarrow S$
Afonso and Rault (2009)	1960-2006	EU-25	Panel Causality	$S \rightarrow T$: Italy, France, Spain, Greece, and Portugal $T \rightarrow S$: Germany, Belgium, Austria, Finland, UK
Saunoris and Payne (2010)	1955-2009	UK	ECM	$S \rightarrow T$
Westerlund, Mahdavi and Firoozi (2011)	1963-1997	50 US state-local government	Cointegration	$T \rightarrow S$
Richter and Dimitrios (2013)	1833-2009	Greece	Granger Causality	$S \rightarrow T$
Aworinde (2013)	1961-2012	Nigeria	Granger Causality	$T \rightarrow S$

Note: T denotes government taxes, S shows government spending, $\rightarrow$ indicates unidirectional causality, $\leftrightarrow$ denotes bidirectional causality, and $\nleftrightarrow$ notes no causality between T and S.

3 Data and Methodology

The aim of this paper is to analyze whether there is a relationship between government taxes and spending by using Granger causality analysis by Kónya (2006) for the period from 1999Q1 to 2014Q1. All data used in this paper are derived from the *EUROSTAT Database* for ten CEE countries. These countries have been selected according to the data availability from this database. CEE countries used in this paper are Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, and Slovenia. In this paper, we use government taxes and spending data as a ratio of GDP for CEE countries.

It is vital for determining the cross-section dependence and slope homogeneity in panel data models, because of the presence of common shocks and unobserved components. So, we have experienced the economic and financial integration and high degree of globalization in terms of economic relations of countries (Hoyos and

Sarafidis, 2006). After examining the cross-section dependence, we employ LM test statistics used by the Breusch and Pagan (1980) and Pesaran (2004). The Breusch and Pagan (1980) Lagrange Multiplier (LM) test is based on the sum of squared coefficients of correlation among cross-section residuals derived by ordinary least squares (OLS). The results from the cross-sectional dependences display that the null hypothesis of no cross-sectional dependence is rejected at 1% level of significance in CEE countries. It suggests that any shock in an CEE country can be moved easily to any country in CEE countries. Other hand, it has importance of deciding whether or not slope coefficients are homogeneity or heterogeneous for panel granger causality analysis. The slope coefficients in panel data models are homogeneous across individual units in many empirical studies. Table 2 also displays the results of slope homogeneity tests and we reject the null hypothesis of the slope homogeneity test and support the country specific heterogeneity (Pesaran and Yamagata, 2008: 50).

Table 2: Cross-Sectional Dependence and Homogeneity Tests

Tests	Test Statistics	P-values
LM	304.628***	0.000
CD_{LM}	27.367***	0.000
CD	12.862***	0.000
LM_{adj}	29.861***	0.000
$\widetilde{\Delta}$	54.245***	0.000
$\widetilde{\Delta}_{\text{adj}}$	56.084***	0.000

Note: *P-values* are from the asymptotic normal distribution. The dataset for this test includes all sample period 1999Q1-2014Q1. The null hypothesis has no cross-section dependence, but alternative hypothesis supposes the cross-section dependence. *** implies rejection of the null hypothesis at the 1% levels.

We tested ten CEE countries using Kónya (2006) based on both cross-sectional dependency and country-spesific homogeneity. Once determining for the cross-sectional dependence and country-specific heterogeneity, we can apply bootstrap Granger causality approach proposed by Kónya (2006) which consider both cross-sectional dependency and homogeneity. This approach is focused on seemingly unrelated regressions (SUR) and Wald tests with country specific bootstrap critical values for determining a causal relationship in the panel data (Kónya, 2006: 979). This procedure does not need pre-testing the unit root process and cointegration properties for the variables used in their levels. So, the variables in the system do not require being stationary in this approach. Other hand, there is no need for pre-testing but the specification of the lag structure. In addition to them, this method determines how many and which countries exists one way or granger causal relationship between them (Kónya, 2006: 979-981). The procedure of this approach is based on predicting the following equations:

$$Tax_{1,t} = a_{1,1} + \sum_{l=1}^{ly1} \beta_{1,1,l} Spend_{1,t-l} + \sum_{l=1}^{lx1} \partial_{1,1,l} Spend_{1,t-l} + \varepsilon_{1,1,t}$$

$$Tax_{2,t} = a_{1,2} + \sum_{l=1}^{ly1} \beta_{1,2,l} Tax_{2,t-l} + \sum_{l=1}^{lx1} \partial_{1,2,l} Spend_{2,t-l} + \varepsilon_{1,2,t} \qquad (1)$$

$$\vdots$$

$$Tax_{N,t} = a_{1,N} + \sum_{l=1}^{ly1} \beta_{1,N,l} Tax_{N,t-l} + \sum_{l=1}^{lx1} \partial_{1,N,l} Spend_{N,t-l} + \varepsilon_{1,N,t}$$

and

$$Spend_{1,t} = a_{2,1} + \sum_{l=1}^{ly2} \beta_{2,1,l} Tax_{2,t-l} + \sum_{l=1}^{lx2} \partial_{2,1,l} Spend_{1,t-l} + \varepsilon_{2,1,t}$$

$$Spend_{2,t} = a_{2,2} + \sum_{l=1}^{ly2} \beta_{2,2,l} Tax_{2,t-l} + \sum_{l=1}^{lx2} \partial_{2,2,l} Spend_{2,t-l} + \varepsilon_{2,2,t} \qquad (2)$$

$$\vdots$$

$$Spend_{N,t} = a_{2,N} + \sum_{l=1}^{ly2} \beta_{2,N,l} Tax_{N,t-l} + \sum_{l=1}^{lx2} \partial_{2,N,l} Spend_{N,t-l} + \varepsilon_{2,N,t}$$

where *Tax* denotes the government taxes, *Spend* refers to the government spending for goods and service, index *i* refers to the country ($i = 1,...,N$), index *t* is the period ($t = 1,...,N$), l is the lag length. Other hand, we can say that $ly1$ and $lx1$ are the maximal lags for *Tax* and *Spend* in the equation (1), and $ly2$ and $lx2$ are the maximal lags for *Tax* and *Spend* in the equation (2). Finally, the error terms, $\varepsilon_{1,1,t}$, $\varepsilon_{1,2,t}$, $\varepsilon_{2,1,t}$, $\varepsilon_{2,2,t}$, are assumed to be white-noises (Kónya, 2006: 980).

Table 3: Panel Causality Test for CEE Countries (1999Q1 - 2014Q1)

| Countries | H_0 : Exp does not cause Rev | | | | H_0 : Rev does not cause Exp | | | |
| | Wald Stat. | Bootstrap critical values | | | Wald Stat. | Bootstrap critical values | | |
		1%	5%	10%		1%	5%	10%
Bulgaria	15.229***	10.247	4.946	3.487	8.638**	9.183	5.548	3.891
Czech Rep.	0.562	10.004	4.942	3.374	1.362	12.052	5.752	4.014
Estonia	6.177**	10.469	5.321	3.627	0.898	9.298	5.563	3.893
Hungary	0.646	9.501	5.167	3.655	0.766	16.839	6.552	3.718
Latvia	5.953**	10.378	5.123	3.656	0.002	9.376	5.562	3.916
Lithuania	0.146	8.933	5.465	3.914	3.057	10.251	6.091	3.967
Poland	0.019	8.557	4.799	3.286	0.007	10.393	6.010	4.143
Romania	11.919***	9.735	5.034	3.574	17.774***	9.407	4.910	3.465
Slovakia	4.785*	10.080	6.512	4.281	0.536	12.517	6.535	4.505
Slovenia	1.628	9.314	5.529	3.747	11.180***	10.025	5.557	3.950

Note: Bootstrap critical values were obtained from 10.000 replications. ***, **, and * imply rejection of the null hypothesis at the 1%, 5% and 10% levels of significance, respectively.

Panel Granger causality test results display that there is a unidirectional causality from spending to taxes in the Estonia and Latvia at 5% level and Slovakia at 1% of significance. The null hypothesis of non-causality running from spending to taxes cannot be rejected for Estonia, Latvia, and Slovakia. Other test results also display that there is one-way Granger causality runs from taxes to spending in Slovenia at the 1% levels of significance. This means that there is no relationship between government taxes and spending, pointing the "institutional separation hypothesis" or "fiscal independence" for Czech Republic, Hungary, Lithuania, and Poland. *Finally,* there is a bidirectional feedback mechanism, "fiscal synchronization hypothesis", for Romania and Bulgaria.

4   Conclusion

The aim of the paper is to examine the existence of causality relationship between taxes and spending nexus in CEE countries in 1999Q1-2014Q1. *First,* empirical test results show the validity of "tax-spend hypothesis" for Slovenia proposed by Friedman (1978). *Second,* we derived the evidence of "spend-tax hypothesis" for Estonia, Latvia, and Slovakia developed by Peacock and Wiseman (1979) and Roberts (1978). *Third,* we found the "fiscal synchronization hypothesis" supposed by Musgrave (1966) and Meltzer and Richard (1981) for Romania and Bulgaria. *Finally,* we do not have any causality results between taxes and spending for Czech Republic, Hungary, Lithuania, and Poland even at the 10% significance level. These results show the interdependent of relationships between taxes and spending, pointing support the "institutional separation hypothesis" or "fiscal independence hypothesis". These results are important to determine the relationship between taxes and spending. We can see how the country can manage its budget balance and fiscal policy using the government fiscal performance in the next period. After Eurozone crisis, it is vital for controlling the excessive imbalances in the budget deficits. We indicate that the main policy implication is essential to reduce the public spending to continue the balance of public finance. CEE governments should equate the taxes and spending, pointing fiscal rule (balance) policy or must make a point of fiscal adjustments for a balanced budget balance. To reach the macroeconomic stability, governments should regulate their economic and fiscal policies and reduce the public deficits without reducing social spending for fiscal sustainability.

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Public Spending and Economic Growth - Before the Crisis Period Review of Literature

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Abstract. The aim of this paper is to analyze the current level of knowledge in the sphere of public expenditure, economic growth and understanding of their mutual relationships. The analysis was based on review of theoretical literature, meta-analysis of previous empirical findings and focused on the period before of economic crisis. The outcome is a comprehensive picture of the results of research concerning the impact of the public sector and its components on economic growth.
Keywords: public spending, economic growth, expenses,
JEL Classification: 043

1   Introduction

The aim of this paper is the review of the theories of economic growth, discussion of potential factors influencing the de/acceleration of economic growth and the summary of empirical studies which measured the strength of the influences. Basic premise is that the public expenditures influence the economic growth before the crisis in 2009.

This paper is divided into two basic parts – theories of growth and factors of economic growth. Economic theories are divided into two sections – original and contemporary. The main factors of economic growth are recognized as the behavior of the public sector, economic performance and economic crises.

This analysis is based on deductive method. I focused on the study of basic information and the outcome is the comprehensive picture of the results. Firstly it was analyzed the history of theories of growth. The research was divided into two basic sections – the original theories and the contemporary theories of growth. Secondly it was analyzed the factors of economic growth.

The last part of this research is based on the make a conclusion and showing the basic problems and factors influencing the economic growth.

2   Theory of Growth

According to the research of literature are theories of growth divided into two basic groups. The first one are original theories of growth which represent the origin analysis this area. The second one are contemporary theories of growth. They build on the original theories and develops them.

2.1   The Original Theory of Growth

The theory of growth and the view of it was evolving and changing over time. The initial phase was represented by the classical theories looking quite negatively on the ways of government policy influencing economic growth. In the mid-20th century, during the onset of Keynesianism and Neo-Keynesianism, the state policies were starting to be perceived as a factor of economic development. Among the resources of the state policy, which influence the economic cycle, tools of fiscal and monetary policy were included. Chiefly in the period after the Second World War, the idea of building a welfare state spread in Europe as different types of public spending were in play. A number of economists (Frey and Stutzeri, 2010 or Giovannini, Hall, and d'Ercole, 2007) examines the impact of the government policies on a social level of prosperity.

The study used the Neoclassical growth models, in which an assumption of the perfect competition appears, which cannot accurately analyze the technological development to match the real situation. The technological progress is provided by knowledge, scientific experimentations, innovations and other factors and it cannot be classified as market good. The question emerged whether the motivation for technological progress, specifically for its production, is possible (Giovannini et al., 2007). There were unsuccessful attempts of endogenisation of technological progress. Ramsey (1928) and his theory of household savings intertemporal optimization was chosen as a model into which the investments were endogenized. Technological progress has long been seen as an exogenous variable and its further modeling was not possible.

In the theories of growth research during the period of neoclassicism a system of Harrod-Dorman models from the 1930s was discovered (Frait and Redka, 2002). In these models, the growth rate of the product is the sum of the rates of technological progress and the growth of the working population. Based on the models, the path of achieving a balance in the economy, which has been the subject of further research, could not be determined.

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Solow and Swan were inspired by the Neoclassical approach to growth. It is a model expanding the factors affecting economic growth by savings and capital. The model was designed so that it can, at a theoretical level, answer the questions concerning economic growth in the economies, differences between them and the cause of their origins and the way economies will converge. The main problem of this model was a discrepancy between the empirical values of capital share on pensions. In practice the values were significantly lower. Owning to this, the capital began to be understood in its broader form.

2.2   The Contemporary Theories of Growth

The efforts to endogenize technological progress led to an almost complete stoppage of long-term growth research and economists focused more on short-term developments. In the following period, roughly from 1960s to 1990s, a disagreement between Monetarists and Neo-Keynesians arose. Monetarist theory is based on the classical approach and considers the impact of these interventions on the economy as negative. Neoclassical and Keynesian theories are not focused on the future development of the individual markets over time as they are focused on their functioning at the time. The influence of Keynes, himself very skeptical about the long term, is clearly noticeable. Technological progress and investment process were included among the factors affecting economic growth, but the factors influencing their dynamics have not been investigated.

In the second half of the 1980s, there was a consensus of both theories. This consensus made room for research and analysis of other aspects of economic development. In the past, the emphasis was put on the determination of nominal variables in the short and medium term, e.g. inflation and unemployment. Owing to the shift of research to the long term, other factors began to be examined. These factors were discussed in the so called New growth theory using the Romer's (1994) and Lucas' (1986) models. A whole new set of questions arose and was gradually answered.

The subject of further research was the so called "New growth theory". The previous research analyzed the growth factors, i.e. investments, savings, technological progress, although new questions emerged, such as: why are some countries able to save up more than others or how the revenues of production factors scale function behaves. The increase of interest in the study of economic policies and in the analysis of their impact on economic growth occurs in this period. Capital began to be at this time regarded as a public good non-rivalrous, indivisible and very difficult to be patentable in the long term. It is also associated with potentially positive externalities. The above mentioned could result in increasing revenues of scale and limited mutual convergence of economies among themselves. There is also an extension of the definition of capital to the physical, human, etc. The nature of capital was investigated in connection with the fact that it is a public good, with the means of delivery and last but not least, its formation. A number of new methods came in connection with the research that transcended the fully competitive market tools. These were, for example, monopolistic rents or public goods security. The aforesaid resulted in the opening of space for the study of individual public policies roles.

3   The Influence of the Public Sector on Economic Growth

3.1   The Behavior of the Public Sector – Global Fiscal Policy Approach

According to the research economic growth is influenced by the behavior of the public sector. Public sector is one of the main factors influencing stability and growth of economics. It is important to have enough knowledge in this area. The public sector belongs among the determinants of capital formation, especially physical. As mentioned in the previous chapter, the new theories extended the physical capital by human capital.

The idea that the public sectors (public policies) affect economic growth can be found in the so-called Barro-Ricardo equivalence theory working with the assumption that the deficit of public policy cannot influence its future growth. In the event of a shortfall due, for example, an expansionary fiscal policy the interest rates will increase according to Barro because public debt must be financed by higher demand for funds in the capital markets. This results in a de facto price increase for credit entities (legal and natural) that demanded it. This leads to the crowding out of investment and the overall decline. At the same time the capital reserves decrease (Barro, 1988). Reducing the investment business and simultaneously the household consumption will result in attenuation and current deficit will lead to tax increases. Theregore, there is not an increase in consumption.

The growth of the economy's capital equipment and potentially the growth of economy is caused by capital public expenditure to physical capital. The condition is that it should be invested in reasonably profitable areas which also have a reasonable return. There are some schools' opinions that it is not so because the displacement effect takes place here. Dispensing applies especially to private investment which would ceteris paribus been invested in the area. If the existence of externalities is taken into account, we conclude that this displacement is not complete. Given that the private sector does not respond to positive externalities, certain investment projects are not advantageous. For this reason, even when displacement effect occurs, the growth of capitalization happens. As an example, it is possible to specify investments in infrastructure.

The existence of externalities is associated with public expenditure in human capital. As an example, it is possible to state health care, education, and expenditure on security work given by A. Smith.

Assessment of the impact of public expenditure and its empirical testing is very difficult. It is necessary to take into account the behavior of the revenue side of public budgets and it is also necessary to calculate a fairly significant delay.

The aim of economic policy should be the welfare, since the satisfaction and wealth of society should be maximized (Boarini, Johansson, and d 'Ercole, 2006). Welfare is being replaced by a proxy - economic growth. Linked to this is another area of concern.

There are various ways to grasp economic growth and public finances. For example, Voráčová (2007) divide the revenue and expenditure sides of public budgets and analyze their impact on growth. On the revenue side, the emphasis is put on substitution and pension effects of different tax types. They conclude that substitution between goods may not result in production shift. In case of intertemporal substitution, at a given time it may take place, contrary to the preceding case. Taxes may affect the amount of savings through motivation of saving.

In case of income tax, the impact on growth is not entirely clear. The pension and substitution effect are always in contrary to each other. The influences of progressively adjusted tax system on economic growth were, for example, examined by Sarte (2001). The result of his research is to demonstrate the existence of substitution effects that may result in outweighing the pension effect. The Keynesian theory is in contrast to the aforementioned, it states that higher progressive tax will lead to the accumulation of resources for subjects having higher propensity for consumption. Based on that, the economy recovers in the recession period.

3.2   Revenue Side of Public Budgets

Economic growth is also influenced by the economic performance. Economic performance related to structure of income and expenditures, taxes and accumulation of capital. Economic performance is used to measure of level of economic growth.

On the basis of a number of economic studies the expenditure structure has a higher influence on economic performance than the level of the expenditures. Based on an analysis of potential relationships made by Tanzi and Zee (1997), three ways were deduced. The first is the impact on the allocation of resources, the second is the redistribution of wealth and pensions, and the third is the impact on stabilizing the economy. Therefore, allocation, redistribution and stabilization functions are based on this analysis. Individual policies thus affect the production and quality of human capital crucial for economic growth.

Taxes may affect economic growth both negatively and positively, depending on what factor they are imposed on. In this context, we are talking about capital accumulation. During the reporting period, there will not be any change in the amount of production, the change will occur in the internal structure. If the substitution of future consumption for current happens, this will decrease the accumulation of capital and growth restriction will be expected. Limiting the amount of human capital taxation will lead to the move of the tax burden on other factors, which may be of a pro-growth character, and the resulting impact on the economy may be less negative. This results in redistribution effects that are generally less well tolerated.

In the case of public expenditure the positive effects on growth is anticipated thanks to the existence of positive externalities. This results in the compensation of reduced public expenditure efficiency compared to private investment. A necessary condition is related to the limiting of administrative costs.

The tax system should be modified so that only minor distortions appear, the tax burden is minimized and it should be primarily focused on supporting research and development representing the human capital. It is necessary to try to preserve social justice (Aghion, Caroli, and Garcia-Penalosa, 1999)

3.3   Empirical Analyses Examining the Impact of Public Spending on Economic Growth

A number of empirical analyses was performed. Panel regression or spatial analysis of non-panel data over time are included among the best tools. In an analysis of the volume and structure of public expenditure the functional classification of public expenditure is mostly used, it is done so within the classification of Government Finance Statistics (GFS). This is the methodology of the International Monetary Fund (IMF), known as the GFS 1986 and since 2002 an updated version of GFS 2001. Unlike the GFS 1986 methodology the GFS 2001 methodology is assimilated to the European System of Integral Economic Accounts (ESA 95) used by the Czech Statistical Office when compiling national accounts and preparing the documents submitted to the European Union. This methodology is used primarily for drafting the budget documents, such as national account or the state budget. Among its other uses the prediction of public finances is also included. The difference between the GFS and ESA lies in the fact that the data are reported on a cash basis using GFS, while ESA uses accrual accounting which accounting is based on. The GFS methodology is available earlier than the ESA and it is possible to convey between these methodologies, although it is necessary to take into account the fact that the methodologies exhibit government sector differently.

The social system inequality is evident in the economy and dealt with by Klazar and Sedmihradská (2009). It deals with the question of whether there is a correlation between the economic development of the country and social inequalities. It is concluded that interdependence can be reversible and this is caused by a certain degree of equality or inequality constraints that may cause the product growth, mainly due to the growing human capital. In addition, activities which are highly productive may be highly appreciable financially. The authors of the above publication conclude that there is a negative relation between the variables and show it on the case of Mexico and Turkey compared to Europe.

Interdependencies between different variables can only be seen with a certain lag, which can take up to 30 years according to Hanushek (2005). The author declares this on the example of educational reforms and their real impact. It is necessary to take into account the wide range of delays, for example Kubátová (2014) states that the delay may be caused by the time necessary to detect the condition or its changes. Other kinds of delays include political and system delays, etc. This raises the notion of notification effect which indicates a situation where there is a preparation of subjects for the situation even before it is announced. In this research, we can assume that there will be delays due to the conservative behavior of subjects that take some time to get used to the phenomenon, accept it or begin to use it. The last mentioned fact often occurs in the case of technological progress.

Within any econometric analysis the certain critical moments must be taken into account. Voráčová (2007) and Frait and Červenka (2002) indicate that it is necessary to test the structure of the estimated delay and based on this, to determine which information is relevant and which is irrelevant.

4   Conclusions

The aim of the research was to analyze the literature dealing with the areas of public expenditure and economic growth.

As a part of the analysis made was the analysis of the theories and approaches to economic growth. At the same time, the factors having an influence on them we analyzed. Among the most significant factors belong the subjects' behavior and structure of income and expenditure in the economy. I review numerous empirical analyses of the impact of public spending on economic growth based predominantly on the classification of Government Finance Statistics (GFS).

The general result is that the economic growth and social inequalities have a negative relationship. A certain degree of inequality (equality) can cause the growth of product. Public policies can also affect economic growth. It always depends on the specific situation and system settings.

The brief summary of empirical studies is depicted in the following table.

Table 1: The impact of description of casual/implication process on economic growth

Author	Description of causal/implication process	Impact on economic growth
Frey and Stutzer (2010)	the impact of the government policies on a social level of prosperity	Positive
Giovannini, Hall and d'Ercole (2007)	the impact of technological progress on economic growth	Positive
Frait and Červenka (2002)	Harrod – Dorman models, growth rate of the product	Positive
Romer (1994), Lucas (1986)	consensus of monetarist and Keynesian theories – new growth theory	Positive
Barro (1988)	Barro-Ricardo equivalence theory – the negative impact of the deficit of public policy	Negative
Boarini, Johansson, and d'Ercole (2006)	the impact of the wealth of society	Positive
Voráčová (2007)	the impact of revenue and expenditure sides of public budgets	Positive/Negative
Sarte (2001)	the impact of progressively adjusted tax system on economic growth	Positive
Tanzi and Zee (1997)	the impact of public policies affecting the production and quality of human capital on economic growth	Positive
Aghion, Caroli, and Garcia-Penalosa (1999)	the impact of tax on economic growth	Positive
Klazar and Sedmihradská (2009)	relation between product growth and human capital	Negative
Hanushek (2005)	preference of long term policies	Positive
Kubátová (2014)	the impact of political and system delays	Positive

Source: Own research.

The majority of studies concludes that there is an empirical evidence that some kinds of public expenditure have positive effect on the economic growth. They depict especially the schooling expenditure, expenditure for infrastructure and the research and development expenditure. Many authors also point out that there is a problem of the time lags, it means that there are different results for long term (usually positive) and short term. This is closely connected with the political circle which causes the preference of short term fiscal measures against measures with long term positive effects (Kydland 2004).

Acknowledgements

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The Impact of Tax Revenue on Graduate's Standardized Unemployment Rate in the Czech Republic

Ladislav Bušovský[*]

Abstract. The aim of the paper is to estimate the impact of public revenue on unemployment of university absolvents. The paper is focused on the most important variables search in an income side of state budget. Afterwards, found variables will be able to be used in more complex econometrical model. This paper is based on econometric analysis of examined impacts (for public and private universities). Results are summarized in tables and graphs and they are commented as a tool of unemployment optimization. The paper works with regression models of standardized unemployment rate of university absolvents, tax revenue, personal income tax, social security contributions and numbers of university students. The results show as the most important variables; the number of public graduates and the tax revenue.

Key words: standardizes unemployment rate, tax revenue, overeducation

JEL Classification: B22

1   Introduction

The tertiary education was huge reformed in last two decades. These changes are reflected in the political perception of tertiary education, in the structure of the education sector, in way of financing universities and at least in the current situation on labour market. The changes in labour market that effect unemployment of university absolvents were my primary point of inspiration of this paper.

Unemployment of university absolvents is becoming very topical discussion throughout Europe. One of the possible theories attempting to explain the distortion in absolvent's labour market is still developing theory called over-education (overeducation). From the name of the theory it is obvious that this theory tries to point on huge "education boom" in latest years. More closely about this theory and it´s factors refers Barr (2005) from United Kingdom. As many authors feel the need to focus on this problem there are lots of different opinions how to solve it. The most of authors seems the solution in regulation of university students but there are also alternatives solutions. Some of the alternatives summarize Václav Urbánek (2007) in his book. For example there are suggestions to construct a system of guide numbers of accepted students by universities or to establish fees for education (tuitions) in universities.

In this paper I try to figure out a possible impact of tax revenue on the problem on graduate's labour market. The primary assumption in this paper is that increasing taxes results (in negative way) on unemployment rate by increasing a labour costs. Also, changes in taxes regime could affect graduate´s decisions about choosing between working and studying. As a tool of research I am using econometric models with tax revenue and numbers of university students as a data sources.

2   Data and methodology

2.1   Selected data

In paper I am working with several data sources. The base consists of: the numbers of university students from the Czech Statistical Office, tax revenue data from the OECD database, personal income tax data from the OECD database, social security contributions data from the OECD database and the survey REFLEX 2013 as a project focusing on employment / unemployment graduates and their impact on labour market.

Data are structuralized to time series. Due to limited time series I work with the period from 2002 to 2012. This period shows constant and still current structure of tertiary education. It also contains all necessary data of all considered variables.

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Graph 1: Standardized unemployment rate of graduates
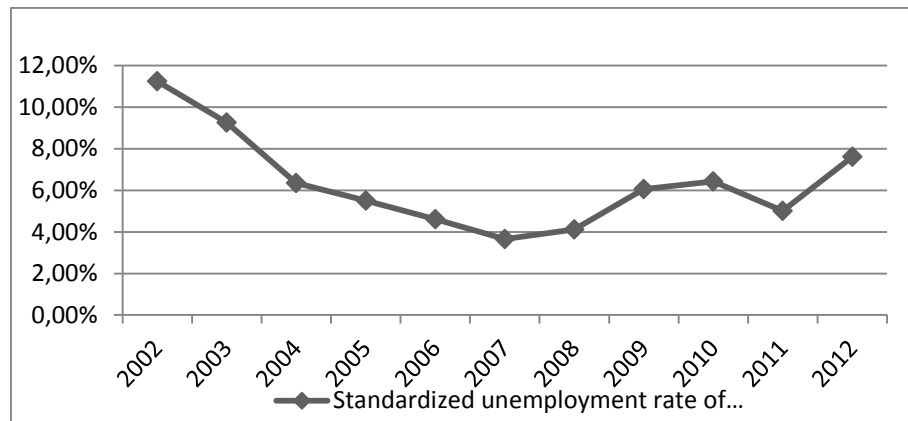
Source: Czech Statistical Office, www.czso.cz, custom processing

The regression model works primarily with the number of university students (public and private), tax revenue, personal income tax, social security contributions and the standardized unemployment rate of university graduates. The standardized unemployment rate acts as a regionally adjusted unemployment rate of university graduates obtained on the basis of survey REFLEX 2013. The tracking data were considered in the months of April for each year. I chose the tracking data to the first April of each due to the higher number of observations in the time series. The April data also contain form of adjustment in unemployment since most of graduates have more time to find a place on labour market during free months after graduation.

2.2   Methodology

Researched dependencies between variables were performed using regression analysis. For estimates compiled models were used the least squares method using econometric software EViews 7.

All gained (or modified) time series exhibit non-stationarity in its course. Therefore, to overcome any apparent effect regression, which could skew the results statistically insignificant variables to statistically significant once I chose the generation of the first differences (annual) for all non-stationary time series. In some cases it was necessary to generate also logarithms of time series and then difference them to gain relevant time series. The modified time series exhibit non-stationarity and prepared to be used in model. It is also cleansed from other relevant problems (heteroskedasticity, autocorrelation) and therefore there is no problems in continue in the analyses.

Table 1: Tested variables in regression model

Name of variable	Variable Label
standardized unemployment rate	d1_unemprate
students of public universities	d1_studpub
students of private universities	d1_studpri
tax revenue	d1_log_rev
personal income tax	d1_log_inc
social security contributions	d1_log_soc

Source: Custom processing

The analysis focuses on analysing the impact of components of public expenditure, tax quota and numbers of students of universities on standardized unemployment rate of graduates. I emphasize that in case of numbers of students I take into account just the students of public and private universities rather than state universities (state universities students are excluded from this paper due to difference in system of their participation in labour market). This analysis considers the standardized unemployment rate of university graduates (d1_unemprate) as the response variable. The explanatory variables are tax revenue (d1_rev), personal income tax (d1_inc), social security contributions (d1_soc) and numbers of students of public and private universities (d1_studpub, d1_studpri).

3   Results

This chapter briefly capture the results estimated using econometric software EViews 7. The results are summarized and process is captured in Table 2. Subsequently, the estimation results are structured into mathematical equations and interpreted and discussed in terms of their usefulness.

As it is evident from Table 2, model had to be estimated during the process by excluding explanatory variables due to their statistical insignificance, which is considered as a standard significance rate of 5 %. During the process of estimation in was necessary to exclude d1_studpri, d1_log_inc, d1_log_soc variables. All these mentioned were found as statistical insignificant.

The Table 2 shows the summary statistics of the estimated model. Based on a comparison of the coefficients of determination and Durbin-Watson statistic it is possible to deduce the apparent absence regression (coefficient of determination is greater than DW statistics). It is also possible to notice that coefficient of determination value reaches 38 % that highlights probably missing explanatory variables. These missing explanatory variables could be found in field of public expenditures. Based on these statistics the model can be considered as quality one. It is necessary to remind that model is working with relatively short time series. Longer time series could be more effective to show the model quality. Unfortunately, the verification by long time series is not possible at this time due to the novelty of tertiary education system in Czech Republic.

Table 2: Estimation process and results

Estimates	Explanatory variables	Coefficient	Standard deviation	p-value
(1)	Constant	0.012564	0.0082	0.1797
	d1_studpub	- 0.001738	0.0017	0.3680
	d1_studpri	0.001281	0.0032	0.7070
	d1_log_rev	- 0.910320	0.7530	0.2722
	d1_log_inc	0.131308	0.1860	0.5068
	d1_log_soc	0.428692	0.4982	0.4226
↓ Excluding d1_log_inc, d1_log_soc, d1_studpri due to their statistical insignificance ↓				
(2)	Constant	0.010710	0.0073	0.1779
	d1_log_rev	- 0.001228	0.0006	0.0774
	d1_studpub	- 0.452104	0.2309	0.0819
Model statistics		**Value**		
Determination coefficient		0.3847		
Durbin-Watson statistic		2.0483		
Final equation:				
*d1_unemprate = 0.0107 – 0.4521 * d1_log_rev - 0.0012 * d1_stupub*				

Sources: ČSÚ, MŠMT, own estimate by using econometric software EViews7

The Table 2 shows the final mathematical equation that is highlighted bellow. For later usage it is marked as equation 1 and it is verbally commented on next page of this paper.

$$unemp = 0{,}0107 - 0{,}4521 * rev - 0{,}0012 * d1\_stupub, \tag{1}$$

where   *unemp1*   =   d1_enemprate variable,
              rev   =   d1_log_rev variable,
              stupub   =   d1_stupub variable.

Equation 1. The first difference of standardized graduate´s unemployment rate is constantly rising by 0.0107 percentage by year to year. The increase of first difference of logarithm of tax revenue (d1_log_rev) by 1 percentage causes decrease of first difference of standardized graduate´s unemployment rate by 0.4521 percentage. At least the increase of first difference of numbers of students of public universities by 1000 evokes decrease of first difference of standardized graduate´s unemployment rate by 0.0012 percentage.

4   Conclusions

Based on the analyse I am able to identify significant variable in influencing the standardized unemployment rate of university graduates. The highest impact in this model is caused by tax revenues and number of students of public universities. From the final equation it is obvious that assumption about impact of increasing taxes has not been confirmed. Moreover, there is opposite effect of tax revenue impact. This positive impact of tax revenue on standardized unemployment graduate´s rate could be explained by alternative economic theory. As taxation is being increased state income logically rises too. The gained income could be used to hire more and better educated

people to state organizations to improve its effectiveness and in consequence the standardized unemployment rate is being decreased. More about this economic explanation and its alternatives will take apart in author´s later papers.

It is important to mention that determination coefficient is around 38 % which is not good. In case model will be completed by missing variables (public expenditure for example) the coefficient should be higher and model will be more effective. In my latest paper (Bušovský, 2014) I noticed high impact of public expenditure on standardized unemployment rate of graduates too. Connection of results in this paper with the results of my already mentioned paper should provide completed overview of impact of public finance on standardized graduate´s unemployment rate – by my assumption.

The result of estimated model also presents the alternative way to solve the problem with graduate´s unemployment rate since we are able to affect it by changes in income part of public finance. These new alternative way can be used as tools of optimization in field of tertiary education and unemployment rate of universities graduates. Also it is important to remind that results are based on short time series which means that results can difference from the long time series results.

Acknowledgements

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Military Expenditures and Economic Growth: Case of the EU Countries

Tomáš Daněk[*]

Abstract: The paper deals with the relationship between military expenditures and economic growth in 28 EU countries between 1993 and 2013 and tries to verify the first pioneering hypothesis which says that there is a negative relationship in relatively poorer countries and a positive relationship in relatively richer countries. A cluster analysis is used to divide the nations into individual groups with the final number of 5. After that a linear regression equation is estimated for all groups and the results are compared. The main findings mostly verified the hypothesis and showed a significant positive relationship between defence spending and economic growth in case of more resource abundant countries and a significant negative relationship in case of more resource constrained countries.
Key words: Military Expenditures, Economic Growth, National Security, GDP
JEL classification: C10, H56, O40

1   Introduction

Many papers that tried to examine whether there is any relationship have mostly come to mixed conclusions. Some authors contend that this is due to the fact that many papers have failed to take into account the relative financial constraints faced by individual countries (Frederiksen and Looeny, 1985). Historically, the first Benoit's paper (1978) dealing with this topic was used by Frederiksen and Looney and they tried to examine a hypothesis which says that relatively poor countries tend to cut back on military expenditures in order to maintain defence programs, while more affluent countries abandon development expenditures much less likely given the constant level of their defence preparedness.

The main aim of this paper is to research the same hypothesis that expects a negative relationship between military expenditures and economic growth in relatively poorer countries (more resource constrained) and a positive relationship in relatively richer countries (more resource abundant). For the purpose of the article, this hypothesis is implemented for the European Union (EU) countries and the results are compared between each other.

2   Review of Literature

Benoit (1978) with his pioneering work is considered to be the first who proposed the thesis that military expenditures are not necessarily detrimental to the national growth. He calculated simple correlation coefficients using a sample of 44 countries between 1950 and 1965. The dependent variable was the average annual growth rate, the independent variables were private investment as a proportion of GDP, net economic assistance and defence spending. All have a positive impact on the growth. However, defence spending is significant only at the 80 per cent level of confidence.

Dunne et al. (2005) published a paper that evaluates some of the theoretical and econometric issues involved in estimating the growth models that include also military expenditures. They hold that while the mainstream growth literature has not found military expenditures to represent a significant determinant of the growth, much of the defence economics literature has found significant effects. The paper argues that this is largely a product of a particular specification, the Feder-Ram model, which has been used in the defence economics literature but not in the mainstream literature.

So far, just a few authors have paid close attention to the defense-growth nexus in EU. Kollias et al. (2004, 2007, 2010) focused on EU15 and they tried to investigate the causal relationship between growth and military expenditures over the period 1961-2000 by panel data methods and finds evidence of a positive bi-directional causality in the long-run and a positive effect from defence spending to growth in the short-run. Given these results, the authors argue that increases in defence may promote growth in this region. However, this study from 2004 has been criticized by Hatzinikolaou (2007) for the econometric analysis employed. The other authors dealing with this topic are Mylonidis (2008) who examined the EU14 and employed a Barro-type model; Dunne and Nikolaidou (2012) who employed in the article an augmented Solow-Swan model etc.

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3 Models of Military Expenditure Effects

Empirical studies give us a plenty of examples from applied econometric to more institutional focused case study papers. Most of them are generally based on the Keynesian and neoclassical approaches. On the other side, Guaresma and Reitschuler (2003) talk about Feder-Ram model which popularity can be clarified by its ability to handle the externality effects of military expenditures on economic growth. However, Dunne et al. (2005) argue with the severe deficiencies found in their article. As the offered alternative seem to be the augmented Solow model or some increasingly endogenous growth models.

3.1 Feder-Ram Model

For explaining defence-growth nexus the Feder-Ram model has been considered to be the most common and used model of the past twenty five years. It is a supply-side model that was originally created to examine the effects of export on economic growth in developing countries (Biswas and Ram, 1986). Thus, this model employs a supply-side explanation for aggregate output with changes in labour and capital. For the purpose of defence-growth nexus, it allows the defence sector to be treated as one sector in the economy and the externality effect of the sector and its differential productivity effect to be identify within a single equation model.

The real origin was given by Feder (1983) who divided the aggregate output of the economy into two sectors – exports and non-exports. On the basis of this division of the economy, it was suggested a two-sector model to explain growth as including of a government and a private sector.

Assume the economy simply composed of two sectors with the output from military (*M*) and civilian (*C*) sector where the allocation of inputs is given between homogenous capital (*K*) and labour (*L*). Then, also consider defence production which influences civilian production operation and θ that represents the elasticity of *C* with respect to *M*:

$$M = M\ (L_m + K_m);\ C = C\ (L_c + K_c) = M^\theta c\ (L_c + K_c) \tag{1}$$

The equation including constraints is given:

$$L = \textstyle\sum_{i \in S} L_i;\ K = \sum_{i \in S} K_i;\ S = \{m, c\} \tag{2}$$

Then domestic product is given by *C* + *M*. There are also some econometric issues in case of estimating the Feder-Ram model. It has been used widely and in a number of different ways as for example the estimation of the effects of military expenditures with using data for individual countries, cross-country data, time series and cross sectional data. The main criticism came especially from Dunne (1996) and Dunne et al (2005) when they argued with the problem of multicollinearity in case of cross sectional data. This issue was found between the last two terms in the estimating equation and a concern with applying obviously insignificant coefficient to measure the externality effects.

3.2 Augmented Solow Growth Model

The Solow growth model is rooted in Solow (1956) and Swan (1956) who described the supply-side changes to aggregate output that explained the growth of the following changes in capital and labour. Then the model was modified and the augmented Solow growth model was developed. The modification is realized in a characteristic of growth using the accumulation of economy-wide human and physical capital. This approach can explain more than three quarters of cross-country variation in growth and it is more than Feder-Ram which can explain 60%.

Generally, the augmented Solow growth model should provide more consistent specification with testable hypothesis for coefficients and it is easier to interpret when estimated. On the other hand, there is also some critique when implementing these exogenous growth models. Although the exogenous models offer a valuable explanation of convergence in growth between nations, these are criticised for failing to explain the observed growth in living standards. For this purpose the endogenous growth models were developed (Dunne et al, 2010).

4 Data Analysis

Six, respectively seven variables were selected for cluster analysis – exports, imports, deficit, private savings, private consumption (all as a % the GDP, investment GDP ratio, military strength. A cluster analysis was performed using these seven variables for 28 EU countries in sample. It is expected that each variable has an effect on the defence burden-growth relationship. At the end, there was added one additional variable which is called Military Strength (MLS). It is used of over 40 factors to determine each nation's military power. From this score, the finalized ranking is generated. The main analytical part of the paper uses modified Benoit's method when the following multiple regression equation is estimated:

$$CGDP = f (EXP, INV, MLTEX) \qquad\qquad\qquad (3)$$

CGDP is the real growth in GDP minus real growth in military expenditures expressed as a cumulative rate of annual growth between first and last years of the available series. EXP is the exports as a percentage of GDP, INV is the gross capital formulation as a percentage of GDP, and MLTEX is the military expenditures as a percentage of GDP. The signs of the coefficient are all assumed to be positive. The data of 28 EU countries between 1993 and 2013 were chosen for the purpose of multiple regression analysis in this paper.

Group 1 (Germany, France, United Kingdom and Italy) – the very resource abundant group, the richest nations in EU – was characterized by high growth in foreign exchange earnings, a low debt-service ratio, a low incremental capital-output ratio, a high GDP ratio, a very good balance between private savings and consumption. This group had also a very high government expenditure multiplier and very good ranking in final score of a special variable military strength.

Group 2 (Spain, Belgium, Netherland, Austria, Sweden, Denmark and Finland) includes countries which are very similar to Group 1, we can also call them resource abundant nations but the results are not so strong in most of variables as in case of Group 1.

Group 3 and Group 4 are called as the resource constraint groups. In case of Group 3 (Poland, Czech Republic, Estonia, Slovenia, Hungary, Portugal and Ireland) the results are not too strict as in case of Group 4. These nations are characterized by lower growth in foreign exchange countries, a higher debt-service ratio, a lower government expenditure multiplier, a lower incremental capital-output ratio and not good balance between savings and consumption.

It was an essential part for each classification. Every nation was classified at the 100% probability level, except for Spain which had a probability of 81% of right placement and except for Poland which had a probability of 87% of right placement. In case of Poland the reason might be the last additional variable – Military Strength because Poland belongs to the strongest countries. Spain should probably belong to Group 1 because of its well-known economic similarity to these countries but the paper respects a result from the cluster analysis (Table 1).

Table 1 Regression Analysis Results

	Regression equation	R^2	coefficient EXP	coefficient INV	coefficient MLTEX
Group 1	CGDP = 0.89 + 1.15EXP + 0.95INV + 0.29MLTEX	0.81	4.28**	2.95**	2.33**
Group 2	CGDP = 3.32 + 0.68EXP + 0.74INV + 0.44MLTEX	0.74	1.45	2.24**	1.84
Group 3	CGDP = 2.14 + 1.77EXP + 0.97INV + 0.74MLTEX	0.85	3.24	2.12	1.62
Group 4	CGDP = 1.42 + 0.11EXP + 0.32INV − 0.28MLTEX	0.71	3.11**	3.79	-2.04**
Group x	CGDP = 0.17 + 0.54EXP + 1.38INV + 0.16MLTEX	0.59	2.75	3.20**	1.15

Source: own calculation based on SIPRI, 2015

Groups 1 to 4 are considered to be from the richest one (the most resource abundant) to the poorest one (the most resource constraint). Group x is a special case which is definitely more resource abundant. We should mainly focus on the last column which shows us a MLTEX coefficient, then the R2 value and the plus or minus sign in equation. However, we can see a positive statistical significance of INV coefficient only for Group 1, 2 and x which means mostly for richer countries. In case of EXP coefficient, a positive statistical significance was found out for Group 1 and 4. Also only Group 1 and Group 4 had a statistically significant MLTEX coefficient at the 99% level of confidence. It is remarkable that Group 1 had a positive coefficient and Group 2 a negative coefficient which supports the hypothesis that resource constraints play a crucial role in the defence-growth nexus. This means quite a stark contrast compared to Benoit's first finding who have not found any relationship between military expenditure and economic growth. But on the other side it verifies the hypothesis and results found by Looney and Frederiksen who tried to examine this relationship using a sample of developing countries. They had only two main groups – first with resource abundant countries and second with resources constraint countries. The R2 values oscillate around 0.75 – 0.9 which is also very similar. It is possible to conclude that in relatively poorer countries military expenditures negatively influence an economic growth and individual defence programs are probably cut back. While in case of richer countries military expenditures probably support or contribute an economic growth. Or at least, these countries are able to manage individual defence programs better and this can bring them an advantage for its economic growth.

5   Conclusions

With focus on results of military expenditures values, a statistical significance was found out for Group 1 and Group 4. It means for the most resource abundant countries (the richest one) and for the most resource constrained countries (the poorest one). Group 2 (it might be said not so rich but also not poor countries), Group 3 (not so poor but also not rich countries) and Group x (Luxembourg) had no statistically significant coefficient. Turning to Group 1 and 4, the results verify the article's hypothesis which says that military expenditures in relatively richer countries tend to have a positive impact on economic growth. These countries can effort less for scarce finances and as a result of their other positive parts (linkage with industry, research, education, etc.), military expenditures can have a significant and positive impact on economic growth. On the other side, there are relatively poorer countries that may have an insufficient government resources or a lack of foreign exchange. In case of these nations, military expenditures obviously drain finances away from more productive investments with a consequent binding impact on economic growth. Thus, it is necessary to recognise the determinants of military expenditures as well as the interdependence of the demand and supply side. All the results must be carefully interpreted and it would be unadvised to make any strict conclusions. The main reason is definitely the observed sample of countries. For the following research it would be interesting to enlarge the number of observed nations or compare them with other parts of the world. Another possibility is to examine a different time framework.

Acknowledgement

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Location of Unwanted Facilities in the City of Prague

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Abstract. The objectives of the paper are, first, to investigate how the problem of NIMBY (Not In My Back Yard) related to the location of unwanted facilities is dealt in a hierarchically organized city, second, to classify observed approaches to NIMBY into specific categories. The NIMBY effect is studied as a conflict between the City of Prague, representing global interests of the city, and city districts, representing local interests of communities. We classified approaches to NIMBY into four categories: financial compensation, fair distribution, local autonomy, and consultation. We observed that city districts, lower level of public administration, behave as guardians of local interests if they communicate with the higher level of public administration. As politicians depend on their local voters, it is not surprising.

Keywords: LULUs, NIMBY, Prague, public administration, negative externality.

JEL Classification: R53, H49

1   Introduction

The objective of national, regional or municipal governments should be to serve citizens, which means, among others, to provide public services and finance or regulate various types of private services for population. Public services can provide public good for the whole population or they can be oriented toward specific disadvantaged population groups. At first sight, it seems that services fulfilling societal objectives should be welcomed by local communities. However in the reality, location of some types of facilities can often lead to conflict situations. For example the location of facilities providing social services for homeless people or facilities providing services for drug users in the community is felt as negative experience and people object to opening of such type of facilities in their neighbourhood. If such unwanted facilities were to be located elsewhere, the same people would have been in favour. This observation is described in the literature as NIMBY (Not In My Back Yard) or LULUs (Locally Unwanted Land Uses).

The term NIMBY has been regularly used in the literature since the 1980s (e.g., Livezey, 1980, Hall, 1981). The conventional view of NIMBY is based on two premises: first, that locally unwanted facilities (waste incinerators, shelters for homeless, highways) are essential to achieve an important societal benefit and realize the public good; second, that selfish opposition of local community prevents the realization of that societal good (Lake, 1993). In such situation, the solution to NIMBY lies in overcoming irrationality, changing selfish attitudes, improving regulatory mechanism, offering some kind compensation to local community.

However, it can be argued that unwanted facilities are not needed by the society but rather by business. In this characterization, NIMBY represents rather a barrier not to societal benefit but to selfish goals of business. NIMBY is thus an expression of people's needs and fears (Lake, 1993). According to Wolsink (2007), the validity of the NIMBY theory is questionable and the idea that opposition is due to egoist NIMBY-type motives has become a great burden to the handling of critical attitudes. The problem is the imprecise and simplistic way the NIMBY concept is used by academics and policy makers (Wolsink, 2007). We suppose that in practice, both alternatives of NIMBY can be probably found.

The economic theory describes a situation similar to NIMBY as a problem of negative externality. A positive or negative externality is said to be present whenever the well-being of a consumer or the production possibilities of a firm are directly affected by actions of another agent in the economy (e.g., Mas-Collel, Whinston, Green, 1995, Samuelson and Nordhaus, 1995). The key problem related to NIMBY lies in the discrepancy between geographically dispersed societal benefits and locally concentrated costs that usually have a form of negative externality. To maximize their utility local residents will be in favor of establishing an unwanted facility, but not in their neighborhood in order to minimize the costs. Such a choice of optimal strategy by all local communities ends up in the situation that unwanted facilities will not be opened anywhere.

The discrepancy between global and local interests may also occur at different levels of public administration: national government versus regional government, regional government versus cities and municipalities, city versus city districts. As local politicians directly depend on their local voters, it is not surprising that the lower level of public administration hierarchy, bearing the burden of local cost, is in opposition to a higher level of public administration collecting dispersed societal benefits. Hence the NIMBY effect is not limited only to traditional external actors as citizens, NGOs, communities on one side, and business on the other side. Because we talk about public administration led by politicians, NIMBY is not limited only to the substance of the problem but it includes politics, too.

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The first objective of this paper is to investigate how the problem of NIMBY is dealt in the hierarchically organized municipal practice. We will study it as a conflict between the City of Prague, representing global interests of the city, and city districts, representing local interests of communities. The second objective of this paper is to classify observed approaches to overcoming NIMBY into specific categories.

2   Methods

We investigate the practice of dealing with NIMBY effect in the City of Prague, the capital of the Czech Republic (1.24 million inhabitants in 2013). The City of Prague has a public administrative structure of three tiers. The highest tier is the City of Prague itself represented by the elected Prague City Assembly and the Magistrate of the City of Prague. Since 1990, the city has been divided into 57 self-governing city districts (Figure 1). The city districts differ in the size of population and territory. The city districts Prague 1–22 are the so-called "large" city districts with high numbers of inhabitants and are mostly located in the inner city. The districts Prague 23–57 (these city districts use names, not numbers, but for simplicity, we denote them as districts Prague 23–57) are the so-called "small" city districts with much lower numbers of inhabitants and are mostly located in suburban areas.

Since 2001, the 57 city districts have been grouped into 22 administrative districts, for state-administration purposes. In this middle tier, one large city district Prague 1–22 in each administrative district has responsibility for providing services of state administration for the entire administrative district. It can be confusing and one has to distinguish whether, for example, by Prague 9 is meant one of the self-governing city districts Prague 1–57 or one of the administrative districts Prague 1–22. In the study, we focus on the relation between the City of Prague and self-governing 57 city districts.

Figure 1: Map of Prague City Districts

Source: http://www.geoportalpraha.cz/.

The author searched the electronic database of official documents of the Prague City Council and of the Prague City Assembly to find examples of decisions on the location of unwanted facilities. An electronic archive is available on the website http://www.praha.eu. The author has concentrated on four selected types of unwanted facilities: social services for the homeless, social services for drug users, regulation of gambling facilities, and municipal waste dumps (the appropriate keywords were used). In the search, personal experience of the author as a member of the Prague City Assembly was also used, so the search has been more focused. Finally, the content of the selected documents was analysed and approaches to NIMBY were compared. A classification of the approaches to NIMBY was developed by the author.

3   Results

In the documents from the Prague City of Council and the Prague City Assembly that have been selected, the autor was able to classify the approaches to NIMBY into four broad types that we call financial compensation, fair distribution, local autonomy, and consultation. The detailed description of each category is below.

3.1   Financial Compensation

One of the alternatives of dealing with the location of unwanted facilities with an expected negative impact on the community certainly is some kind compensation. For example, three city districts (Březiněves, Ďáblice, and Dolní Chabry), receive direct subsidy from the City of Prague to compensate the location of municipal waste dumps on their territories (City of Prague, 2013). The city districts also receive various compensations from the company operating the waste dumps.

A typical example of financial compensation is the regulation of gambling. On one hand, gambling is seen as an unwanted free-time activity with dangerous negative impacts; on the other hand, the City of Prague and city districts receive specific taxes from gambling facilities that enable them to finance sport activities, culture or social services (e.g., City of Prague, 2013a). If the taxes collected from locally unwanted facilities are used for the benefits of local community, some compromise could be possibly found.

Although not a typical case of NIMBY (if it is NIMBY at all), the conflict of a local community with the Prague Botanical Garden (operated by the City of Prague) provides an interesting example. In 2011, the Prague Botanical Garden planned to enclose an additional territory that was freely accessible at that time. By this measure the Prague Botanical Garden intended to protect its property better, but the new fence interrupted a walking path used by local residents. This plan of the Prague Botanical Garden provoked a disagreement among the residents and a petition was signed by over 3 000 people. The City District of Prague 8 succeeded in negotiating free admission to the Prague Botanical Garden for the residents in the neighboring area.

3.2   Fair Distribution

If it is technically possible, fair distribution of unwanted facilities may be accepted by the city districts as a satisfactory compromise solution. This effort is practiced for example by the New York City (Rose, 1993, Weisberg, 1993). The New York City Charter (Section 203) requires the City Planning Commission to adopt criteria to further the fair distribution of the burdens and benefits associated with city facilities, consistent with community needs for services and efficient and cost effective delivery of services and with due regard for the social and economic impacts of such facilities upon the areas surrounding the sites. The City Planning Commission adopted the Criteria for the Location of City Facilities, which have been in effect since 1991. They are commonly known as the Fair Share criteria because they attempt to foster an equitable distribution of public facilities throughout the city.

The Prague City Council declared that policy of fair distribution of social services with a negative local impact on the communities should be based on three assumptions (City of Prague, 2014d):
- The numbers of homeless people and drug users are objective facts and can be estimated to some extent.
- There is no other territory than the territories of the city districts.
- There is no socially and legally acceptable way of forcing the people to leave the city.

If one accept these facts, then the cooperation between the city and city districts is necessary. Fair distribution of social problems is one dimension of solution to the NIMBY effect.

The municipal policy addressing the problem of homelessness is described in its strategic document The Concept of Proposals Addressing the Problem of Homelessness in Prague 2013–2020 (City of Prague, 2012). As an estimate, it is used the number of 4 000 homeless people, from that number 1 500 are so-called apparent homeless that move around the city. The number of problematic drug users in Prague was estimated at 14 300 in 2013. The municipal drug policy is described in *Drug Policy in the City of Prague 2014–2020* (City of Prague, 2014a), *Action Plan of Drug Policy 2014–2016* (City of Prague, 2014b), and *Annual Report of Drug Policy 2013* (City of Prague, 2014c). To deal with the distribution problem effectively, the level of 22 administrative districts as described above is preferred to 57 self-governing city districts as some city districts are too small. The data on service capacities were prepared by the Department of Health, Social Care and Prevention of the Magistrate of the City of Prague. These types of social services (facilities) are included (City of Prague, 2014d):
- Asylum;
- Low threshold day services centre for the homeless;
- Night shelter for the homeless;
- Low threshold contact centre for the drug users.

The intensity of negative impact to local community is estimated by numbers 1 to 4 (see Table 1), where value 1 means the lowest negative impact and value 4 means the highest negative impact (City of Prague, 2014d). The capacity of services is evaluated by the number of beds and the number of contacts and then, the capacities are multiplied by the intensity of negative impact. In the case of night shelters for the homeless, we divide the intensity

by two if the night shelter is open only in winter period (November – March). The total sum of points for each administrative district is then used as a measure of fair distribution.

Table 1: Intensity of Negative Impact to Local Community

Type of Social Service	Negative Impact
Asylum for mothers and children	1
Night shelter for the homeless (open only in winter)	1.5
Asylum for men	2
Night shelter for the homeless	3
Low threshold day service centre	4
Low threshold contact centre for drug users	4

Source: City of Prague, 2014d.

3.3 Local Autonomy

Another solution to a conflict between global interests and local interests is to shift the decision making power on the location of unwanted facilities from the higher administrative level to a lower level. In this case from the government of the City of Prague to the governments of city districts. A relatively successful example of autonomy is the regulation of gambling. The governments of city districts can regulate the places and opening hours or make a decision to completely prohibit gambling in their territories. Often, the referendum is initiated, either by the city districts or by civic associations (see http://8bezhazardu.cz/, http://7bezhazardu.com/, http://1bezhazardu.cz/). Technically, the decree on lottery regulation in the city is issued by the City of Prague (2013b), however, city districts directly participate on the preparation of this municipal decree and their suggestions are almost always accepted.

Of course, local autonomy as a solution is not suitable for all types of unwanted facilities, because one possible outcome of such power transfer can lead to a "locally optimal" solution based on just moving the problem from a given district to a neighboring one. For example, drug users or homeless people may be removed by increased activity of the municipal police in some selected places, but this measure just shifts the problem to some other places.

Petitions against drugs organized by civic associations easily gain popularity among local community. One such petition, addressed to the city districts of Prague and to the City of Prague (2014), required to relocate facilities providing services for drug users minimally 2 km from schools. However, such places do not exist in the densely populated city, with the exception of a few municipal forests or the Prague international airport.

3.4 Consultation

Some kind of consultation or cooperation between the city and the city districts is usually a part of all above mentioned approaches. Here we mean such cases in which consultation, communication, information sharing, participation in planning, public hearings are intended to be the principal method of overcoming the NIMBY effect. The objective of a higher administrative level is convincing, attitude changing, gaining mutual trust, removing prejudice from unknown. Collaborative approaches to planning should be preferred and technocratic and corporatist based elite decision-making avoided (Wolsink, 2007). In this heterogeneous category we can find a group of approaches that differ in the intensity of consultation and cooperation that would ideally require further research. In contrast to local-autonomy category, the final decision remains in the hands of a higher administrative level.

The first versions of municipal drug policy documents were rejected by the Prague City Assembly in November 2013, above all due to the opposition from the city districts. Subsequent consultations with the city districts in December 2013 and January 2014 at which drug policy was explained and the city districts can comment the documents proved useful. According to comments, drug policy was revised and, in March 2014, municipal drug policy was discussed in the city drug commission, city assembly committees and with district drug coordinators. Finally, *Drug Policy in the City of Prague 2014–2020* was approved by the Prague City Assembly without any serious objections in March 2014 (City of Prague, 2014a). *Action Plan of Drug Policy 2014–2016* was approved in September (City of Prague, 2014b). Further, it was also agreed that if the city will finance some new facility serving drug users, the city districts will be informed and consulted in advance.

4 Conclusions

On the example of public administration hierarchy represented by the City of Prague and its city districts, the author investigated the following types of unwanted facilities: services for the homeless, services for drug users, municipal waste dumps, and regulation of gambling. Services for the homeless or drug users, together with

municipal waste dumps, can be seen as public services necessary for the life of the city, so NIMBY can be thus, at least to some extent, perceived as selfish opposition of a local community. Gambling is a totally different case, since no societal benefit, except taxes, is expected. The city administration serves as a regulator that is balancing the interests of community and business.

It was observed that city districts, lower level of public administration, behave as guardians of local interests if they communicate with a higher level of public administration, a guardian of global city interests. As local politicians depend on their local voters, it is not so surprising that they prefer local interests to global ones. This naturally creates an internal conflict in the city that is divided into smaller administrative units.

Approaches to NIMBY were classified into four categories: financial compensation, fair distribution, local autonomy, and consultation. The author is from claiming that some category of NIMBY solution is universal or better than another category, but we believe that such classification could help politicians and senior officials to tackle the NIMBY effect. It needs both further empirical research and literature search to check whether some other approaches are available.

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Accounting Reform of the Czech Public Finance: The Five Year Anniversary

Luboš Dufek[*]

Abstract. Accounting reform of the Czech public finance has been a revolutionary step from cash basis accounting to accrual accounting. The goal of this contribution is to provide basic theoretical background for events, which have led to acceptation of accrual accounting in the Czech public sector, and to identify strengths and weaknesses of current situation. Although the regulations, which introduced the accrual accounting principles, have entered into force in 2010, original strategic decision has been made in 2007 and the necessity to do so can be tracked to the New Public Management trend, which is much older. For some types of state organizations, in general smaller semi-budgetary organizations, is accrual accounting definitely way to go, but for bigger budgetary organizations, like ministries, it brings significant administrative cost without noticeable benefits and the framework can be confusing, as shown on audit results. Another complication for the most of the organizations is the PAP statement, which is combination of statistical and accounting evidence.
Keywords: Public finance, accounting reform, the Czech Republic.
JEL Classification: H83, M41.

1 Introduction

It is not so long ago when students in the Czech Republic could hear from their public finance lecturers that the public sector accounting differs greatly from the accounting of the private sector. A lot have changed in this field since then. Nowadays the public sector accounting works with depreciation, expenses or the matching principle. As it may seem trivial from the point of view of the private sector accounting, this was a huge step for the public sector, which was enabled (maybe it is better to say enforced) by the accounting reform of the Czech public finance.

The goal of this contribution is to provide basic theoretical background for events, which have led to acceptation of accrual accounting in the Czech public sector, and to identify strengths and weaknesses of current situation. To achieve this goal, we have chosen methods of the literature review and the analysis of the accounting related documents (accounting statements of budget chapters and Supreme Audit Office accounting controls).

This contribution is organized as follows. The first chapter provides basic theoretical background about the accrual accounting in public sector and general information about the Czech accounting reform. In the following part there is a discussion of the main strengths and weaknesses of the current situation. The last part is the conclusions, where we summarize our findings.

2 Accrual accounting and the public sector

World Bank (2005) defines the government accounting as "the process of recording, analyzing, classifying, summarizing communicating and interpreting financial information about government in aggregate and in detail reflecting transactions and other economic events involving the receipt, spending, transfer, usability and disposition of assets and liabilities." According to OECD (2001) "accrual-based systems recognize transactions or events at the time economic value is created, transformed, exchanged, transferred, or extinguished and when all economic flows (not just cash) are recorded." Building on this, International Public Sector Accounting Standards recognize assets, liabilities, net assets/equity, revenue and expenses as elements under accrual accounting (IFAC, 2010). For a long time, there was no need to use accrual principles in the public sector, because of its differences against private sector organizations. But when the scope of activities of public and private sector are in many cases blending together, it is only logical that those organizations are destined to use similar accounting. And since the state has to have only one accounting system, accrual accounting is the nowadays trend in the public sector. But as the World Bank (2005) concisely states "one of the challenges of accounting reform (for example introduction of accrual accounting or of a modern treasury system) is deciding where to stop."

The pressure to adopt accrual accounting can be connected to the so called New Public Management (NPM). The NPM movement have risen in the 1980s. Lapsley, Mussari and Paulsson (2009) defines the NPM as "a model of reform which privileges quantification and results and in which accounting has a central role. It is a model in which mimicry of private sector practices is advocated." Anyone with just basic knowledge about current politic

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situation in the Czech Republic can see, how appealing the NPM principles must be for the Treasury of the Czech Republic. To learn more about the NPM impact on the OECD countries, see Hood (1995).

The Czech Republic is definitely not a pioneer in usage of accrual accounting in the public sector. While in 2002 half of OECD Member was using some elements of accrual accounting (Matheson, 2002), official (and legally binding) decision to implement accrual accounting in the Czech Republic was made in 2007 by The Resolution of the Government of the Czech Republic no. 561/2007, which contained basic principles of the accounting system which had to be operative at 1st of January 2010 (therefore the title of this contribution). We also need to understand, as stated by Guthrie (1998), that "*the adoption of accrual accounting and budgeting techniques has not been an end in itself, but rather, a means to the enactment of significant changes in the scope, scale and style of public sector administration and activity.*" According to aforementioned resolution was the main goal of the accounting reform "*to create conditions for effective apprehension of correct, entire and timely information about economic situation of the state and involved accounting units.*" Four main principles were mentioned:

1. Creation of appropriate conditions;
   - It was necessary to create legal, technical and other framework not only at start of the reform, but also to keep it working in the subsequent time,
   - Although there are some possibilities of improvement, we could tell this principle is being fulfilled,
2. Effectiveness of the chosen instruments;
   - Cost of the processes should be appropriate to benefits gained,
   - This is probably the most problematic principle, since the increased cost are pretty visible but the benefits are not,
3. Truth and fairness of displayed information;
   - Displayed information should give complete information about economic situation of the state,
   - The consolidation is only just being introduced to the system, also some financial statements are problematic from the truth and fairness point of view (in general cash flow/equity changes statement),
4. Timeliness of accounting;
   - Timely information should be more useful for the operative management on both micro and macro level,
   - Timeliness was definitely increased, we can see that from electronic tools like "Monitor", as problematic may be seen the usage of information by the management.

Matheson (2002) further states that "a sound and transparent budgeting and accounting architecture is a fundamental building block for good public sector governance." And how does the accounting architecture of the Czech accounting system look like? The main legal framework for the public sector accounting is following:

- The Accounting Law (no. 563/1991);
- Decrees of the Ministry of Finance (no. 410/2009);
- The Czech Accounting Standards (no. 701 to no. 710);
- Different methodological guidelines of the Ministry of Finance (MoF) published on their webpage or in the Financial Bulletin, Q&A about accounting problems on the MoF webpage, methodological seminars and lectures provided by the MoF…

Besides the accounting architecture there is also technical architecture of the system, which is mainly provided by the Central System of State Accounting Information (Czech abbreviation is CSÚIS). This system is very close and connected to the Integrated Information System of Treasury (Czech abbreviation is IISSP). Important legal framework for the technical architecture of the system is Decree of the MoF no. 383/2009, which in its novelization from 2012 introduced the PAP statement. Also there is relatively new Decree of the MoF no. 312/2014, which deals with the issue of consolidation of financial statements.

3 Current issues of the public sector accounting in the Czech Republic

To fully understand the impact of the accounting reform, we need to divide affected organization into different groups. On the main level, we need to distinguish between central and local government. Impact of the accounting reform on the organizations of local government (e.g. municipalities and organizations established by them) was researched by Nekolová (2014). She used questionnaire survey amongst 102 municipalities and came with interesting results, which are summarized in the Table 1. As we can see, the accounting reforms architects are probably not the most favorite persons between accountants working for the local government. As mentioned in the previous chapter, there is a problem with the effectiveness of the chosen instruments, since the most of the respondents can see increase in cost but the benefits can be seen only by less than one third of them. But if it is just a negative thinking and not good understanding of the bigger plan of the reform, there is a good thing that the most of the respondents have shown the compliance and fulfillment of requested task.

Question	Yes	No	Question	Yes	No
Means the reform a fundamental change of your accounting?	92%	8%	Was necessary to hold a special training for employees?	55%	45%
Was the information provided by MoF sufficient?	20%	80%	Do you consider the accrual principle beneficial?	27%	65%
Was necessary for you to search for other sources of information?	100%	0%	Do you use the accrual principle in your accounting?	86%	14%
Are you already adapted on the new accounting system?	18%	82%	Are you accounting with off-balance sheet items?	96%	4%
Brings the reform a bigger amount of working tasks?	90%	10%	Beneficial attitude towards the accounting reform	10%	78%

Source: Nekolová (2014)

Note: *The sum of some answers not being 100% is caused by the "I don't know responses".

The central government should be further divided into two main groups: budgetary and contribution (sometimes called semi-budgetary) organizations. The contribution organization should not differ much from the private sector organizations, at least in theory. General idea of the contribution organization is that it works in domain in which is state interested and it can generate some revenues by its operations, but not enough to cover all of its expenses, so the state contributes rest of the money to the organization to avoid being in "red numbers". For many of these organizations is accrual accounting necessity, because there are almost the same private sector companies – good example could be hospitals, which are usually contribution organizations and there are already hospitals run by the private sector, so the state need same accounting basis for the comparison between those. So semi-budgetary organizations can probably see the biggest benefit from the accounting reform and can mentally better put up with the cost increase.

The last but not least affected by the accrual accounting reform are the budgetary organizations. As the name suggest, budgeting process plays the main role in these organizations. Accounting used to be (and still kind of is) just formal procedure, and its outputs are rarely used by the management. This can be supported by statement of Prokůpková (2010): *"There was not (and still is not) demand for information neither from organization managers nor from the state."*

Table 2: Audits before accounting reforms

Audit at	Main finding	Final report date
Agriculture	Not abiding the accounting law (CZK 2.4 mil)	8.1.2009
Labour and Social Affairs	Repeating the same mistakes (CZK 657 mil)	8.1.2009
Education, Youth and Sports	Accounting reports are inconclusive (CZK 20 mil)	20.5.2009
Energy Regulatory Office	Accounting reports are OK	21.5.2009
Defence	Accounting is not true and complete (CZK 27 mil)	7.7.2009
Labour and Social Affairs	Accounting is not true and fair (CZK 3.5 bil)	29.9.2009
Institute for the Study of Totalitarian Regimes and 3 others.	Accounting errors (CZK 1.1 bil)	30.9.2009
Education, Youth and Sports	Accounting reports are OK	29.10.2009
Agriculture	(CZK 1.4 bil)	10.12.2009
Transport	(CZK 19.7 bil)	7.6.2010
Labour and Social Affairs	Accounting reports are OK	2.11.2010
Agriculture	Accounting reports are OK	8.12.2010
Czech Statistical Office	Accounting is not true and fair	13.6.2011

Source: Supreme Audit Office Press announcements, own research.

Problematic enactment of the accrual principles can be seen in recently published results from audits done by Supreme Audit Office, which often show errors in accounting. We have conducted analysis of these audits. As a data source we have used announcements published on the webpage of the Supreme Audit Office from the 19th of November 2008 till the 11th of May 2015 (last 400 announcements). 26 of them (6.5%) was about results of audits evaluating the accounting of the selected accounting units. Half of the audits (table 2) were conducted before the accounting reform and other half (table 3) after it, so we can compare the results. We can see that before reform there were also errors in the accounting, but 4 of the 13 control actions had positive results, while after reform only 1 of the 13 controlled subjects passed the test, and even in this case there were accounting errors around CZK 20 bil. The accounting mistakes were also lower before the accounting reform (sometimes "only" in millions of CZK), while after the reform errors were usually in billions or in tens of billions. Audits conducted

after reform also brought the brand new main result – the Supreme Audit Office stated, that the legal framework is ambiguous and therefore he could not give opinion, whether the accounting statements provide fair and true view or not. This was the case in the 6 audits and even recently (see the last entry in the Table 3) is Supreme Audit Office evaluating some accounting problems – mainly transfers, which are crucial part for many of the big selected accounting units, as will be shown later in figures 1 and 2.

Table 3: Audits after accounting reform

Audit at	Main finding	Final report date
Czech Social Security Administration	Legal framework is ambiguous	6.9.2011
Labour and Social Affairs	Legal framework is ambiguous	16.2.2012
Defence	Legal framework is ambiguous	2.7.2012
Czech Social Security Administration	Legal framework is ambiguous	17.9.2012
Transport	Legal framework is ambiguous	25.2.2013
Land Surveying and Cadastre	Problems with accrual principle	17.6.2013
Education, Youth and Sports	Legal framework is ambiguous	2.9.2013
Labour and Social Affairs	Accounting is not true and fair (CZK 11 bil)	16.9.2013
Industry and Trade	Accounting errors (CZK 7 bil), ambiguous framework(CZK 168bil)	30.12.2013
Regional Development	Accounting errors (CZK 25 bil), framework still ambiguous	19.5.2014
Defence	Besides errors (CZK 19.8 bil) is accounting OK	18.8.2014
Labour Office	Accounting is not true and fair (CZK 37.6 bil)	2.3.2015
Environment	Accounting errors (CZK 7 bil) and ambiguous framework for transfers	11.5.2015

Source: Supreme Audit Office Press announcements, own research.

Budgetary organizations activities are very far from the private sector. The best examples are the ministries. The most of the money they spend are intended to fulfill the redistributive function of the state. This is very far from private sector practice and puts a great pressure on the accounting, when the accrual principles are involved. Following figures show the comparison between transfer expenses/revenues and "other" expenses/revenues of main budget chapters. From total number of 42 budget chapters we have chosen 14, all of them are chapters including ministries and their organizations. Great difference between chapters can be in most cases explained also by different legal form of organizations. If the chapter has many semi-budgetary organizations, the contribution the ministry send is marked as a transfer both in expenses and revenues. As stated before, the process of consolidation, which should clear the financial statements of these duplicities has only just began. On the contrary, the chapter like justice, where the organizations have form of budgetary organization shows almost no transfer expenses/revenues. The most of the transfer revenues, if we abstract contributions to semi-budgetary organizations, come from the European Union as a refinancing of already provided dotation titles.

The accounting evidence of transfers is definitely the biggest complication for accountants in the public sector. There are usually many different transfer titles which need to be distinguished by analytic evidence, but even the most often case of the transfer that is partly co-financed by the money from abroad (European Union or Norway funds) requires, according to Czech Accounting Standard no. 703, 16 different accounting records during whole process. This could turn quite challenging for the economic information systems of transfer providers, because number of required accounting records can easily go to tens of thousands. And since the transfer titles usually have some other evidence system, extended evidence in accounting does not seem to have additional benefits, definitely not for the transfer providers.

Figure 1: Transfer expenses of budget chapters
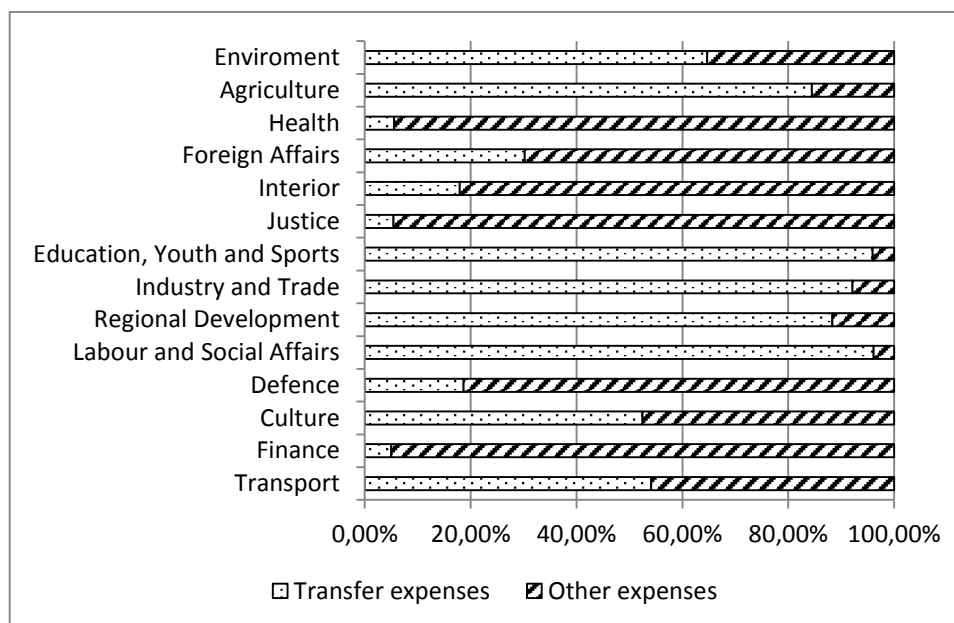
Source: Profit and loss statements of individual budget chapters.

Figure 2: Transfer revenues of budget chapters
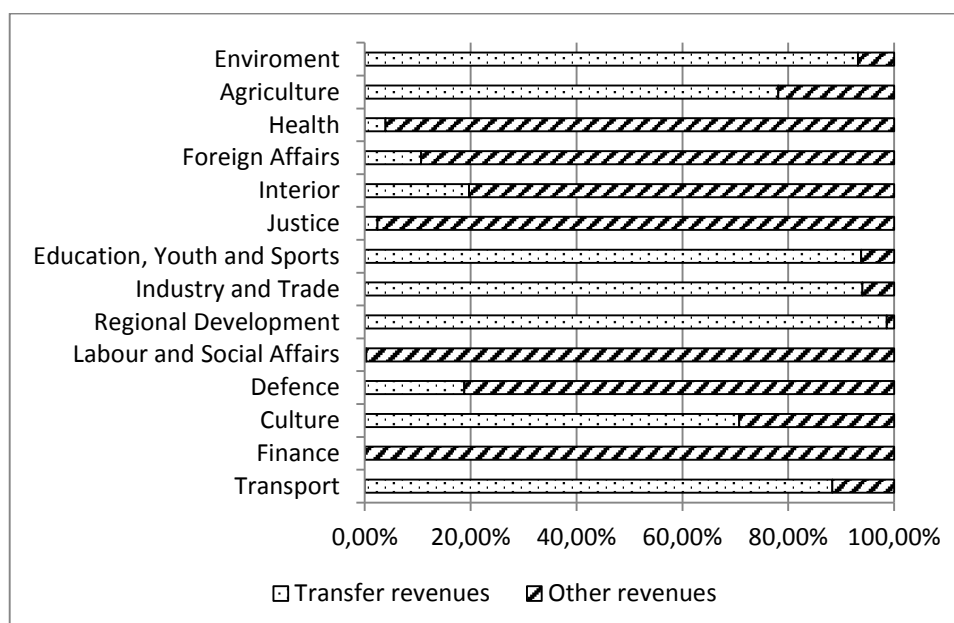
Source: Profit and loss statements of individual budget chapters.

The accounting process has been made even more complicated in the 2012, when the third novelization of the MoF Decree no. 383/2009 introduced the PAP statement. When first introduced, the PAP statement had 13 parts, since then it has grown and now it has 17 parts, most of them are combination of accounting and statistical evidence. It only affects 10 % of biggest public sector accounting units, but it accounts for 90 % of public sector assets. Users of information from the PAP statement should be mainly Czech Statistical Office, Czech National Bank, Ministry of Finance and Ministry of Regional Development. Problems emanating from the PAP statement for accountants is simple. While it is connected to the accounting system, it request more information that are not usually needed in common accounting database, therefore it creates more and more records, putting further strains on both accountants and economic information system. One example for all, in the Ministry of the Environment, synthetic account no. 571 (transfer expenses) had 5,525 different partners of transaction in 2014, which needs to be reported in the PAP statement. And because in the 2015 this synthetic account will be divided into two (571 and 575) to distinguish between "Czech" and "in the future refinanced expenses from abroad", there will be at least 11 thousand lines in the PAP statement. This maybe the fulfillment of "going too far" risk mentioned in the beginning of this contribution.

In this chapter, mostly the weaknesses of the current situation were shown, but there are also some positives, that should be mentioned. Accrual accounting principle is necessary for the Czech Republic as a whole, because it allows to show better than cash-based accounting how is the state really using its money. As the next step of the accounting reform is being the consolidation, the improvements in this area should be seen in the few years. The accounting reform also brought the increased transparency, figures 1 and 2 were created from the data that any taxpayer can easily access and find out how his money is being spent.

4   Conclusions

This paper focuses on problematic of accounting reform of the public finance in the Czech Republic more precisely of description of theoretical background and the issues that are connected with the transition from the cash basis of accounting to the accrual accounting. In the first part we have mentioned events, which led to accounting reform in the Czech Republic, like the New Public Management trend and Czech policy actions preceding the actual reform. The second part was about issues of public sector with accrual accounting, like limited perception of benefits amongst accountants, results of the control actions conducted by the Supreme Audit Office which have focused on the accounting, problematic accounting evidence of transfer or the PAP statement. Every single issue would deserve more attention, but due to limited extend of this contribution this is more of inspiration for potential further research.

Acknowledgements

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The Influence of Electoral Cycle on Income Tax Policy Focusing on an Employment Income

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Abstract. The contribution deals with the issue of the impact of electoral cycle on the tax policy setting focusing on individual income tax of selected employed taxpayers. The analysis is focused on timeline from 1996 to 2012 on the territory of the Czech Republic. In our research we used the differences of indicator of personal average tax rate which is annually calculated on the international level by the OECD and as the method we used t-test and graphical display of development of tax indicator. From our research it is clear that the electoral cycle did not have an effect on the tax policy setting especially prior and election year. Conversely, we identified the increase of personal average tax rate in the year after the election.

Keywords: individual income tax, employment income, personal average tax rate, tax policy, electoral cycle

JEL Classification: H24

1   Introduction

The representatives of the legislative power are responsible for the implementation of tax policy, as a part of fiscal policy. The behavior and activities of these subjects can be focused on implementation such measurements that may increase their popularity among voters in order to get a higher chances of their re-election in a democratic electoral system. On the basis of that issue, we will deal with the political business cycle in a detail. This model was firstly introduced by Nordhaus (1975). He focused on the identification of the impact of electoral cycle on fiscal policy implementation. His model assumes opportunistic parties and irrational voters. In his research he used the development of macroeconomics indicators, such as the inflation rate or the unemployment rate, in the period prior the election and post-election year. Štiková (2007) the opportunistic motives, explains as a politicians´ behavior which is based on using such economic instruments in order to maximize their popularity and chances of reelection in following parliamentary election. The author states that the political affiliation is not important because the behavior of each politician is influenced by the term of parliamentary election. The theory predicts that politicians should manipulate fiscal policy just before elections by increasing public expenditures or decreasing tax burden of taxpayers. These steps can be considered as the efforts to determine the growth of economy and employment or rather as the effort to improve the living standard of voters. The post-election period should be linked with fiscal restriction, especially by the decrease of public expenditures or increase of tax burden of citizens (Spěváček, 2002). It means that the fiscal policy in tax field could be deformed especially in election year or in a period prior and after the election year. Janků (2013) adds that due to the assumption of the irrational voters, all next intentional pre-election fiscal expansion must be successful. The assumption of irrational voters became the object of critique. Therefore Rogoff and Sibert (1988) introduced the model political business cycle which is based on the temporary information asymmetries between voters and political representatives. It is clear that the governments receive information about its competency more quickly than the voters can. Therefore the public sees the government's competency with a lag. As a consequence of that fact it is obvious that the incumbent party can have an incentive to lower taxes in election years to show their competency (Rogoff, Sibert, 1988). Another significant difference between Nordhaus's model and Rogoff's model is the fact that Rogoff's model is more focused on main budgetary components such as spending, revenues, deficits and taxes rather than only on macroeconomics indicators (as in Nordhaus's model).

There are some studies which dealt with the impact of political business cycle on fiscal policy setting, for example Shi and Svensson (2006), Doležalová (2013), Štiková (2007), Brender and Drazen (2005), or Andrikopoulos (2004). The researches of mentioned authors are oriented especially on macroeconomics indicators (as Nordhaus, 1975). Mainly, they use indicators as GDP, the inflation rate or the unemployment rate.

Related to the topic of this contribution (tax field of fiscal policy), it is necessary to modify the above described approaches while respecting the basic theoretical aspects (principles) of political business cycle. Within the analysis of political business cycle in tax field, the authors are using the indicators, such as total tax collection or

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development of nominal or effective tax rates. Mentioned indicators were used by Foremmy and Riedel (2014), Ehrhart (2013), Mikesell (1978), Petterson-Lidbom (2003) or Andrikopoulos et al (2006). The objective of Ehrhart (2013) was to analyze the impact of the electoral cycle calendar on the composition of tax revenue (direct versus indirect taxes). For testing she used the indicator of total tax collection. She analyzed data of 56 developing countries over 1980-2006 time periods. Her results revealed significant pre-electoral political budget cycle. She found out that the political representatives are using especially indirect taxes (e.g. value added tax) to increase their popularity prior parliamentary election. But the indicator of total tax collection is not the most convenient way how to test the impact of electoral cycle on tax policy setting. The fluctuations in total tax collection may be caused by other factors, for example it can be influenced by the government´s inability to administer the tax collection (Foremmy and Riedel, 2014). The same opinion expresses Petterson-Lidbom (2003) who states that it is more suitable to use the tax rate itself instead of indicator of total tax collection. He expresses in favor of tax rates because they have advantage of more closely reflecting of elected governments´ intensions. The indicator of tax rates was used for example by Foremmy and Riedel (2014) or Mikesell (1978). As a tool for testing the impact of electoral cycle on the tax policy setting the authors used the changes in nominal (statutory) tax rates. In contrast with Andrikopoulous et al (2006), the authors in their researches confirmed the existence of the effect of the electoral cycle on the tax policy setting. In case of Foremmy and Riedel, it was used German corporate income tax in time period 2000 to 2008; Mikesell (1978) tested the changes in nominal tax rates of various types of taxes on timeline 1960 to 1978 on the territory of the USA.

However, the nominal tax rates also have some disadvantages. We cannot consider them as a sufficiently objective indicator how to make a comparison of tax burden of individual group of tax payers. For those purposes, the effective tax rates are being calculated. Final determination of them takes into account various elements in tax base determination or calculation a final tax liability. These factors belong to the field which can be used by representatives of public policy holders more often than the indicator of nominal tax rates. As a consequence of that they may implement voters´ attractive tax policy to increase their popularity among selected group of taxpayers which furthermore can lead to a higher chance of re-election. On the basis of that we consider the effective tax rates as a convenient instrument how to identify the existence of electoral cycle in tax policy setting. This idea is also confirmed by Brychta (2010) whose research was oriented on the calculation of effective tax rates of selected tax payers of individual income tax on the territory of the Czech Republic. In conclusion of his contribution, he encourages to test the development of effective tax rates of income tax depending on the changes in political field. Despite of fact that Macnaughton, Matthews and Pittman (1998) express the idea that the effective tax rates are often less visible that the nominal tax rates, we consider them as a convenient indicator for testing the impact of electoral cycle on tax policy setting. From various possibilities how to set effective tax rates, we chose the indicator so called personal average tax rate. This is an indicator providing the information about tax burden of households; and it is annually calculated on the international level by the OECD.

On the basis of above mentioned facts we can formulate our assumption involving the issue that the electoral cycle can influence the employment income tax policy setting, and thus the personal tax burden of taxpayers. As a consequence of described trends in behavior of representatives of legislative power, we expect to observe a reduced personal average tax rate prior parliamentary elections and election years, further a higher one once the elections took place. On the basis of that fact the objective of this paper is to examine whether the changes in personal average tax rate of selected types of employed taxpayers are influenced by national electoral cycle in case of the Czech Republic on timeline 1996 to 2012.

2   Methodology

On the basis of the fact that the tax payers of individual income tax are also registered voters, when the average share of taxpayers of individual income tax on total registered voters was according to the data from FS (2015) and ČSÚ (2014) calculated on 40 % in time period 2002 to 2013. And the remaining part of voters is created by non-economically active population (students, pensioners), which we do not consider as a group whose vote could be influenced by the tax policy setting. We decided to begin our research with the analysis of the existence of the impact of term of parliamentary elections, so called business electoral cycle, on the individual income tax policy focusing on an employment income.

As it was mentioned above, it is reasonable to use effective rates rather than nominal one or total tax collection. Therefore to fulfil the objective of this paper we use statistical data which is annually presented by the OECD (2015a) in document "Taxing Wages". We use the tax indicator (PATR), it means personal average tax rate. The indicator is calculated according to following formula:

$$PATR = \frac{sum\ of\ personal\ income\ tax + employee\ contributions - cash\ benefits}{gross\ wage\ earnings} \qquad (1)$$

The calculations are based on the earnings of a full-time adult worker (including both manual and non-manual), so called an average worker. Furthermore, the average earnings (AE) are calculated as multiplication of average monthly earnings and number "12".

Our empirical analysis concerns 8 model taxpayers (households) which are according to the OECD considered as the most significant. Each group is determined by marital status, a number of children, principal earner and secondary earner, furthermore each household contains a full-time adult employee working in one of a broad range of industry sectors of each OECD economy. Some of the households also have a spouse working less than full-time. It is assumed that the taxpayers have no income source other than employment and cash benefits. The analyzed model tax payers are represented in detail in Table 1.

Table 1: Characteristics of taxpayers (households)

No.	Marital status	Children	Principal earner	Secondary earner
TP1	Single individual	No children	67% of average earnings	
TP2	Single individual	No children	100% of average earnings	
TP3	Single individual	No children	167% of average earnings	
TP4	Single individual	2 children	67% of average earnings	
TP5	Married couple	2 children	100% of average earnings	
TP6	Married couple	2 children	100% of average earnings	33% of average earnings
TP7	Married couple	2 children	100% of average earnings	67% of average earnings
TP8	Married couple	No children	100% of average earnings	33% of average earnings

Source: OECD (2015b)

In Table 2 there are shown the input data for our empirical analysis. To increase the explanatory power of these data, we highlighted the election years. The values in the Table 2 can be negative as well as positive. In case of negative values, the taxpayers receive so called tax bonus.

Table 2: The values of PATR for each model taxpayer

	TP1	TP2	TP3	TP4	TP5	TP6	TP7	TP8
1996	**20.9**	**22.5**	**25.8**	**0.3**	**7.3**	**11.6**	**14.4**	**20.9**
1997	21.0	22.9	25.9	0.5	7.1	11.7	14.5	21.3
1998	20.9	22.8	25.9	-15.5	-3.4	7.7	14.5	21.2
1999	20.9	22.7	25.7	-15.9	-2.1	9.5	14.5	21.1
2000	20.8	22.6	25.6	-17.2	-4.3	7.7	14.3	21.0
2001	20.7	22.5	25.5	-15.5	-2.0	9.4	14.4	20.9
2002	**21.0**	**22.9**	**26.0**	**-14.9**	**-1.9**	**9.4**	**14.8**	**21.3**
2003	21.2	23.3	26.4	-12.8	1.5	11.2	17.6	21.7
2004	21.6	23.9	27.1	-9.2	4.9	13.7	18.2	22.3
2005	21.7	24.0	27.3	-11.3	1.4	12.4	17.5	22.5
2006	**19.1**	**22.4**	**27.2**	**-9.3**	**0.0**	**10.2**	**16.0**	**20.2**
2007	19.7	22.9	28.1	-12.9	-6.2	4.8	11.0	20.8
2008	19.1	23.6	27.3	-14.8	-6.9	6.2	11.6	20.9
2009	17.9	22.3	25.8	-13.3	-6.0	6.5	11.8	19.5
2010	**18.1**	**22.5**	**25.9**	**-13.1**	**-5.7**	**6.6**	**11.9**	**19.6**
2011	19.1	23.1	26.3	-11.2	-4.2	7.6	12.8	20.1
2012	18.7	22.8	26.1	-14.5	-6.3	5.9	11.6	19.9

Source: OECD (2015a), authors

In our analysis we used the differences in tax rates which were calculated individually for each analyzed year according to following formula:

$$\Delta PATR = PATR_t - PATR_{t-1} \tag{2}$$

Our analysis is focused on the data covering from 1996 to 2012. During this time period there were 5 parliamentary elections. We could not include the election year 1992 in our research because of an unavailability of data for tax indicator (PATR). Furthermore the election year 1998 was considered as a common non-election year because of the fact it was an early election. From that reason we think that the representatives of legislative power could not influence the individual income tax policy. If we take into account the term of next parliamentary election in 2013, we can consider the year 2012 as a prior election year. Next main characteristics of analyzed election years (type and their terms) are given in Table 3.

Table 3: Identification of election years

Year	Type of election	Term of election
1996	regular	31.5.1996 - 1.6.
1998	early	19.6. - 20.6.
2002	regular	14.6. - 15.6.
2006	regular	2.6. - 3.6.
2010	regular	28.5. - 29.5.

Source: ČSÚ (2015)

To fulfil the aim we used the t-test. Therefore we created 3 null hypotheses (H0) which we tested via mentioned test.

Hypotheses A: Prior election year (t-1) the personal average tax rate of model households is decreased.

Hypotheses B: In election year (t) the personal average tax rate of model households is decreased.

Hypotheses C: In post-election year (t+1) the personal average tax rate of model households is increased.

The aim is to test one-sided hypothesis about decrease or increase average value. We assume the normal distribution of both groups. The testing is based on the level of significance 5 %. We verified the hypotheses for all model tax payers (households).

The classification of analyzed time period is divided into a prior election year, an election year and a post-election year. If we take into account the fact of calculation the final personal average tax rate from the legislation in force 1st January of taxation period and the term of all parliamentary election (they took place in half of the calendar year), we assume that the steps influencing the electoral decision of taxpayers could be already implemented in pre-election year.

Furthermore we used the development of personal average tax rates in the graphical display. Due to it we can compare the development of the indicator and the term of parliamentary election separately for each model taxpayer.

However, we chose the maximal timeline, it is necessary to take into account that applied research has its limits relating to a short observed timeline and a small number of data especially for the election years. Moreover we focused only on one group of taxpayers - individual income tax (employment income), therefore we cannot generalize our results for all individual income tax policy setting. Furthermore we took into account only the criteria of term of parliamentary election. Even if the pre-election promises can play a significant role in voters´ decision, we did not include them to our research because of impossibility to get relevant data.

3   Results and discussion

The verifying above mentioned hypotheses (A, B, C) about the existence of the impact of electoral cycle on the individual income tax policy setting on the territory of the Czech Republic was realized individually for each category of taxpayers. We tested the changes of personal average tax rates expressed by differences in all analyzed timeline. The received results of our research are presented in Table 4.

Table 4: Summary results for all model taxpayers (households)

	Hypothesis A	Hypothesis B	Hypothesis C
$\alpha = 0.05$	The decrease of PATR prior parliamentary election year (t-1)	The decrease of PATR in election year (t)	The increase of PATR in post-election year (t+1)
Tested assumption	YES	YES	YES
Results of verified hypotheses	H0 rejected	H0 rejected	H0 not rejected
Conclusion	NO	NO	YES

Source: Authors´ own processing

From Table 4 it is clear that in case of all model tax payers we reject null hypothesis about the decreased personal average tax rates on the 5 % significance level prior and in parliamentary election year. On the basis of used method, we can interpret it as there were no significant changes (decreasing of PATR) prior and in election years in relation to the others years. On the other hand, the hypothesis about the increase of PATR in post-election year was not rejected on the 5 % significance level. In the analyzed timeline we can identify the growth of PATR in case of all model taxpayers.

As it was mentioned we used the t-test to analyze changes of PATR globally for all observed years. From that reason it is interesting to look at the development of PATR separately for each model taxpayer and subsequently compare it with the term of parliamentary election year. The described situation is illustrated in Figure 1, the term of election is represented by grey columns.

Figure 1: The development of PATR for each model taxpayer
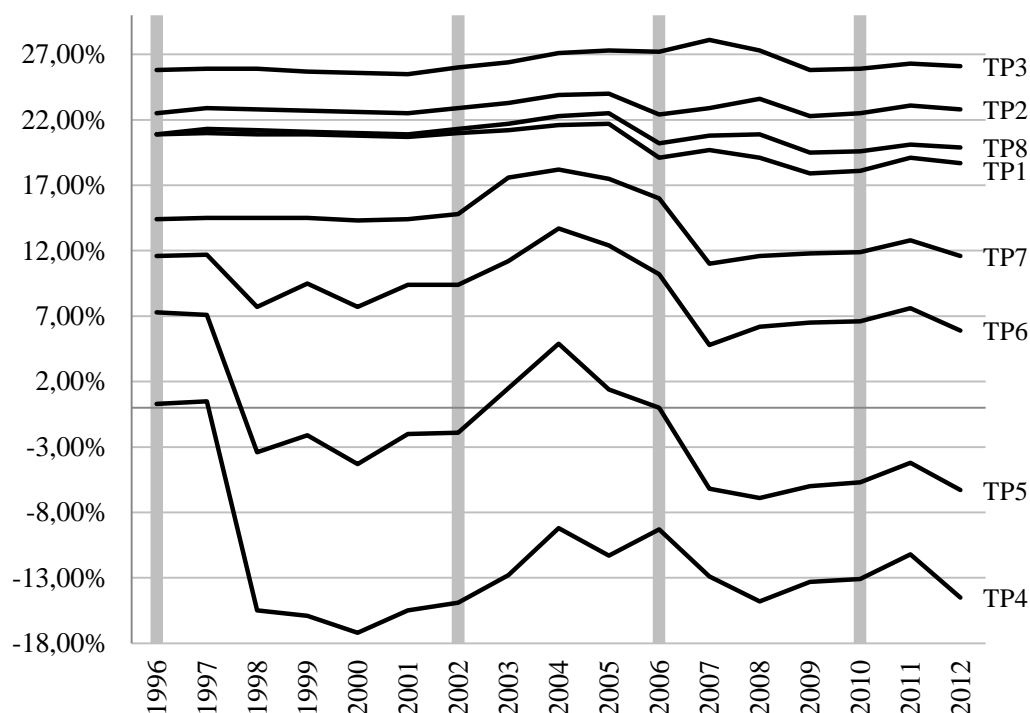
Source: Authors´ own processing

If we concentrate on the development of personal average tax rates and the term of parliamentary elections, we still focus on 3 analyzed periods – a prior election year, an election year and a post-election year.

In pre-election years we can observe various results for individual taxpayers. In case of taxpayers without children (TP1, TP2, TP3 and TP8) we can notice a decline of PATR in 2009, but a growth of PATR in 2005. Conversely for taxpayers with children in their households (TP4, TP5, TP6, TP7) we identify the opposite results in the same time period. The identical results for all model taxpayers we can observe only in the pre-election year 2012. On the basis of Figure 1 we can partly confirm a decrease of PATR prior election years, although the hypothesis A was rejected on the 5 % significance level.

In the election year we also expected a decrease of PATR. Despite of our assumption, we observe an increase of PATR in 2002 and 2010 for all model taxpayers. The development of personal average tax rate confirms our assumption only in 2006, when the PATR decreased in 7 out of 8 model taxpayers. Based on the results of major election years, we can state that the conclusions of hypothesis B are consistent with our graphical findings.

The only not rejected hypothesis was the hypothesis C about the re-increasing of personal average tax rate in post-election year; moreover the graphical display confirms these conclusions. In post-election years (1997, 2003, 2007 and 2011) there was a growth of PATR in case of all model taxpayers, except from the households with children in post-election 2007 when we observe the decrease of PATR.

4   Conclusions and discussion

The aim of our research was to identify whether the electoral cycle has the impact on the tax setting behavior in field of individual income focusing on the employment income on the territory of the Czech Republic in the time period 1996 to 2012. For that purpose, we analyzed the changes in personal average tax rates for 8 model taxpayers and tested 3 basic hypotheses. The first hypothesis A is whether the PATR of model taxpayers is decreased prior the parliamentary election, second hypothesis B if it is reduced in election year and final hypothesis C whether there is an increase of PATR in post-election year.

The conclusions of hypotheses A and B say that there was no considerable decrease of PATR on the significance level of 5 % prior and election years in relation to others years for all model taxpayers. On the contrary, the hypothesis C about re-increased PATR in post-election year was not rejected on 5 % significance level.

Furthermore, in our empirical analysis we used the graphical display of the development of PATR. On the basis of it, we formulated the same conclusions (as in hypotheses B and C) for election and post-election years. In case of prior election year, although we rejected the hypothesis about decreased PATR, there were identified some declines in personal average tax rate.

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As a consequence of that, we can conclude with following findings: prior and in an election year we cannot confirm the existence of the impact of electoral cycle on individual income tax policy setting, in other words the attractive tax policy in individual income tax field was not realized to maximize chances for re-election of representative of legislative power on the territory of the Czech Republic. Although in the post-election years we identified increases in PATR which are consistent with our assumption, we cannot confirm the existence of political business cycle in individual income tax policy focusing on employment income on the territory of the Czech Republic, as it was introduced by Nordhaus (1975) or Rogoff and Sibert (1988). Moreover, our conclusions differ from the results of authors such as Ehrhart (2013), Foremmy and Riedel (2014) or Mikesell (1978). Our results rather correspond with the results of Andrikopoulous et al (2006) who state that the tax policy cannot be always influenced by the electoral cycle.

Acknowledgements

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The Quantitative Performance Indicators for Financing Healthcare from the State Budget

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Abstract. The aim of the paper is to identify possibilities of the performance budgeting in the healthcare expenditures of the Czech state budget. The budgeting in the Czech Republic still relies on the incremental method and omits using of performance indicators. On the contrary, most of the OECD member countries has adopted some type of performance budgeting. The reasonable step is to analyse and evaluate experience of those countries and formulate the acceptable strategy for budgeting in the Czech Republic. In the field of the healthcare expenditures, the paper identifies opportunities and suggests specific quantitative performance indicators as well as the targets for every suitable programme. It also recommends adequate strategy and approach for adopting performance budgeting.
Keywords: healthcare, budgeting, performance indicators.
JEL Classification: H61, I18

1   Introduction

The aim of this study is to identify possibilities of performance budgeting in healthcare expenditures of the Czech state budget. Thus it deals only with the minority of health-related expenditures because general government amounts only to circa 3% of public expenditures on health; most of the public expenditures are made by health insurance funds (HIFs). The reason for selecting the state budget expenditures is that given institutional and legal obstacles surrounding the governance of HIFs the state budget might be more feasible part of the health-related expenditures for transformation into the performance budgeting framework.

Most of the OECD member countries adopted performance budgeting schemes several years ago. Their example therefore provides welcomed source of experience as they now use performance budgeting routinely on daily basis. On the contrary, the Czech state finance management still relies on incremental budgeting. Although there were some discussions regarding the possible adoption, only marginal steps towards changes have been made so far and no systematic performance indicators are presently used in the budget process. However, this situation only emphasizes the opportunity to learn from already tried international know-how. The scientific method of this study is therefore based on international comparison.

2   Performance Budgeting

According to OECD "…there is no single agreed standard definition on performance budgeting. A variety of terms and definitions are incorporated under the label…These terms are all concerned with introducing performance information into budget processes. Beyond this, however, there is little agreement on the type of information…nor if and how to relate performance information to resource allocation." (OECD, p. 20). Other source defines performance budgeting as a type of budgeting that "aims to improve the effectiveness and efficiency of public expenditure by linking the funding of public sector organizations to the results they deliver. It uses systematic performance information … to make this link" (OECD, p. 12).

It is important to note that the agenda of the performance budgeting is not passing modern trend in the field of public finance but the result of evolution of several decades. We can differentiate between two basic strategies, gradual adoption and "big bang" approach. The second conceptual dichotomy lies in the difference between top-down and bottom-up approaches. The former entrusts the main role to the hands of central government agency. In the case of the latter "the individual agencies are the key actors…, their participation can be voluntary and they have freedom to develop their own methods…" (Robinson, p. 33).

The third possible typology is constructed with respect to the comprehensiveness of the performance budgeting and differentiate between partial and comprehensive coverage of the public finance. There are also three distinguishable stages of the performance budgeting depending recognizably by how tight is the linkage between performance and funding.

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Table 1: Types of performance budgeting

Type	Linkage between performance and funding	Planned or actual performance	Main purpose in the budget process
Presentional	No link	Performance targets and/or performance results	Accountability
Performance-informed budgeting	Indirect	Performance targets and/or performance results	Planning and/or accountability
Direct performance budgeting	Tight	Performance results	Resource allocation and/or accountability

Source: OECD (2007, 21)

3   Budgeting of Healthcare Expenditures in the Czech Republic

According to the 2014 Annual Report the expenditures of the Ministry of Health (MoH) totalled up to 7.2 bln. CZK. The current expenditures stand for the majority of the total, 5.7 bln. CZK (79 %). The rest is formed by the capital expenditures. All these expenditures can be divided by many categories. Czech budget classification adopted a concept of "specific obligatory indicators" that are laid down for every ministry or agency encompassed in the state budget. These indicators are not allowed to be adjusted without permission of the Ministry of Finance (MoF) or the Budget Committee of the House of Deputies. However, specific indicators do not display performance but financial information:

Table 2: Specific obligatory indicators of the Ministry of Healthcare in 2014

Indicator	mil. CZK	Share
State administration	2,054	28.6%
Research & Development	1,229	17.1%
Hospital care	1,172	16.3%
Particular healthcare facilities and services	974	13.6%
Health programmes	1,475	20.5%
Other activities	280	3.9%
Total	**7,184**	**100.0%**

Source: Ministry of Healthcare of the Czech Republic (2014): *Annual Review 2014*.

"State administration" includes all expenditures related to the operations MoH (wages, energy, water, property maintenance etc.) and other agencies under MoH with state administration function. „Research & Development" expenditures are mainly transfers to state-owned hospitals and public universities. Indicator "Hospital care" covers all current and capital transfers to state-owned hospitals or specialized facilities which provide healthcare. The minority of expenditures related to this indicator goes to the non-state hospitals.

There are agencies encompassed in the MoH budget chapter that do not perform state administration such as the National Medical Library. Their funding forms roughly one half of the indicator "Particular healthcare facilities and services". The second half is dedicated to the financing of the air rescue service. Indicator "Health programmes" consists of a wide range of subsidy programmes. They aim to improve public health and deals with drug addiction, AIDS, physical disability, etc. "Other activities" include financing of the international cooperation, education of health professionals or solution of crisis situation.

The MoH´s Annual Review is (as it is presently constructed) informative only in terms of financial data. The evaluation of the expenditures is based on year-to-year comparison and on the compliance of the financial plan. The long-term comparison and non-financial threshold are seldom present. Expenditure prioritization could be regarded as a "black box" because neither formal rules, nor other consistent principles are used. The decisions are mainly based on political agenda and influences of various stakeholders. This fact has already been pointed out by several scholars (e.g. Ochrana, 2003). There is a lack of information in the budget documentation on the objectives of MoH as well as, with some rare exceptions, on the qualitative indicators. Therefore no one knows how MoH measures the progress towards the stated objectives or why it allocates certain amount of money on each particular programme. There is no quantitative assessment of the fulfilling of the targets.

The budget legislation and practice operates with the term "programme financing" which is an attempt to come close to budgeting with quantitative targets. It is used mainly in case of investment expenditures – usually renovation or construction of buildings and hospital pavilions, purchasing of medical devices and ambulances etc. The programme financing is held under the special regime apart from other expenditures. Under this scheme the individual projects consist of set of financial and output target indicators that have to be achieved.

As an example to illustrate the shortcomings of current approach we have chosen the programme called "Supporting the development and renewal of material and technical base of the university hospitals". One of the projects is named "International Clinical Research Centre Brno" and it is used as an example in the Table 3.

Table 3: Examples of quantitative non-financial indicators of programme financing

	State 31. 12. 2012	Development of the parameter at the time of realization			Average costs of parameter at the time of realization				
		Property acquisition	Property appreciation	Rental property	In 1,000 CZK on unit of measure		In 1,000 CZK per year		
					Property acquisition	Property Appreciation	Repair and maint.	Material, Energy	Services
Indicator	**Floor area of offices and workrooms (unit of measure – m2)**								
Parameter value	148,521	4,742	51,741	8,592	29	17		1	2
Obligation	MIN	MIN	MAX	MAX	MAX	MAX		MAX	MAX
Indicator	**Automobiles - lower class (unit of measure – pieces)**								
Parameter value	62	18	4		344	3	17	57	7
Obligation	MIN	MIN	MAX		MAX	MAX	MAX	MAX	MAX

Source: Government of the Czech Republic (2006)

4 Lessons from OECD Countries

The most OECD countries have implemented performance indicators to the budget documentation and process. Even though there are different approaches, strategies and techniques, we can find common principles across those countries. We examine the main features of the performance indicators of three OECD members.

4.1 Australia

The agenda of the Department of Health is divided into outcomes which are presented by one or more programmes contributing to the certain outcome. There are definitions of outcome strategies, programme objectives, Qualitative Key Performance Indicators (KPI - consist of Qualitative Indicators and Budget Year Reference Point or Target) and Quantitative Deliverables (D) along with financial information on expenses.

Table 4 below lists the qualitative indicators for the programs clustered under the Outcome 1 – Population health. Objective is a reduction in the incidence of preventable mortality and morbidity, through public health initiatives, promotion of healthy lifestyles, and approaches covering disease prevention and health screening.

Table 4: Quantitative indicators for the programs of Outcome 1

Programs	Quantitative Indicator	2013-14 Revised Budget	2014-15 Budget Target	2015-16 Forward Year 1	2016-17 Forward Year 2	2017-18 Forward Year 3
Public Health, Chronic Disease and Palliative Care	**D -** Number of breast care nurses employed in the McGrath Foundation	53	57	57	57	57
	KPI - Percentage of people invited to take part in the National Bowel Cancer Screening Program who participated	41%	41%	41%	41%	41%
Drug Strategy	**KPI -** Percentage of population 14 years of age and older recently (in the last 12 months) using an illicit drug	<13.4%	<13.4%	<13.4%	<13.4%	<13.4%
	KPI - Percentage of population 18 years of age and over who are daily smokers	15.2%	13.9%	12.6%	11.3%	10.0%
Immunisation	**KPI** - Increase the immunisation coverage rates among children 24-27 months of age	92.7%	92.9%	93.2%	93.4%	93.7%
	KPI - Increase the immunisation coverage rates among children 60-63 months of age	90.0%	91.5%	91.7%	92.0%	92.2%

Source: Australian Government Department of Health (2014).

4.2 New Zealand

The Ministry of Health presented the Statement of Intent 2014 – 2018 to the House of Representatives and published it on its websites. It defines seven health targets for the fiscal year 2014/2015. These form set of national

performance measures specifically designed to improve the performance of key health services of particular concern to patients. Health targets approach was introduced in 2007/2008.

Table 5: The health targets and qualitative measures for FY 2014/2015

Health target	Quantitative measures
Shorter stays in emergency departments	95% of patients will be admitted, discharged, or transferred from an Emergency Department within 6 hours.
Improved access to elective surgery	The volume of elective surgery will be increased by at least 4,000 discharges per year.
Shorter waits for cancer treatment	All patients, ready for treatment, wait less than 4 weeks for radiotherapy or chemotherapy.
Faster cancer treatment	85% of patients will receive their first cancer treatment within 62 days of being referred urgently with a high suspicion of cancer by July 2016.
Increased immunisation	90% of 8-month-olds will have their primary course of immunisation on time by July 2014 and 95% by December 2014, and this is maintained through to 30 June 2017.
Better help for smokers to quit	95% of hospitalised patients who smoke and are seen by a health practitioner in public hospitals and 90% of enrolled patients who smoke and are seen by a health practitioner in general practice are offered brief advice and support to quit smoking.
More heart and diabetes checks	90% of the eligible population will have had their cardiovascular risk assessed in the last 5 years.

Source: Ministry of Health, New Zealand (2014): Statement of Intent 2014 to 2018 Ministry of Health.

4.3   The United States of America

The Department of Health and Human Services in its Annual Performance Report and Performance Plan (2010-2015) lists five Strategic Goals. Each of them contains several Objectives so there are together 24 Objectives. Report provides information on the progress toward achieving the goals and objectives described in the Strategic Plan and Annual Performance Plan.

The 2014-2018 Strategic Plan contains only four Strategic Goals and 20 Objectives. For every Objective system of quantitative targets is established along with the responsibility of lead agency for every target. Furthermore, the Department also lays down Priority Goals only for one budget year.

Table 6: Quantitative performance indicators for the Priority Goals

Priority Goal	Quantitative performance indicator
Improve health care through meaningful use of health ICT	Increase the number of providers who receive incentive payments from the Medicare and Medicaid Electronic Health Record Incentive Programs for the successful adoption or demonstration of meaningful use of certified EHR technology to 425,000.
Reduce foodborne illness	Decrease the rate of Salmonella illness from 2.6 to 1.9 cases per 100,000 inhabitants.
Improve patient safety	Reduce the healthcare-associated infections by demonstrating a 10 percent reduction in national hospital-acquired catheter-associated urinary tract infections from the current SIR of 1.02 to 0.92.

Source: U.S. Department of Health & Human Services (2014).

Apart from the Priority Goals, the Strategic Goals cover usually 4-6-year period. Sometimes, targets are not set down for all years but they start in the middle of the period. In Annual Performance Report the Department evaluates whether the quantitative targets were met or not. If the data are not available for an evaluation the Department denotes the status as "pending" and specifies the time of the data availability.

Table 7: Examples of quantitative targets in the USA

	FY 2010	FY 2011	FY 2012	FY 2013	FY 2014	FY 2015
Reduce the annual adult combustible tobacco consumption in the United States (cigarettes)						
Target			1,342 per capita	1,259 per capita	1,212 per capita	1,174 per capita
The total number of tobacco compliance check inspections of retail establishments						
Target		N/A	84,000	75,000	100,000	105,000
Reduce the proportion of adults (aged 18 and over) who are current cigarette smokers						
Target	Set Baseline	20.5%	20%	19%	18%	17%
Increase the number of calls answered by the suicide hotline						
Target	555,132	555,132	555,132	555,132	765,638	989,994
Increase the percentage of adults with severe mental illness receiving homeless support services who report positive functioning at 6 month follow-up						
Target	66%	62.3%	68.4%	63.1%	63.1%	66.1%
Reduce the proportion of adolescents (grade 9 through 12) who are current cigarette smokers						
Target		18.9%	18.6%	18.2%	N/A	17.6%

Source: U.S. Department of Health & Human Services (2014).

5   Challenges and Risks for the Czech Republic

When adopting the performance budgeting certain risks can arise from hurried time schedule. If the MoH had not enough time to prepare for implementing performance indicators it could lead to the undesirable outcomes. Because of this the gradual reform is more adequate in the Czech settings than the big bang one. It means adopting should get through all three stage of performance budgeting gradually:

- To develop performance indicators and objectives in order to establish presentational model. The aim of this step is to introduce the performance indicators, to authenticate an availability of the data, sufficient time-series and to avoid incorrect interpretation of the data. This stage could take two or three years.
- Performance indicators are systematically used by both MoH and MoF to inform budget decisions. The linkage between performance information and funding is thus indirect as in the performance-informed model. This second step would assure that both ministries are able to use performance indicators in the budgeting process. The risk would be eliminated by the preference of the political decision, as usual in the present, when there was an uncertainty that decision based on the performance indicator would lead to desirable outcomes. The duration of this stage is estimated on two years.
- Direct performance budgeting should be the ultimate step. A direct link between the performance information and the allocation of resources to the expenditures programmes are established wherever it is possible and desirable. All main risks were acceptably lowered in the previous stages.

Another risk can arise from personal changes in public administration. Nonetheless, present form of incremental budgeting is more vulnerable to this type of risk than the performance budgeting. This is caused mainly by clearly defined and published targets of the performance budgeting which is not secret know-how of certain officials that appears in the model of incremental budgeting.

Top-down strategy appears to be more suitable for the Czech Republic than the bottom-up. The main reason is that so far. After 25 years of post-communist state no successful attempt emerged from individual agencies or ministries. Top-down strategy also brings some other advantages. To name the most important, it brings better co-ordination, stronger pressure for implementation and more information at the centre to enhance decision-making. There should be two lines implementation. The first one goes from MoF to MoH. The second one links the needs of 20 agencies under MoH with the resources available to the central agency. Along with the usual usage within MoH, the elements of performance budgeting might be used in evaluation of the budgetary over-requirements by MoF. Both institutions would evaluate whether planned goals of program were successfully met. It would necessary to use the data about the performance indicators that are based on robust time-series. This would eliminate possibility of underestimates of the planned goals.

The most comprehensive indicators of healthcare measure effects directly on improving health status of citizens, but we have acknowledge that there is no straightforward uncomplicated causal relation which would enable us to judge the merit of the programme solely on the overall population health status. There are many other determinants which affect health status. Table 8 shows possible quantitative non-financial indicators.

Table 8: Possible quantitative indicators for the healthcare expenditures

Specific indicator	Programme/area/institution	Suggested performance indicator/target
State administration	State Institute for Drug Control	Savings achieved thanks price revisions, access to pharmaceuticals, patients´ direct payments in %
	Regional Hygienic Offices	Reducing % of swimming sites with unacceptable water quality, number of participants in "Healthy town" and "Healthy school" projects
Research & Development		QALY, reducing case-mix adjusted cost, number of patients benefited from R&D
Hospital care	Investment transfers, current transfers	QALY, access to medical services, number of patients, number of beds or facilities, effective coverage
Particular healthcare facilities and services	Regional emergency service	Number of cases, waiting time
	National Medical Library	Number of book borrowings, access to digital sources
	Air rescue service	Number of flights, waiting time
Health programmes	Equalization of opportunities for persons with disabilities	Number of persons with disabilities using rehabilitation services, information coverage in %, new volunteer centres, % of correct answers in tests
	Care for children	Reducing % of obese children
	Long term care	Reducing incidence of decubitus ulcers (%)
	Anti/drug policy	Reducing the proportion of cigarette smokers
	AIDS prevention	Reducing HIV/AIDS incidence (%)
Other activities	Medical education	Number of successful participants, % of vacancy in hospitals, % graduates staying in the Czech Republic
	International cooperation	Number of foreign students supported

Source: authors

6   Conclusions

This study indicates opportunities for the performance budgeting for the healthcare spending from the state budget in the Czech Republic based on experience from three OECD countries. The application and adoption of performance indicators is suitable for majority of expenditures of the Ministry of Health, especially on investment transfers to hospital, public health and prevention programmes, medical education or R&D. The study recommends top-down implementation approach, partial coverage and gradual strategy from presentational model to direct performance budgeting. Transitional period could last five years to avoid undesirable results and eliminate variety of risks.

Acknowledgements

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The Efficiency of the Public Sector in Selected Countries Using the DEA Method

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Abstract. The public sector, on one hand, is a reason to develop public finance; on the other, it represents a certain "driving force" of the incessant circulation of public resources in the economy and IS one of the drivers of their dynamics. Considerable attention is therefore paid to the analysing of the efficiency of the public sector, in economic practice as well as in economic theory. The article deals with the analysis of the efficiency of the public sector in selected countries using the DEA method. The method applied in the analysis is the one of Afonso, Schuknecht and Tanzi used in the 2003 and 2006 studies.

Keywords: public sector, efficiency, analysing methods

JEL Classification: H10, H11, D61

1 Introduction

The recent systemic crisis affected the situation in the public finance sector, too. Emphasize on the effectiveness and long-term sustainability of public finance is even more pressing at the present. The public sector, on one hand, is a reason to develop public finance; on the other, it constitutes the grounds for a permanent circulation of public resources in the economy and is one of the drivers of their dynamics.

The efficiency of the public sector represents an important factor in terms of achieving stability and sustainability of public finance. The principal aim of the article is to determine the efficiency of the public sector in selected Central and Eastern European countries over the period of 2006–2013. To establish the level of efficiency, the Public Sector Efficiency (PSE) indicator is used, which measures the performance of the public sector (PSP) in relation to the expenditure spent in achieving that performance, and the DEA method.

2 Theoretical basis

Efficiency is one of the key terms in economics and means an absence of wastage, i.e. as effective use of resources as possible to satisfy people's needs and wishes (Samuelson, Nordhaus, 1991). The efficiency of the public sector has been the subject of a long-lead discussion. The causes behind the great length of this discussion are numerous. The main question is how to articulate the outputs of the sector. Also the choice of the methods and especially the indicators to convey and measure how effective it is presents a problem; and not a minor problem, because the factors at work here include also the considerable heterogeneity of the individual areas of this sector and its "divaricated" nature. When assessing the efficiency of the public sector and its optimum size, the following can be considered: First, how well supported is the classification of a certain production as a public sector production (which means how justified is it to fund that production from the public purse). Second, the so called allocative efficiency, consisting in the application of suitable methods of analysis to make a decision on whether the production of certain goods and services should be procured by the public sector. Third, production efficiency, which consists in selecting the most effective technology to produce public goods and services.

The public sector faces inefficiency issues as a result of ignoring any of the above listed factors. A lack of efficiency in the public sector works through as an unjustified inclusion of a certain project in the public financing sector (1) or as allocative inefficiency (2) where ineffective projects have been selected [this giving rise to the so called "sunk costs" which are costs incurred as a result of a wrong decision]. What may also be brought about is the so called productive, or technical, inefficiency, that is X-inefficiency, as a result of a failure to apply the lowest-cost technology and the fact that a portion of public resources has been expended for needless employees whose productivity of work is low, rather than to achieve higher outputs.

The efficiency issues of the public sector are the reason why various procedures and methods of expressing and measuring that efficiency are sought and applied. The study by A. Afonso, L. Schuknecht and V. Tanzi (2003) became the pioneering work in this area. To analyse the efficiency of the public sector, the authors proposed:

- An indicator of the performance of the public sector – the PSP (Public Sector Performance)

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- An indicator of the efficiency of the public sector – the PSE (Public Sector Efficiency) which measures the performance of the public sector (PSP) in relation to the expenditure spent in achieving that performance – the PEX (Public Expenditure)

The authors applied non-parametric techniques – the Free Disposal Hull (FDH) and the Data Envelopment Analysis (DEA) – and compared 23 OECD member countries in the period of 1990–2000. In 2006, the authors published the results of another research, using new EU member countries and emerging markets as an example (Afonso, Schuknecht, Tanzi, 2006).

The following countries were included in the analysis: 11 new member countries of the EU - Cyprus, the Czech Republic, Estonia, Hungary, Lithuania, Latvia, Malta, Poland, Slovakia and Slovenia, 2 candidate countries – Bulgaria and Romania, 3 senior member countries - Greece, Ireland, and Portugal, 9 countries which had been labelled as emerging markets, which included - Brazil, Chile, Korea, Mauritius, Mexico, Singapore, South Africa, Thailand, and Turkey.

The comparison of the total volume of spending in those countries over the period of 1993–2003, the spending ratio in relation to GDP and the spending ratio in relation to per-capita income revealed that the size of the governments in the new member countries exceeded that of the emerging markets, with only the Baltics falling in the group with a relatively small public sector (A. Afonso, L. Schuknecht, V. Tanzi, 2006). When analysing the performance and efficiency of the public sector, the authors proceeded from a methodology already designed and applied earlier on (A. Afonso, L. Schuknecht, V. Tanzi, 2003). As far as the Public Sector Performance (PSP) was concerned, the authors applied almost the same sub-indicators, for the period of 2001/2003. In addition to omitting public infrastructure, education is reflected only by a qualitative measure of education achievement (leaving out secondary school enrolment) and economic performance excludes the level of per capita GDP (which in this sample would strongly bias in favour of the rich countries). In the next step, the authors focused on the Public Sector Efficiency (PSE) analysis. This analysis corroborated the results of the 2003 study – that more public spending often has relatively low returns as regards improved performance.

After that, the authors focused on the analysis of the public sector efficiency applying the DEA method. Finally, they broadened their analysis to account for the effect of non-discretionary factors. They worked on the understanding that there are also other non-fiscal factors affecting efficiency, such as: secondary school enrolment, the competence of the civil, per capita GDP, an indicator of property rights, trade openness, transparency in public policy, etc. The authors evaluated the importance of non-discretionary factors, via Tobit regressions.

The authors arrived at the following conclusions: Countries with small public sectors and public spending ratios not exceeding 30% of the GDP tend to be more efficient. The DEA analysis revealed that only a small part of the countries analysed are close to the production possibility frontier. Certain non-fiscal factors have an effect on the efficiency of public spending and the public sector.

In 2013, another study by A. Afonso, A. Romero and E. Monsalve was published, applying a similar approach to the analysis of the public sector and its efficiency as the two already mentioned studies by Afonso, Schuknecht and Tanzi of 2003 and 2006 (António Afonso, Alma Romero, Emma Monsalve, 2013). That study focused on the public sector efficiency analysis in 23 Latin-American and Caribbean countries (LAC) over the period of 2001–2010.

3   Analysis of the efficiency of the public sector in selected countries in the years 2006-2013

In our analysis, we applied the approach of Afonso, Schuknecht, Tanzi (2003, 2006) and Afonso, Romero, Monsalve (2013). To establish the efficiency, we selected 12 European countries, which included Bulgaria, the Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic, Slovenia and three senior EU members – Greece, Ireland, and Portugal – in the period of 2006-2013.

The public sector efficiency analysis was performed in the following steps:

1) The PSP (Public Sector Performance) indicator calculation

$$PSP_i = \sum_{j=1}^{n} PSP_{ij}$$

(1)

with $PSP_{ij} = f(I_k)$

$$\Delta PSP_{ij} = \sum_{i=k}^{n} \frac{\partial f}{\partial I_k} \Delta I_k$$

(2)

2) The PSE (Public Sector Efficiency, the measuring of the public sector performance in relation to the costs expended in achieving that performance) indicator calculation

$$PSE_i = \frac{PSPi}{PEXi}$$

$$(3)$$

with

$$\frac{PSPi}{PEXi} = \sum_{j=1}^{n} \frac{PSPij}{PEXij}.$$

$$(4)$$

PEX_{IJ} – expenditure spent to achieve the performance of the public sector

3)   Application of the DEA method

4   Results

1) The selected sub-indicators of the overall public sector performance indicator (PSP) included 6 socio-economic indicators, three of which relate to the basic fiscal functions of governments and three to the performance of public administration, to education, healthcare, and public transport infrastructure (Afonso, Schuknecht, Tanzi, 2006).

The PSP indicator was calculated in the exactly same way as in Afonso (2006), with the updated time series instead of 1994-2003, 2004-2013. All of the indicators were "scaled", i.e. divided by their arithmetical averages.

The Table 1 shows PSP and its components for 2013 and the final PSP from 2003 for comparison:

Table 1: Public Sector Performance (PSP) Indicators in 2013

Country	Adminis tration	Human capital	Health	Distribu tion	Stability	Economic performan ce	**PSP 2013**	PSP 2003
Bulgaria	0.91	0.94	0.98	0.93	0.95	1.17	**0.98**	0.72
CR	0.96	0.93	1.01	1.09	1.17	1.27	**1.07**	0.98
Hungary	0.95	1.02	0.99	1.04	0.54	0.73	**0.88**	1.06
Latvia	1.05	1.01	0.98	0.94	0.61	1.14	**0.95**	0.97
Lithuania	1.02	1.11	0.98	0.95	0.83	1.24	**1.02**	0.90
Poland	1.03	0.94	1.00	1.00	2.43	1.33	**1.29**	0.97
Portugal	1.06	1.02	1.02	0.95	0.71	0.45	**0.87**	1.06
Romania	0.93	0.95	0.98	0.95	0.84	1.42	**1.01**	0.77
SR	0.84	0.90	0.99	1.09	1.32	1.28	**1.07**	1.04
Slovenia	1.00	1.06	1.02	1.10	0.85	1.02	**1.01**	1.14
Greece	0.89	0.96	1.02	0.95	0.36	0.11	**0.72**	1.11
Ireland	1.36	1.14	1.03	1.01	1.40	0.83	**1.13**	1.29
Average	1.00	1.00	1.00	1.00	1.00	1.00	**1.00**	1.00

Source: Eurostat

Poland showed an important increase in the PSP indicator, mainly due to good stability and economic performance. These two indicators happen to influence the overall PSP indicator the most. That's due to the fact that these two indicators differ quite a lot among the countries with respect to the other indicators.

Table 2: Total government expenditures per GDP in 2003 (average of 1999-2003) and 2013 (2009-2013)

% of GDP	Bulgaria	CR	Hungary	Latvia	Lithuania	Poland	Portugal	Romania	SR	Slovenia	Greece	Ireland
2013	37.2	43.0	49.8	39.8	40.3	43.7	50.1	38.2	51.1	41.5	54.6	48.5
2003	36.6	50.0	49.6	34.7	32.2	44.7	44.7	30.9	40.1	41.6	44.7	32.3

Source: The Global Competitiveness Report, Eurostat

The arithmetical average of total government expenditures per GDP of the 12 countries moved from 40.2% to 44.8%. Only the Czech Republic (-7.0) and Poland (-1.0) showed decreased government total expenditures per GDP, on the other hand the Slovak Republic (+10.9) and Greece (+9.8) recorder the highest jumps.

2) The Table 3 shows PSE and its components for 2013 and the final PSE from 2003 for comparison:

Table 3: Public Sector Efficiency (PSE) Indicators 2013

Country	Admini stration	Human capital	Healt h	Distribut ion	Stabil ity	Economic performance	**PSE 2013**	PSE 2003
Bulgaria	1.09	1.10	1.35	0.86	1.14	1.41	**1.16**	0.74
CR	1.00	1.07	0.91	0.89	1.22	1.32	**1.07**	1.20
Hungary	0.86	0.98	0.72	1.07	0.49	0.66	**0.79**	0.89
Latvia	1.18	0.93	1.11	0.82	0.68	1.29	**1.00**	1.50
Lithuania	1.14	1.04	1.47	0.91	0.93	1.38	**1.14**	1.10
Poland	1.06	0.91	1.15	0.89	2.49	1.36	**1.31**	0.92
Portugal	0.95	0.93	0.86	1.05	0.63	0.40	**0.80**	0.95
Romania	1.09	1.22	1.26	1.07	0.99	1.66	**1.21**	0.95
SR	0.74	1.12	0.99	1.01	1.16	1.13	**1.02**	1.02
Slovenia	1.08	0.93	0.89	1.06	0.91	1.10	**1.00**	1.10
Greece	0.73	0.96	0.90	1.20	0.30	0.09	**0.70**	0.97
Ireland	1.26	0.93	0.92	1.43	1.30	0.77	**1.10**	1.55
average	1.01	1.01	1.04	1.02	1.02	1.05	**1.03**	1.07

Source: Eurostat, The Global Competitiveness Report, Transparency International Org.

The PSE is calculated as PSP divided by the relevant expenditures per GDP that were:
- Public consumption as proxy for input to produce administrative outcomes (administration)
- Education expenditure for education performance (human capital)
- Health expenditure for health performance/outcome indicators (health)
- Transfers and subsidies as proxies for input to affect the income distribution (distribution)
- Total spending as proxy for the input to affect economic stabilization (stability)
- Total spending also as a proxy input for economic efficiency (economic performance)

Similar to PSP, the most important indicators to calculate the overall PSE indicator were stability and economic performance for exactly the same reasons as by PSP. Poland had the best value of PSE among the 12 countries again due to stability and economic performance in 2013. The second best PSE in 2013 was calculated for Romania due to good records in education, health and economic performance that were reached by the relative low expenditures.

3) The DEA was calculated from PSP as a single input and total public expenditures per GDP as single output, exactly the same way as in Afonso (2006). The DEA in 2003 was calculated for the 12 analyzed based on the input values in Afonso (2006).

Table 4: DEA results: one input, one output (VRS input oriented)

	2013		2003	
Country	VRS TE	Rank	VRS TE	Rank
Bulgaria	1.00	1	0.85	4
Czech Republic	0.91	6	0.63	11
Hungary	0.75	9	0.64	10
Latvia	0.94	4	0.91	3
Lithuania	0.95	3	0.97	2
Poland	1.00	1	0.70	9
Portugal	0.74	10	0.71	8
Romania	0.99	2	1.00	1
Slovak Republic	0.77	8	0.79	5
Slovenia	0.91	5	0.77	6
Greece	0.68	11	0.71	7
Ireland	0.83	7	1.00	1
Average	0.87		0.81	
Min.	0.68		0.63	
St.dev.	0.11		0.14	

Source: Eurostat, Eurostat, The Global Competitiveness Report, Transparency International Org.

The DEA analyses proved more or less the PSE indicator results. It identified Romania and Ireland as efficient among the 12 tested states in 2003 while in 2013 the efficient states changed to Bulgaria and Poland with Romania being very close to the efficiency border. Romania and Bulgaria were efficient due to low public expenditures and quite good results while Poland was efficient due to best outcomes.

The following picture illustrates the positions of the countries analysed with respect to their results:

Figure 1: Theoretical production possibility frontier: one input, one output VRS in 2003 vs. 2013
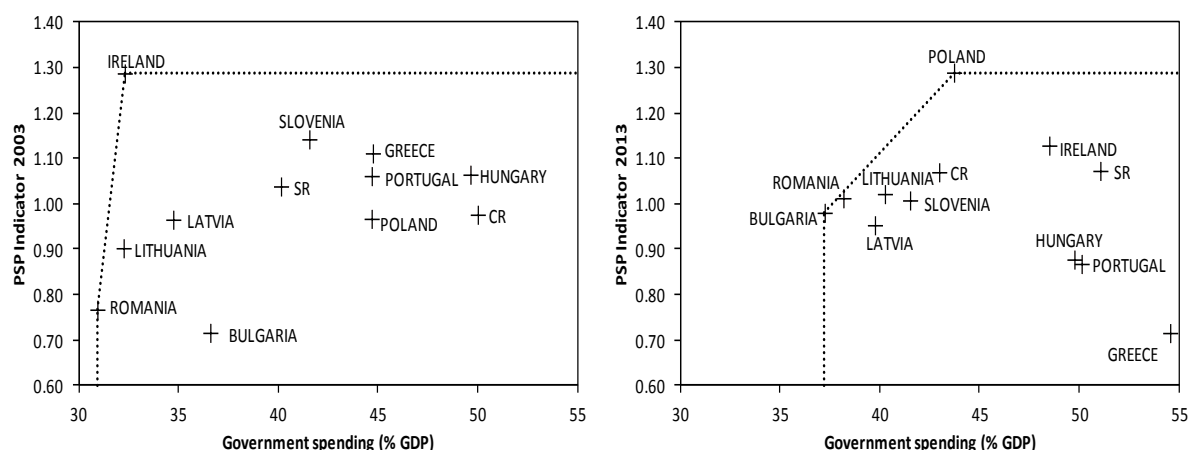
Source : Eurostat, The Global Competitiveness Report, Transparency International Org.

If one compares the charts from 2003 and 2013, there are several remarkable facts: The public spendings per GDP increased in almost all countries – the chart moved to right - this can be explained by the financial crises that led to higher government expenditures and lower GDP. Greece fall – due to very poor economic performance and stability. Ireland fall from efficient to average country –worse economic results with high relative government expenditures. Bulgaria moved to efficient country – increased performance with low government expenditures. Czech Republic moved from one of the worst to medium countries – increased performance and lower government expenditures.

5   Conclusions

In our analysis, we applied the approach of Afonso, Schuknecht, Tanzi (2003, 2006) and Afonso, Romero, Monsalve (2013). To establish the efficiency, we selected 12 European countries, which included Bulgaria, the Czech Republic, Hungary, Latvia, Lithuania, Poland, Romania, the Slovak Republic, Slovenia and three senior EU members – Greece, Ireland, and Portugal – in the period of 2006-2013.

The PSP indicator was calculated in the exactly same way as in Afonso (2006), with the updated time series instead of 1994-2003, 2004-2013.

Poland showed an important increase in the PSP indicator, mainly due to good stability and economic performance. These two indicators happen to influence the overall PSP indicator the most. That's due to the fact that these two indicators differ quite a lot among the countries with respect to the other indicators.

The arithmetical average of total government expenditures per GDP of the 12 countries moved from 40.2% to 44.8%. Only the Czech Republic (-7.0) and Poland (-1.0) showed decreased government total expenditures per GDP, on the other hand the Slovak Republic (+10.9) and Greece (+9.8) recorder the highest jumps.

The PSE is calculated as PSP divided by the relevant expenditures per GDP. Poland had the best value of PSE among the 12 countries again due to stability and economic performance in 2013. The second best PSE in 2013 was calculated for Romania due to good records in education, health and economic performance that were reached by the relative low expenditures.

The DEA analyses proved more or less the PSE indicator results. It identified Romania and Ireland as efficient among the 12 tested states in 2003 while in 2013 the efficient states changed to Bulgaria and Poland with Romania being very close to the efficiency border. Romania and Bulgaria were efficient due to low public expenditures and quite good results while Poland was efficient due to best outcomes.

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Overheads Associated with Management of Buildings in the Czech Republic: A Case Study

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Abstract. Cost management in state organisational units (SOU) is still accompanied by a high degree of inefficiency. A high degree of rigidity given by the legislation, political decisions that change rules of the state administration's effective performance and, on the other hand, a small degree of responsibility for efficient management of resources set by a direct linkage to the state budget do not as a whole create a sufficient stimulus for the change. One of the possible ways is to introduce modern management methods based on causality of activities and costs of SOU, which include notably the ABC/ABM methodology. The largest group of overhead costs is associated with operation of buildings and management of buildings becomes an increasingly complex system. This is confirmed by the performed regression analysis which indicates that overhead expenses on buildings' management are dependent primarily on the value of buildings and do not depend on the number of workers. At the same time, however, it means that operating costs of running buildings increase with the value of these building as a consequence of their equipment with technologies.

Keywords: efficiency, ABC/ABM, state organisational units, overhead costs.

JEL Classification: H41, M41, D24

1   Introduction

In practice of public sector institutions, overhead costs represent a fundamental cost item. Although overhead costs increase over time in all sectors of the economy (Petřík, 2007), as a problem they could be identified in the case of state administration organisations. These institutions manage a significant volume of public finances, but since they are not subjected to a competitive pressure, they lack systems to ensure effective management of costs. Broadly speaking for all these organisations there may be identified from the material perspective 3 types of overhead costs: a) IT overheads, b) overheads associated with the operation of buildings and c) other overheads. Ensuring operability of state administrative authorities requires their effective management, not only by way of legislative solutions such as strict rules imposed by the Act on Budgetary Rules, Act on Property of the Czech Republic, Act on Financial Audit or rules of public procurement set by the relevant law. For large SOU with a broad range of activities there is therefore necessary to seek a solution using a different way of working with costs, rather similar to business practice. One way is to adopt principles of managerial accounting (Fibírová et al., 2000) and notably principles of cost management via use of the ABC/ABM methodology that understands costs in causal relationship (Kaplan-Cooper, 1998). The level of costs should in turn be such as to allow the provision of this service to the extent usually set as a result of a political decision, but not at the price of costs that are higher than absolutely necessary to fulfil the given task. The goal of this paper is to demonstrate the possibility of using the existing accounting information for the construction resources cost drivers (RCD). Give a definition of parameters for managerial control of costs according to ABC / ABM and this show on the example of management buildings. The goal of regression analysis is also determine whether the use of resource cost driver in the form of the number of workers the right to assign costs of processes. Therefore comes forward an idea to correctly-casually specify costs within the first stage and identify causes of their formation, growth and optimisation opportunities. For effective management of costs, processes, outputs or profit are needed information that traditional accounting systems do not provide. In essence this relates to a biunique role of the accounting system and cost system, when it is crucial to get information what, when, where and how significantly impacts individual monitored operating costs.

2   Overheads associated with management of buildings

We shall discuss the issue of managing overheads associated with operation of buildings on the example of the Customs Administration of the Czech Republic. Overhead costs incurred by the need to maintain and operate buildings for purposes of fulfilling tasks of public administration authorities constitute the second most important cost item next to personnel costs (direct costs). The following table presents shares of individual general overhead items within three selected periods.

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Table 1: Selected values of buildings' overheads

Year	IT Overheads	% share	Overheads of Buildings	% share	Others Overheads	% share	Total Overheads
2003	203,718,000	28.8%	315,046,000	44.5%	188,488,000	26.7%	707,252,000
2009	198,158,000	32.2%	294,993,000	47.9%	122,291,000	19.9%	615,442,000
2014	123,396,000	27.2%	211,834,000	46.7%	118,322,000	26.1%	453,552,000

Source: own from AVISme.

Since 2004, the shares have not fundamentally changed and thus it may be established that overhead costs that may be associated with operation of buildings account for nearly one half of all overheads. Operation of buildings is unlike most other activities of SOU associated also with direct material. However, the level of these costs is compared to supply services and other expenses of this overhead group negligible and therefore there is no need to take them further into account. Overheads associated with operation of buildings have a nature of fixed costs in their traditional understanding, while in terms of the ABC/ABM methodology they in turn represent long-term variable costs. "Variable" because in the context of ABC/ABM they arise causally and therefore they must be variable. "Long-term" in turn due to the fact that causes that provoke them and determine their level tend to change over the long-term horizon. Over the past decade, operation of buildings becomes increasingly complex and represents a separate sophisticated system that includes provision of energy, hygiene and technical standards, information transfer and functionality of subsystems, prevention of failures, removal of emergency situations and more. It is also increasingly linked with operation of IT systems which require space adaptations, construction of penetrations and supply of electrical power. Ultimately, operation of buildings and their overheads thus also move into the category of short-term variable costs. As a result, cost management needs to respond also to this fact.

Within the ABC model adopted by the Customs Administration, RCD as well as ACD were predominantly specified as derivatives from the number of employees or the amount of working time of employees, usually expressed by FTE (full time equivalent). In the case of RCD these were derived as a number of workers performing individual specified activities in all processes. For ACD, where the cost object is represented by the actual main process, as the number of employees "operating" the given competence and performing the specific main activity. For practical adoption were these RCD used because of their ready availability from databases and an option to carry out a quick questionnaire survey of time consumption. Supportingly were in turn also used results of the analysis of expenditure dependence, identified using a simple regression (Hammer, 2011, 2012). Although this simple research did not show any strong dependence of expenditures in the category of buildings' overheads on the number of workers, nevertheless due to the chosen short time series the hypothesis could not be rejected. For such specified regression analysis there lacks a sufficiently long time series of empirical data on the performance of activities, cost objects and causal consumption of buildings' overheads. For this reason, information on activities that cost objects consume was substituted by the so-called substitute criteria. As substitute criteria, i.e. explanatory variables of the consumption of buildings' overheads, were used financial and economic criteria.

- asset value,
- number of employees,
- tax revenues,
- capital expenditures,
- volume of foreign trade in goods burdened by excise taxes,
- inflation.

3   Results of regression analysis of overheads buildings

The basic research question thus stands as what affects the volume of costs of buildings' operation? Within the ABC methodology this represents the most important decision, since it affects the specification of cost drivers, RCD. The performed analysis should, among other things, provide an answer to the question whether it is appropriate to use FTE for the allocation of buildings' overheads to processes within cost management or preparation of a budget and its breakdown. Overhead costs of buildings' operation may be also affected by several "substitute" factors and therefore we have adopted a multiple regression analysis (Seger, Hindls, 1993). For the above mentioned "substitute" explanatory variables there could be compiled a time series of the same length as for buildings' overheads and at the same time these may substitute significant cost objects, consumed by the organisation's activities.

Table 2: Descriptive statistics of explanatory and explained variables

type	mean	median	min	max	standard deviation
asset value*	7,191,577	7,615,617	1,724,619	10,013,562	2,025,238
number of employees	7,591	7,419	5,728	9,393	1,507
tax revenues**	176,676	144,918	93,064	292,494	60,138
capital expenditures *	591,323	492,767	156,118	1,492,670	368,230
volume of foreign trade in goods burdened by excise taxes**	166,000	133,000	44,000	326,000	97,000
inflation (%)	4.90	2.80	0.10	20.80	4.80
cost for buildings management*	265,634	274,691	130,732	339,896	51,815

Note: *in thousand CZK, ** in million CZK

Source: own from AVISme.

The regression model that best describes the entire cost group has the form

DLcost for buildings management = - 0.01574 + 0.5576*DLasset value (1)

For the time series there was not confirmed stationarity, but the value of the ADF-test is only just below the limit of the test criterion. The time series does not demonstrate autocorrelation (DW = 2.36) and neither there was confirmed an apparent regression (R2<DW). Same as for all the examined variables, a problem poses the length of the time series which does not allow for disproving of heteroscedasticity (Arlt, 1999).

As the results indicate, the only significant explanatory variable is the value of the property. Partial coefficient of determination points towards a significant dependence on the asset value with a value of 0.74, which fact is also confirmed by the t-value (t-prob) which is sufficient to reject the null hypothesis at the 99% significance level. Adjusted coefficient of determination points towards a significant tightness of dependency within the regression function with the value of 0.72 and the value of the F-test confirms that it is possible to reject the null hypothesis at the 95% level of significance and the overall model is statistically significant. Other examined explanatory variables are utterly insignificant. Comparison of results of the F-test and individual t-tests of the regression coefficients confirms that the model is suitable. The regression coefficient indicates a positive, bellow-unitary sensitivity of buildings' overheads with respect to a unitary change in the value of assets.

Practical interpretation confirms the assumption that total overheads are mainly dependent upon the asset value. Logically it was assumed that the more assets are used, the more it is necessary to incur in operating expenses on their operation and sustainability. There failed to get confirmed the assumption that significant shall be also the number of employees. This is probably due to the fact that until 2004, most of the objects were border crossings that were built based on international agreements and not for purposes of placing own personnel. An interesting result is that buildings' overheads are not explained by inflation. For example, for one of the overhead items – rents of buildings – this is one of conditions and growth in expenditures often occurs only as a result of applied indexation clause. Its small importance is once again due to the fact that until 2004, objects of border crossings in state ownership accounted for most buildings. Similarly the minimal impact of capital expenditure of the previous period confirms the fact that the investment stage, especially for investments in buildings, is longer than 1 year.

Table 3: OLS results for the total buildings' overhead variable

y = DLcost_buildmanagement	Coefficient	Std.Error	t-value	t-prob	Part.R^2
constant	-0.0157388	0.01324	-1.19	0.2491	0.0693
Dlasset value	0.557552	0.07546	7.39	0.0000	0.7418
R-squared	0.741803		F-statistic		54.59
Adjusted R-square	0.728214		prob F-statistic		[0.000]**
Durbin-Watson statistic	1.86655				

Source: PC Give

The undertaken analysis should, among other things, provide an answer to the question whether it is appropriate to use FTE for allocation of buildings' overheads to processes. The performed analysis has proved that the number of employees alone is not enough to explain the costs of processes, since their amount is influenced also by other factors, mainly by specific cost objects according to the ABC methodology. In a simplified form they depend primarily upon the value of buildings. Specification of RCD (and possibly also ACD) as FTE derived from the number of staff does not provide correct results. In order to estimate buildings' overheads that consume specific selected cost objects it is thus necessary to make an intermediate step and create a cost driver that allocates to all

(i.e. main, support and control) processes (activities) their corresponding proportional share of objects. The construction of RCD must in turn be based on the form

$$RCD_i = \hat{y}_i / \hat{y} \, ,$$
(2)

where
RCD_i = specific RCD for the given budgetary item,

$\hat{y}_i$ = estimated buildings' overheads of the specific process, calculated from values of the explanatory variables,

$\hat{y}$ = estimate of the cost group's total costs for all processes.

4 Conclusions

Established results of the buildings' overheads refute the initial hypothesis (Hammer, 2011, 2012) that the decisive factor of buildings' operating costs represents the number of workers, possibly the value of FTE. Into the group of the buildings' overheads were included the following expenditures

- rents in rented buildings,
- expenditures on energy,
- repair and maintenance,
- services associated with the operation.

The original assumption was based on logical reasoning that SOU rent buildings in order to accommodate the required number of workers and thus also energy expenditures reflect the intensity of buildings' usage by workers. Likewise, repairs and maintenance and services related to the operation (cleaning, etc.) should be dependent upon the number of workers. However, when adopting a more detailed analysis we arrive at quite a different result which corresponds to the established results of regression analysis. Nowadays buildings do not represent only a suitable space expressed as an area per worker, but constitute instead a sophisticated system given by communication channels, managed energy transfer and other subsystems that must be operated in order to meet the required technological, technical and labour-hygiene standards. Along the growing complexity of building equipment is also increasing its value and regardless of the number of workers placed in buildings there are also rising operating costs, i.e. operating overheads of buildings. These costs thus logically do not depend on the number of workers but instead on the value of buildings. There applies a similar principle as in the case of IT overheads. Technological progress increases requirements for its involvement in all areas of activities performed by SOU. Some 20 years ago, buildings did not have any data networks, air conditioning, electronic heating control, electronic security equipment against fire, etc. Nowadays all this is a necessity and without many of these elements the given object is even not legally operable. This also applies to the size of the rented area, since possible or effective is to rent from the technological perspective only a self-contained space and thus the number of employees in individual offices cannot be effectively optimised.

With respect to design of RCD, regression analysis' results bring both the positive in terms of specification of the impact of assets' value as well as the necessity to perform an intermediate step in terms of formulating the ABC/ABM model. The main, operational and support processes make use of different areas of the building space. Provided we carry out assigning of primary costs of processes only at the stage of assigning the costs to cost objects, this way there would not be properly included costs of support and operational processes. It is therefore necessary to split the buildings' overheads based on space usage to all processes and only then to add them into the concrete RCD main processes. To main processes so because these use the given space themselves. This way it is also possible to remove any possible specifics, when one of the supporting or operational processes uses technologically more intensive / less challenging object (e.g. own reproduction section, warehouses, independent boiler rooms, substations, etc.).

Familiarity with SOU costs and factors that affect them represents one of the principal conditions of management. Persistent efforts to deal with SOU cost effectiveness using legislative means leads on the other hand to the growth of incurred costs. SOU in order to meet more and more legislative restrictions and rules of drawing public resources SOU procure additional and more complicated systems. However, the management of SOU should primarily know what factors affect the cost of SOU and how, for which purpose represents the most appropriate means the comprehensive managerial concept of ABC/ABM.

Acknowledgements

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Child Care Periods in Pension Systems

Martin Holub[*]

Abstract. Pension systems, as well as other subsystems of government social policy, must respond to the socio-demographic development of the society, especially an increasing life expectancy, changes in family behaviour, and fertility development.

Although taking periods of child care in to account (not only) in the Czech pension system has a long tradition, new alternative options to make provision for the child care in pension systems have recently been sought especially in connection with the implemented reforms of pension systems. This paper deals with forms of theoretical measures: the concept of children pay as you go, the relation of the amount of the contribution rate to the number of children raised, and the assignment of a portion of old-age pension scheme contributions.

Both poor theoretical grounds of these concepts and practically zero or negative experience with its application in European countries result in not recommendation these experiments to Czech government.

Keywords: Old-age pension, CPAYG, social security, non-contributory periods

JEL Classification: H55, J26, G22

1   Introduction

Although taking child care periods into account (not only) in the Czech pension system has a long tradition, the current discussions concerning the manner and options of pension reform in the Czech Republic include proposals to change the way of the consideration of the child care in old-age pension entitlements and the amount of old-age pension benefits for parents (Hyzl 2004, Hampl 2014). The Expert Committee on Pension Reform (OKPDR) established by the Ministry of Labour and Social Affairs in connection with the settlement of transfers between families with children and the society and the consideration of investments in the child care and in the context of low birth rate discusses the options to introduce the relation of the old-age pension amount to the number of children or a change in the amount of contributions depending on the number of children or the assignation of part of contributions by children in favour of their parents (OKPDR, 2014). These considerations are associated with the efforts to increase the birth rate and to ensure "better" conditions for families with children, as well as with the efforts to ensure the long-term financial sustainability of the pension system.

The objective of this paper is to present the proposed theoretical concepts of making provision for the number of children raised in the pension system, to carry out the critical analyses of the concepts, and to identify their strengths and weaknesses. Based on this analysis and discussing these concepts in the context of the present Czech pension system, the paper aims to present recommendations for the Czech government policy and to complement the current debate about the directions of the reform of the pension system in the Czech Republic.

2   Consideration of Child Care Periods in EU Pension Systems

The child care periods within the context of old-age pension systems are taken into account in all EU countries, differences between individual countries only exist to the extent to which those periods are taken into account.

Mostly, the periods of the child care in the first years of life are taken into account. Any gaps in the periods of old-age pension insurance of parents resulting from child care can be compensated by the payment of contributions for the period from public resources or the parents are allowed to buy additional and voluntarily pension entitlements. The periods of child care may only serve to fill partially the gaps in the insurance period when determining old-age pension entitlements (adding a minimum number of years needed to qualify for an old-age pension). Very rarely any social security contributions are not paid for non-contributory periods of insurance for child care. The periods of child care may be excluded when calculating the amount of old-age pension in order not to decrease the actually achieved income from which the pension is calculated. In some countries, the child care is taken into account by providing the benefits linked to place of residence, which are similar to family benefits but they have a direct or indirect impact on the subsequent determination of old-age pension entitlements. The countries with a point system applies crediting individual accounts of the insured with bonuses for child care or extending the insurance period by crediting bonuses.

In the Czech Republic, the period of care for a child aged up to four years is currently taken into account as a non-contributory period and affects both old-age pension entitlements and the amount of old-age pension. The care may only be taken into account for the purpose of future retirement benefits for both women and men, but the same period of care may not be considered for more than one person simultaneously. Further, in the Czech

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Republic, the age limit for the retirement of women is allowed to be reduced according to the number of children raised. However, this advantage for women is being abandoned at the moment.

3   Proposed Forms of Consideration of Child Care Periods in Pension

Recently, in the context of the Czech pension reform, there have appeared even some unconventional proposals for the pension reform, assuming considering the number of children raised in the amount of the pensions.

3.1   Concept of Children Pay as You Go (CPAYG)

In Europe, the idea of consideration child care in pension system has been discussed since the eighties of the last century; for example, in the dispute concerning the reform of the German pension system, Borchert (1981) proposes to introduce a special part of old-age pension, the so-called parental pension. In his study, Bental (1989) seeks a balance between the population growth and the capital accumulation. He shows that achieving the Pareto's optimum is possible in the case of PAYG social security systems where the benefits are determined in proportion to the number of children. In his study, Cigno (1996) examines the relationship between the fertility rate and domestic savings. Based on specific data concerning Germany, Italy, the United Kingdom, and the United States, he shows that the expansion of social security systems has led to a reduction in fertility rates in the countries monitored. More specific proposals addressing this issue appear at the beginning of the 21st century in the study of Sinn (2004), where the author discusses the relationship between investments in human capital and an old-age pension system. The author comes to the conclusion that the social security provides good protection in old age for the childless persons but also creates strong disincentives to investments in human capital. In addition to the current conventional systems of social security, Cigno (2009) recommends to establish alternative old-age pension systems which would allow an individual to acquire pension entitlements through their children in whom they invested while raising them. The pension system where the amount of pension benefits depends on the number of children raised is usually identified as Child Pension or CPAYG and, as Vostatek (2015) says; „it is not a pension in favour of children but "in return for" children. The child pension means a socio-political project of providing an old-age pension to parents with three or more children...the child pension is designed as a universal benefit, regardless of income. Parents with one child under this concept are entitled to one third of the child pension, parents with two children are entitled to two thirds of the pension. The childless retired persons will be entitled to no part as they did not invest in raising children." The concept of CPAYG is further elaborated upon especially in Germany; Sinn (2013) expanded his study, dealing with the relation of social security contributions to the number of children and proposes a complementary system of private insurance for the childless retired persons or parents with a small number of children, where the amount of contributions is increased with the decreasing number of children. As an initial value of zero contributions, the number of children equalling three is suggested. Another German author Werding (2014) deals in his study with the idea of introducing discounts on old-age pension system contributions. Also here, the main starting point is the idea that the old-age pension security can be achieved either by investing in the social security system (savings) or investments in human capital (children) or a combination of both.

The general proposal to reform the current Czech PAYG pension system to the CPAYG was presented in 2004 by the representatives of the ING Group who in their study (Hyzl et al. 2004) suggested that the current basic PAYG pension system should be gradually replaced by the CPAYG system and a compulsory savings scheme. Within the CPAYG system, the contributions would be paid by all the earning population, but only those who have raised at least one child would be entitled to a pension the amount of which would depend on the number of children. The compulsory savings would be financed through funds and the amount of contributions would depend on the number of children of a family.

The philosophy of the CPAYG concept is based on the current issues of PAYG pension systems connected with declining fertility rates, which give the impression of dependence of those systems on the performance relations between various generations - retired persons, economically active generations, and generations of future payers (children). The basic underlying assumption of the concept is that the PAYG old-age pension system (in terms of its organisation in the Czech Republic or Germany) is not de facto social insurance but simply a redistribution of the existing income of economically active generations to the economically inactive generation. The concept operates with the assumption that the economically active are obliged to pay a "contributions" dependent on their income to a sort of clearing house (e.g. to the account of the state budget). Economically inactive retired persons then acquire pension entitlements to a percentage of (wage) income of economically active persons. This assumption is based on the traditional concept of old age security in a family where the level of parents depended on the living standards of children; in terms of state level, the standard of living of retired persons depends on the standard of living of the economically active generation.

Within the concept of the CPAYG, raising a child is seen as an investment and some authors of this concept reduce the costs associated with raising children only to the costs of education. Another way in which some authors try to find a way to recognise the gains for a pension system coming from children is to determine the "value"

according to the actually made contributions. From the perspective of authors of the CPAYG concept in a hypothetical society in which the costs of upbringing and education of their children would be borne exclusively by parents, only parents with children would have pension entitlements proportionate to the number of children - the more children they raised the higher pension entitlements they would have. Within the CPAYG concept, the childless persons are assigned the role of old-age security through private savings into which free resources available by virtue of childlessness and the absence of costs associated with raising children are directed.

3.2   Relation of the social security contributions amount to the number of children

Another suggested way to make provision for the child care in a pension system is the relation of contributions to the number of children. This measure can be implemented separately or may be implemented in addition to CPAYG, e.g. as it is suggested in their studies by Sinn (2013) or Hyzl et al. (2004). The institution of reduced old-age pension contribution rate for an employee was applied in the Slovakia as the only European country in the period from 1 January 2004 to 31 December 2005. Employee could reduce the contribution rate by 0.5% for each child. Given the fact that the institution was introduced against the will of the government and was ill-conceived and unfair, it was cancelled after two years and replaced by increasing the tax bonus per child. The option of the relation of the contribution rate to the number of children, both upwards and downwards, also appeared in 2005 in the reform proposals of the Socialist Party in Portugal, when the then Prime Minister Socrates proposed to reduce old-age pension scheme contributions for families with more than two children and increase the contributions for the childless parents or parents with only one child, arguing that "after all the wealth created by future generations will guarantee the income of future retired persons" (Linhas, 2006). Given the strong criticism of the proposal from liberal politicians criticising the measure for malfunction, as well as from left-wing politicians seeing the measure as an advantage for large families with high income, and with respect to a negative opinion of social partners, the measure has, however, never been implemented.

3.3   Contributions assignment

The last theoretical options of alternative consideration of child care periods in the pension system contained in the outputs of the OKPDR is the assignment of old-age pension scheme contributions in favour of parents drawing pension benefits. In the past, a similar measure was proposed in the Slovakia where a group of deputies submitted in 2008 a proposal to improve the unfavourable social situation of retiree through tax assignment. The deputies suggested that the taxpayer should assign a portion of taxes paid (in a lump sum of SKK 1,750 per year) to his/her parent drawing an old-age or disability pension and justified their proposal as follows: "The proposal is an expression of inter-generational solidarity between the employed children and their parents. It partially eliminates the discrimination of especially parents in multiple-children families whose standard of living was lower even during the care for dependent children and is usually lower at the time of drawing pensions benefits. With the existence of PAYG pension pillar, employed children are often solidary with other people than their own parents." (PSPČR, 2009). With regard to the opinion of the Ministry of Finance which, however, fundamentally disagreed to the present proposal, the assignation has not been established in the Slovakia.

4   Micro and Macro-economic Analysis of Proposed Measures

The influence of possible reform measures on individual income situation of hypothetical individuals can be examined through microeconomic models within which I am testing the "Slovak" variant of decreasing the contributions depending on the number of children, the "Portuguese" variant regulating the contribution rates upwards and downwards, or the option of tax assignment for the persons with income at the average wage level.

Table 1: Adjustment of contribution rates by 0.5% for each child, contributions assignment

Decrease/increase in the contribution rates			Employee's monthly savings in CZK		Assigned portion of the contributions in CZK	
Number of children	Employee's contribution rate		Slovak variant	Portuguese variant	1%	2%
	in %, SK	in %, PTG				
0	6.5	7.5	0	-272	0	0
1	6.0	7.0	136	-136	272	544
2	5.5	6.5	272	0	544	1,088
3	5.0	6.0	408	136	816	1,632
4	4.5	5.5	544	272	1,088	2,176
5	4.0	5.0	680	408	1,360	2,720
6	3.5	4.5	816	544	1,632	3,264

Source: Own calculations based on the legislation in force in 2014

The calculations performed show that an individual with income at the average wage level would be affected in almost no manner whatsoever by any measure reducing the contribution rate by 0.5 percentage points (Slovak variant), since as compared to the expenses of a family with 2 children, which has been the most frequent model of families in the Czech Republic in recent decades and still prevails in declared preferences of future parents this advantage only amounts to 2.2% of the costs associated with the presence of two children in a family (CZK 12,552 according to the Czech Statistical Office, 2003). The distribution of benefits provided in the entire spectrum of contributors is interesting. Almost 80% of payers would not be entitled to any or only minimum (136 CZK) support and only 18% of payers would still be entitled to a negligible support in the amount of CZK 272. In terms of the number of households with children, 90% of households with children would only be entitled to a negligible advantage, 45% of households with one child would be entitled to a discount of CZK 136 and 45% of households with a child in the family (two-child) would be entitled to a discount of CZK 272. Even when considering the Portuguese variant, any change in a contribution rate at an individual level has not significant impact on the income of hypothetical individual. Considering the assumption that the contribution rate adjustment would relate to both parents, the effect on the total family income would double. Nevertheless, the total family income when considering a reduction in contribution rate with a third child of 0.5% will not increase, not even by 9% of the additional costs associated with raising the third child. A penalty for childlessness would burden the family budget by 2% of the total household income. Upon assigning contributions by children directly to their parents, an average old-age pension would increase by 2.5% in case of assigning 1% of the assessment base for each raised child who would pay contributions at the given time.

Table 2: Macroeconomic effects of changes in the contribution rates depending on the number of children

Number of children considered	Contribution rate in %			Hypothetical annual contributions collected in millions of CZK					
	Contribution rate -0.5 in SK	Contribution rate +- 0.5 in PTG	Current state maintained	Contribution rate -0.5 in SK	Current state maintained	Number of contributors	Contribution rate +- 0.5 in PTG	Current state maintained	Number of contributors
0	28.0	28.0	28.0	234,131	234,131	2,561,837	146,226	141,184	1,544,813
1	27.5	27.0	28.0	66,307	67,512	738,709	104,524	102,691	1,123,628
2	27.0	26.0	28.0	66,720	69,191	757,081	117,402	117,402	1,284,600
3	26.5	25.0	28.0	11,708	12,371	135,358	20,247	20,615	225,563
4	26.0	24.0	28.0	1,714	1,846	20,194	2,793	2,896	31,690
5	25.5	23.0	28.0	363	398	4,358	560	591	6,472
6	25.0	22.0	28.0	154	172	1,886	226	243	2,658
Total				381,096	385,622	4,219,423	391,977	385,622	4,219,423

Source: Data source: Own calculations based on the legislation in force in 2014

The calculation shows that the Slovak variant (0.5% reduction for one child) would generate an annual income shortfall of the old-age pension scheme of CZK 4.6 billion as a result of uncollected contributions. The results of the Portuguese variant suggest that especially because of the great number of childless insured persons and insured persons with one child who would be penalised by a higher contribution rate - in fact 63% of all contributors in a given year, this concept would generate pension scheme surpluses in the amount of CZK 6.4 billion. Introducing the option to assign a portion of pension contributions would bring about negative macroeconomic impacts on the balance of the pension account. When assigning 1% of the assessment base, a income shortfall of contributions would amount to CZK 11 billion; when assigning 2%, the shortfall would amount to CZK 22 billion, which constitutes 0.6% of the pension account income in 2013.

5   Critical Analysis of Theoretical Concepts

The measures adopted to reform the PAYG pension systems globally have brought, among others, the strengthening of ties of contributions paid by the insured persons to the old-age pension system and the resulting pension benefits; no country has changed over to the concept of CPAYG and no current legislation applicable to the old-age pension schemes in EU Member States includes the concepts of consideration of child care period in a pension system as discussed by the Expert Committee on Pension Reform. Although the current problems of PAYG pension systems, connected with declining fertility rates, may give the impression of dependence of those systems on the relations between various generations, this fact is not a reason for the origination of new concepts of old-age pension systems reflecting the number of raised children. As stated by Vostatek (2015), the concept of child pension does not fit into any of the basic social models. Other reasons for rejection are as follows.

The concept of child as "a contribution to the system", i.e. as an investment, is not only ethically problematic. Economically, we face the problem of how to evaluate investment costs and economic profitability of children.

One of variants is to reduce investment costs to the costs of education, which does not help much in this situation. Expenses on education are not necessarily indicative of possibility to utilise education in the labour market, where a wage for the employees then forms the base for the payment of contributions.

Another question of discussed concepts unanswered by the current theory is: What would pension entitlements of those whose children do not pay contributions be? Same as the entitlements of the childless persons? What if a child is disabled and draws benefits from the pension system? However, the essence is that there is no causal link between the raised child (as an alleged contribution to the system) and the future contribution payer (as a real contributor to the system). The provision of such unity is neither practically feasible nor desirable. Another unclarified element of the concepts of CPAYG and assignation of contributions is the openness of the Czech Republic and the associated movement of labour force within the EU. As no one can guarantee that any child would one day become a contributions payer, no one can guarantee that he/she would be a contribution payer in the Czech Republic. A foreign country where a person raised in the Czech Republic would work and, therefore, pay contributions, would thus surely not allow the option to assign a portion of the contributions in favour of beneficiaries under the Czech law. Free movement of labour force is one of the pillars of the EU common market and this element of old-age pension scheme could constitute indirect barriers to the free movement of labour force. On the other hand, the question arises whether the incoming immigrants in the Czech Republic would be entitled to the assignment of contributions in favour of their parents who do not live and have never lived and have never paid contributions in the territory of the Czech Republic.

A controversial (and mistaken from the perspective of the current theory) underlying assumption of those concepts is that the PAYG old-age pension system is not de facto insurance but simply a redistribution of the existing income of economically active generations to the economically inactive generation. Economically inactive retired persons then acquire pension entitlements to a percentage of (wage) income of economically active persons. These assumptions of the concept are however mistaken, a contribution to the old-age pension system made in the form of social security is in fact a contribution to be paid by the participants in order to secure themselves financially in the event of invalidity or old age or their close persons in the event of their own death. In the Czech Republic, the basic old-age security is partly realised through social insurance. The entitlement of the insured person to social security benefits is derived from the payment of contributions and the length of employment. This concept of old-age pension system totally contradicts the historical facts known about its origin and development. The current form of old-age pension system in the Czech Republic is not a "continuation of traditional family solidarity of the children with parents at an all-society level". As regards the social function, this system has replaced a traditional family solidarity, but the principle of it is, however, quite different.

Another major problem of these proposals is that they do not cover all persons in the population since not all of them participate in the old-age pension system. What mechanism would ensure that parents who do not participate in the old-age pension system draw benefits associated with the fact that their children participate in the pension system? This problem is more distinct in the Czech Republic than e.g. in Germany where there are different schemes for the old-age security for officials and self-employed persons.

The concept of the relation of the amount of contributions to the number of children includes the relative unfairness consisting in a different amount of contributions depending on the income level. As the expenses on the raising children are more or less stable and independent of family income, but a decrease in the contributions is directly dependent on the amount of income, the mentioned benefit in the form of option to reduce the contributions provides different benefits for "equal" upbringing. The concept of introducing a variable contribution rate according to the number of children as proposed in Portugal would mean in the Czech Republic a further increase in the already high burden on work as a result of contribution rate for a significant part of the population.

The method of financing a portion of pension entitlements through the assignment of contributions or taxes can be described rather than support for families with children as a concept of "acknowledgement" of good upbringing. Within the concept of the assignment of contributions or taxes, the funds are in fact assigned to the parents drawing the pension only by those children who are contributions or income tax payers. Another controversial issue of the assignment of contributions as it is proposed is the payout of funds assigned by children to the parents. The discussed proposals envisage the final amount of the pension from the basic system as a reduced portion of the currently pension and a contribution from the children. However, since there is no automatic matching (unity) between the concept of raised children and a contribution payer, the determination of the amount of any assigned contributions is unrealistic. These facts pose the question of how an individual pension scheme should be constructed within the concept of assignment of contributions and with the relation of the amount of pension of the parent to the actually paid contributions by his/her children? How to consider the matter so uncertain as the amount (or even the very existence) of pension scheme contributions of his/her children? Individual pension schemes of individuals cannot be drawn up based on imaginary contributions of its children to the pension system in the future. A situation where pension entitlements are uncertain until the last moment is unacceptable in a mandatory pension system. It is also unacceptable that the amount of pension changes over time depending on the number of economically active descendants and their activity in the labour market.

6   Conclusions

Although the concept of CPAYG have been frequently mentioned in some variants in the last two decades, almost always it is only a theoretical proposal without an economic calculation or at least educated guesses.

The idea of introducing variable contribution rate of the pension scheme according to the number of raised or conceived children is not currently applied in any country of the world. Model calculations of decreasing the pension contribution rate have shown that reducing the burden on households with an average income would be marginal. The variant of introducing a variable contribution rate according to the number of children in the Czech Republic would mean a further increase in the already high burden on work as a result of contributions for a significant part of the population.

In case of assignment, it is rather than supporting families with children supporting retired persons. The effect of this measure for the parents would occur only at the time of drawing pension benefits, that means actually long after the time of real upbringing. Supporting parents, however, should be directed to the period of actual upbringing, when it is objectively needed.

On the basis of the amount of the submitted evaluation of alternative concepts of making provision for upbringing children in social security, the author recommends that the Czech Republic should avoid those solutions in the further reform of the pension system. A significant risk for the use of such concept is problematic theoretical grounds associated with the elusive quantification of its effectiveness. A not negligible risk of these alternative forms of making provision for the child care in an old-age pension system is practically zero or negative experience with its application in foreign old-age pension schemes.

Acknowledgement

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Effect of Corruption on Tax Revenue in the OECD and Latin America Countries

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Abstract. The paper deals with the problem of corruption and its consequences for tax revenue. There are several reasons to believe that the level of corruption is positively linked to tax evasion. We analyzed the effects of corruption in OECD countries and Latin America countries. Annual data for the period 1998-2013 and 46 countries were used. The fixed affects as well as random effects models were applied in order to test assumed causal relationships. We find strong support for negative effect of corruption on total tax revenue. Moreover, turning to the structure of tax revenue, the results suggest that the negative effect is more significant for taxes on goods and services rather than in the case of income taxes.
Keywords: corruption, tax revenue, tax evasion, income taxes, taxes on goods and services
JEL Classification: H20, H26, D73

1 Introduction

There are several negative effects of corruption mentioned in the economic literature so far. The negative effect on the foreign direct investment (e.g. Habib and Zurawicki, 2002), economic growth (e.g. Mauro, 1995) and poverty (e.g. Gupta, Davoodi and Alonso-Terme, 2002) are most frequently reported there. In this paper we analyse the effect of corruption on tax revenue. Firstly, we assume that there is potential connection between the level of corruption and the size of tax evasion in the country, thus corruption could cause less tax revenue. The corruption in the case of tax administration could lead to less effective system of tax fraud detection. The probability of detection is probably one of the most important determinants of tax evasion. Relatively high share of tax payers could rather choose to pay the bribe to tax administrators than pay the taxes, especially when the bribe is significantly lower than tax and probability of detection is rather low. Furthermore, several authors argue that individuals choose to enter the shadow economy in order to avoid corrupt officials (e.g. Friedman, et al., 2000, Schleifer, 1997). Moreover, some taxpayers could be deterred from paying taxes when they recognize that the level of corruption is high in the country. The trust in institutions seems to be important when paying the taxes. Furthermore, the high level of corruption in society is usually linked with overall lower level of compliance with laws. The corruption can also act indirectly, for example through its potential impact on economic growth. Besides the analysis of corruption's impact on overall tax revenue, we also examined the potential differences in the effects on income taxes and taxes on goods and services. The panel data fixed-effect and random-effects models have been applied in the analysis using the data for OECD as well as Latin America countries.

2 Literature review

The most popular and simplest definition of corruption is that corruption is the abuse of public power for private benefit (Tanzi, 1998). Corruption is often seen in relation to the informal sector or shadow economy. Orviska (2005) stated that corruption is one of the factors determining the size of shadow economy. Moreover, Orviska, Caplanova, and Hudson (2014) have also recently reported that lower levels of corruption are associated with higher degrees of satisfaction with democracy. Lacko (2000) argues that the size of the shadow economy is positively linked to weaker public services, proxied by the level of corruption and the absence of the rule of law. Hudson, Williams, Orviska and Nadin (2009) argue that corruption and the desire to avoid corrupt governments officials are the key drivers of businesses moving into the informal economy. Kubátová and Říhová (2009) also reported that in a corrupt environment the revenues from corporate tax are significantly lower. As stated by the authors, this is mostly due to a less effective state administration and court system. The lower payment moral of tax payers can be accompanying factors. These statements have been supported by the results of regression analysis where the level of corruption has been proved to be statistically significant factor affecting corporate tax revenues.

Thus, we can say that the problems of the shadow economy and corruption are closely linked together and a reduction in corruption could have positive effects on reducing the shadow economy and vice versa. Friedman et al. (2000) analyse the relationship between the level of corruption and the size of the shadow economy from a similar perspective. They argue that entrepreneurs choose to enter the shadow economy to "dodge the grabbing hand of corruption". As a result the governments tend to have less revenue and become smaller. This view is also

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supported by the analysis done by Schleifer (1997) who also linked firms going underground to the desire to avoid corrupt officials. Friedman et al. (2000) also found that stronger legal environments have a positive impact on tax revenues. The negative effect of corruption on tax revenues have been also empirically supported by Tanzi and Davoodi (1997). Similarly, Imam and Jacobs (2014) consider corruption as another institutional variable with a negative effect on tax revenue in Middle East countries. The role of trust between tax authorities and tax payer seems to be especially important for the reduction of tax evasion in the country. Feld and Frey (2002) assume that higher trust in tax authorities could induce higher tax revenue. It is likely, that this kind of trust could be significantly distorted by higher levels of corruption. Bird, Martinez-Vazquez and Torgler (2012) argue that a more legitimate and responsible state is an essential factor for a more adequate level of tax effort in developing countries as well as in high income countries. They extend the conventional model of tax effort and show that not only are supply factors important, but also demand factors such as corruption and voice accountability.

There are also several studies that found the effect of corruption on the tax mix or structure of tax revenue. Tanzi and Davoodi (2000) find out that a one point increase in corruption reduces the ratio of direct taxes to GDP by more than the ratio of indirect taxes to GDP. Similarly, Abed and Gupta (2002) argue that there is a negative effect of corruption on both direct and indirect taxes. However, the effect on direct taxes is more intensive. On the other hand Thornton (2008) based on the regression results from a panel of 53 Middle East and African economies finds that the effect of corruption on tax collections is besides social security especially evident in the case of taxes on domestic goods and services and international trade transactions. He argues that the efforts to combat corruption in tax collections should focus on indirect taxes.

According to Mahdavi (2008) corruption in tax assessment and collection tends to be a more serious problem when the tax base is more difficult to observe or in the case when taxpayers can negotiate tax payments with tax administrators. The author also emphasises the potential positive effect of reducing the level of corruption on international trade. His results also support the assumption that reducing the level of corruption, together with other factors such as increasing government legitimacy by promoting political freedoms, has, on the one hand, a positive effect on tax revenue, but could also significantly change the tax mix on the other hand.

3   Data and methodology

To analyze the relationship between corruption and tax revenue we decide to use panel data regression analysis, thus all variables include a cross-sectional component as well as a time-series component. The variables used in the models are summarized in the Table 1. The panel data used in the models contains observations on corruption, tax revenue and GDP per capita for the period between the years 1998 and 2013.

**Table 1 Variables used in the models**

Variable	Description	Source
Dependent variables:		
Total tax revenue (TTR)	Total tax revenue as a share of GDP	http://stats.oecd.org/
Tax revenue from taxation of income (TR_income)	Tax revenue from taxes on income, profits and capital gains (taxes coded as 1000 according to the OECD classification) as a share GDP	http://stats.oecd.org/
Tax revenue from taxation of goods (TR_goods)	Tax revenue from taxes on goods and services (taxes coded as 5000 according to the OECD classification) as a share of GDP	http://stats.oecd.org/
Independent variables:		
Corruption	The level of corruption using the data from Corruption perception index (CPI) calculated by Transparency international. We transform this indicator thus: Corruption = (100 – CPI) (Higher value means higher level of corruption)	Transparency international
GDP per capita	GDP per capita, PPP (current international dollars)	http://data.worldbank.org/

Source: Authors.

These 46 OECD and Latin America countries are included in the sample: Australia, Austria, Belgium, Bolivia, Brazil, Canada, Colombia, Costa Rica, Czech Republic, Denmark, Ecuador, El Salvador, Estonia, Finland, France, Germany, Greece, Guatemala, Hungary, Chile, Iceland, Ireland, Israel, Italy, Japan, Luxembourg, Korea, Mexico, Netherlands, New Zealand, Nicaragua, Norway, Paraguay, Peru, Poland Portugal, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom, Uruguay, USA, Venezuela. The sample of countries has been chosen according to the availability and comparability of data. The missing data about tax revenues for the year 2013 has been interpolated by a linear trend in the case of 4 countries.

The indicator reflecting the corruption has been calculated using the Corruption perception index by Transparency international. A higher value of this index means a lower level of corruption. In order to get more straightforward interpretations we decided to transform this indicator. Thus, the effect of corruption on tax revenue is directly reflected in our models and a negative effect of corruption is represented by a negative sign of the coefficients. GDP per capita has been used as a control variable. We assume that tax revenue is positively affected by GDP per capita and this could be particularly true for revenues from income taxes.

Figure 1: The development of corruption variable and total tax revenue/GDP from 1998 to 2013
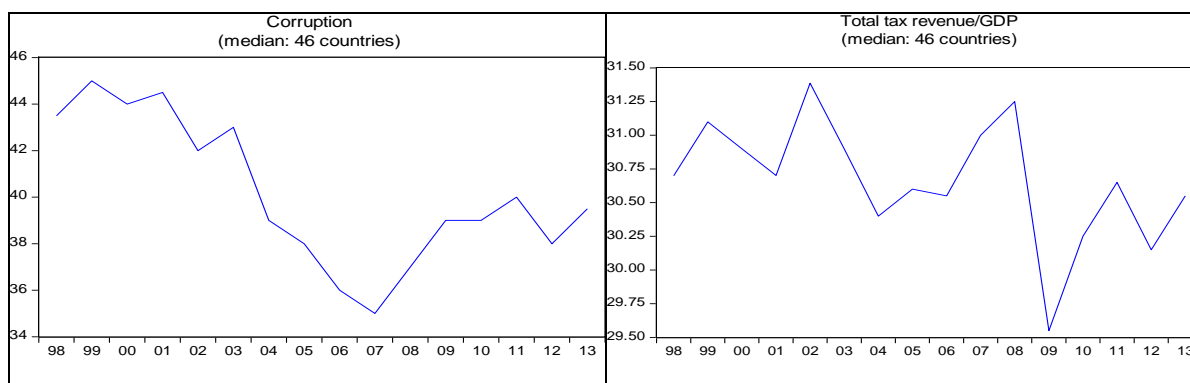
Source: Authors calculation based on the data from Transparency international and OECD.

We applied fixed effects as well as random effects models, but the results of Hausman tests are stated in the last rows of tables 3, 4 and 5. According to this test, mostly the fixed-effects models seem to be the more appropriate choice. We also used pooled data models to compare the results. All variables were tested for weak stationarity using a set of panel unit-root test (Levin-Lin-Chu; Breitung; Im, Pesaran, Shin; Fisher ADF and PP tests).

We perform the tests with the intercept only as well as with intercept and trend. The linear trend is mostly significant, thus the unit-root tests with intercept and trend have been mostly considered as the decisive ones. According to the majority of panel unit root tests results all variables except GDP per capita seem to be stationary at level. Despite this fact, the results are mostly somewhat mixed, thus we decide to use also the first difference of variables in separate models, to completely rule out the potential problem of spurious regression.

4 Results

We used various types of regression models in order to ensure the robustness of our results. Firstly, we have performed the panel regression analysis with total tax revenue (on GDP) as the dependent variable. The results of different models are summarized in Table 2. We apply the pooled model as well as fixed effects models and one random effects model. According to the results of the Hausman test, the fixed effects models seem to be more accurate than the regression with random effects in this case. As can be seen, the negative effect of corruption on total tax revenue on GDP is significant in all models used. In the cases, when we used corruption and total tax revenue variables at their levels, the models are statistically highly significant with R^2's close to 1. We also need to incorporate the autoregressive parameter AR(1) in these models to deal with the potential problem of autocorrelation in data. The observed effect of corruption on total tax revenue is negative and statistically highly significant in the pooled model as well as in the model with cross-section fixed effects. Despite the results of unit-root tests that mostly indicate no unit-roots in our data, we decide to use also differenced variables. This is done in order to avoid potential spurious regression. These models again supported our previous results, which mean that corruption has a negative effect on total tax revenue. These coefficients are significant at the 5% level of significance. As expected, the power of these models is much weaker, this time according to R^2, although of course this tends to happen when we move from levels to first difference models. The best model according to Akaike criterion is the one with period fixed-effects.

Table 2: The results of regression models using total tax revenue on GDP as dependent variable

Dependent variable:	(1) Total tax revenue	(2) Total tax revenue	(3) ΔTotal tax revenue	(4) ΔTotal tax revenue	(5) ΔTotal tax revenue
Fixed effects (FE) / Random effects (RE):	Pooled Model	Cross-section FE	Cross-section FE	Cross-section RE	Period FE
C (cross-section/period average)	34.83 (16.86)	31.59*** (48.17)	0.04 (0.03)	0.05 (0.85)	0.20*** (3.22)
Corruption	-0.04*** (-2.66)	-0.05*** (-3.37)			
ΔCorruption			-0.04** (-2.51)	-0.05*** (-3.11)	-0.03** (-2.36)
Δ(Log(GDP per capita))	0.28 (0.32)	0.36 (0.39)	1.65 (1.54)	1.31 (1.27)	-2.39** (-1.97)
AR(1)	0.98*** (219.7)	0.78*** (30.85)			
Observations	644	644	690	690	690
R^2	0.99	0.99	0.08	0.02	0.15
F–statistic	1,8513.5	1,253.6	1.23	5.93	7.14
Durbin-Watson stat.	1.92	1.85	2.03	1.9	1.99
Akaike crit.	2.93	2.92	3.00		2.84
Hausman test				7.92**	

Source: Data source.
Notes: Regressions are estimated using panel data over the period 1998-2013 across 46 OECD and Latin America countries, (.) denotes t statistics and */**/*** means significance at the 10% / 5% / 1% levels.

Further, we analyzed separately the potential impact of corruption on two different types of tax revenues. On the one hand, we used the tax revenue from taxes on income, profit and capital gains on GDP as the dependent variable in the models shown in Table 3. On the other hand, the tax revenue from taxes on goods and services on GDP has been used as the dependent variable in the other models summarized in Table 4. According to the results of the Hausman test the fixed effects model seems to be more appropriate in the case of income taxes and the random effects model is more suitable for the models with taxes on goods and services as the dependent variable. We are again using the variables at levels as well as at first difference to compare the results.

Table 3: The results of regression models using the tax revenue from taxes on income

Dependent variable:	(1) Tax_revenue_ income	(2) ΔTax_revenue_ income	(3) ΔTax_revenue_ income	(4) ΔTax_Revenue_ income
Fixed effects (FE) / Random effects (RE) :	Cross-section FE	Cross-section FE	Period FE	Cross-section RE
C	10.54*** (24.72)	-0.19*** (-4.84)	-0.07 (-1.58)	-0.17*** (-4.38)
Corruption	-0.02** (-2.25)			
ΔCorruption		-0.01 (-1.51)	-0.01 (-0.6)	-0.01 (-1.42)
Δ(Log(GDP per capita))	2.75*** (4.33)	5.2*** (7.26)	2.14*** (2.64)	4.66*** (6.78)
AR(1)	0.72*** (27.72)			
Observations	690	690	690	690
R–squared	0.99	0.12	0.18	0.07
F–statistic	921.4	1.84	8.96	25.05
Durbin-Watson stat.	1.62	1.86	1.82	1.76
Akaike crit.	2.1	2.18	2.03	
Hausman test				7.28**

Source: Authors.
Notes: Regressions are estimated using panel data over the period 1998-2013 across 46 OECD and Latin America countries, (.) denotes t statistics and */**/*** means significance at the 10% / 5% / 1% levels.

As it can be seen our results suggest that there is a difference between these two types of tax revenue. The effect of corruption is insignificant in most of the models with income tax revenue. It is significant at the 5% level only in the first model. However, this model has a very low value of Durbin-Watson statistics and thus we can assume that there could be a problem with serial correlation or even more likely there is a spurious regression in this case. The positive effect of GDP per capita on this type of tax revenues is highly significant. This is in line with theoretical assumptions about income tax revenues.

Table 4: The results of regression models using the tax revenue from taxes on goods and services

Dependent variable:	(1) Tax_Revenue_ goods	(2) ΔTax_Revenue_ goods	(3) ΔTax_Revenue_ goods	(4) ΔTax_Revenue_ goods
Fixed effects (FE) / Random effects (RE) :	Cross-section FE	Cross-section FE	Period FE	Cross-section RE
C (cross-section or period average)	0.04 (0.03)	0.06* (1.91)	0.12*** (3.31)	0.06* (1.92)
Corruption	-0.02*** (-2.63)			
ΔCorruption		-0.02* (-1.91)	-0.02** (-2.18)	-0.02** (-2.44)
Δ(Log(GDP per capita))	0.46 (0.87)	-0.96 (-1.58)	-2.32*** (-3.3)	-0.94 (-1.61)
AR(1)	0.75*** (27.71)			
Observations	644	690	690	690
R^2	0.96	0.07	0.09	0.01
F–statistic	290.13	1.07	3.95	4.05
Durbin-Watson stat.	2.03	2.18	2.06	1.90
Akaike crit.	1.92	1.85	1.75	
Hausman test				3.91

Source: Authors.

Notes: Regressions are estimated using panel data over the period 1998-2013 across 46 OECD and Latin America countries, (.) denotes t statistics and */**/*** means significance at the 10% / 5% / 1% levels.

Interestingly, based on our results, the effect of corruption on indirect taxes is more evident. The negative effect of corruption on tax revenue from goods and services is statistically significant at least at the 5% level in three out of four models and it is also significant at the 10% level in one model. The effect of GDP per capita is negative in three models. However, it appears to be significant only when we apply period fixed effects.

5   Conclusions

Based on the theoretical assumption there are several ways how the level of corruption in the country could negatively affect the tax revenue. Corruption could have a negative effect on tax administration and tax audits as well as negatively affect the credibility of the institutions. Moreover, tax payers can be motivated to enter the shadow economy and not to pay taxes when the level of corruption in the country is high. Based on our results, we find relatively strong empirical support for this effect. Corruption seems to have a significantly negative effect on total tax revenue. Interestingly, in contradiction to the results of several other studies (such as Tanzi, Davoodi, 2000 or Abed, Gupta, 2002) we find out that the effect of corruption is more significant in the case of indirect taxes rather than direct taxes. This is mostly in line with the results of Thornton (2008). In fact, especially VAT tax fraud is one of the most challenging problems in many countries including Slovakia.

These results may have implications for governments. Decreasing corruption in the public sector should be one of the key steps towards raising tax revenue. The fiscal corruption in tax administration is very likely the most relevant issue in this case. The governments should be focused more on corruption in relation to indirect taxes, because the effect of corruption seems to be more evident there.

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Indebtedness and Corporate Finance Structure

Vratislav Izák[*]

Abstract. We analyse using both the descriptive statistics and panel data analysis the indebtedness and corporate finance structure in a sector of non-financial corporations in a sample of EU Member States in the pre/crisis period (1995-2007) and in the crisis period (2008-2012) looking at the differences between these two time spans. We use the flow-of-funds approach utilizing the explanatory power of balance sheet items. We have confirmed the heavier reliance on equity than debt financing in the pre-crisis period. In the crisis period the proportion of debt financing has increased, hence not only public but also private indebtedness matters. In panel analysis we have found a significant impact of both debt and profit share on investment. Last but not least we have discovered a positive impact of trade credit as an alternative source of financing on the GDP created in the sector.

Keywords: non-/financial corporations, balance sheets, indebtedness, panel analysis.

JEL Classification: D22, G11, H32

1   Introduction

The financial and economic crisis in full-fledged market economies has put considerable strains not only on public finances but also on other sectors, see Blanchard et.all.(2010), Cecchetti et.all. (2011), World Economic Outlook (2014), Reinhart-Rogoff (2010) and many other studies. This in turn has been contributing to underlying financial instability in the whole economy.

We carefully distinguish in this paper between the pre-crisis period (1995-2007) and the crisis-period (2008-2012) exploiting the underlying statistical data for the old EU Member States (12) and their postsocialist peers (6 countries). As concerns the postsocialist countries, due to the lack of some data, they are mentioned only marginally. The country samples in the statistical analysis are dependent on the disposable time series. In this way we look at the relevance of financing and credit conditions on investment and economic activity in the mentioned time spans.

We attempt to shed lights on several selected topics which we judge to be important not only for the development in the sector of non-financial corporations but for the future development in the whole economy of the EU Member States. The accent is on the development of leverage measured as the debt-to-GDP ratio and debt-to-financial assets ratio, the reliance on equity and debt financing, on the impact of debt on investment and on the role of credit as a tool of financing working capital.

The paper is divided into five parts. After the introduction we begin in the second part with the description of the disposable time series in the balance sheets of the relevant countries. The third part enlightens the development of leverage and the role of both equity and debt financing in the pre-crisis and crisis periods. In the fourth part we utilize panel regressions showing the relations between debt and investment on the one side and between trade credit and GDP created in the sector on the other side using both static and dynamic models. Final conclusions represent the last part of the paper.

2   Data

We have gathered time series of 18 EU Member States dividing the data for 12 old and 6 postsocialist countries respecting the still prevailing differences between these two samples. The initial year is 1995 in spite of the fact that not for all countries we have all required data. The ending year is 2012 and in some extraordinary cases also the year 2013.

The source of data is represented by detailed national accounts published regularly by OECD-see Lequiller-Blades (2006) for the profound methodological explanation. The financial accounts and especially the balance sheet accounts have been devoted in the past less attention compared to other national accounts data and have been left to statisticians and national accountants. The financial accounts show how the borrowing sectors obtain the financial resources they need and how the lender sectors allocate their surpluses.

In detailed national accounts we have at the disposal: a) Financial balance sheets-consolidated and non-consolidated and b) Financial accounts-consolidated and non-consolidated. The former record the stocks of financial assets and liabilities at the end of the accounting period and the latter display, by type of financial instruments, the financial transactions between institutional sectors. Both are reported at current prices in millions of national currencies and in millions of Euros for the members of the Euro zone. We have preferred the non-

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consolidated data because in the centre of our attention is not the position of the sector per se but the individual firms aggregated in the sector.

In what follows, and especially in the panel analysis, we use these cross identifiers for the countries in our sample: Austria (AT), Belgium (BE), Czech Republic (CZ), Germany (DE), Denmark (DK), Estonia (EE), Greece (EL), Spain (ES), Finland (FI), France (FR), Hungary (HU), Italy (IT), The Netherlands (NL), Poland (PL), Portugal (PT), Slovakia (SK), Slovenia (SL), Sweden (SE). The distinction between the old and post-socialist countries is given due to the different degrees of homogeneity which is greater inside both sub-groups than between them. This hypothesis will be of course verified during the empirical analysis.

3   Leverage, debt and equity

3.1   Leverage

From the international sources, see e.g. Blanchard et.all. (2010), Cuerpo et.all. (2013), Corporate Finance and Economic Activity in the Euro Area (2013), Bouis et.all. (2013), Liu-/Rosenberg (2013), we know that a high leverage ratio is risky because in the event of a drop in the value of its assets the borrower might become insolvent. From the American experiences we know that when the value of their assets fell (the effect of the fall in house prices) some banks with high leverage went bust and obviously stopped lending. Also in the sector of non-financial corporations the leverage and the sometime mentioned deleveraging-Cuerpo et.all. (2013) and Corporate Finance (2013) have been scrutinized.

In this paper we compare debt with the GDP (gross value added created in the sector) in order to evaluate to what extent the NFCs is able to repay its debt when it falls due. Debt equals loans plus securities other than shares plus insurance technical reserves. Leverage is defined as the ratio of debt to GDP and as the ratio of debt to total financial assets. Financial assets are composed from currency and deposits, securities other than shares, loans, shares and other equity, insurance technical reserves and other accounts receivable. We can compare debt with financial assets to assess corporate indebtedness because these assets can be sold to generate funding liquidity or they can serve as collateral. The Table 1 displays the results of these ratios in both the pre-crisis and crisis periods.

Table 1: Leverage ratios (in percent)

Country	Debt/ GDP Pre-crisis	Crisis	Debt/FA Pre-crisis	Crisis
AT	140.7	190.6	113.1	70.7
BE	227.1	320.6	51.6	41.7
DE	119.0	117.2	56.0	55.1
DK	146.6	198.3	60.6	57.3
EL	174.5	210.5	80.5	167.8
ES	184.2	251.2	48.7	70.1
FI	150.7	204.8	65.7	68.6
FR	156.4	195.4	39.1	42.7
IT	143.1	193.5	70.8	89.6
NL	154.1	147.7	69.3	46.6
PT	238.2	341.5	58.2	66.8
SE	-	-	54.9	54.9
CZ	95.5	79.3	45.5	37.8
EE	-	-	68.6	75.4
HU	139.7	237.9	45.3	41.5
PL	79.6	92.7	45.2	55.5
SK	100.3	100.9	45.0	54.7
SL	118.4	186.2	51.8	75.4

Source: Own calculations.

Note: For Debt/GDP ratio for Greece the pre-crisis includes only the average from 2006 and 2007. For Spain and Hungary since 1999 and for Poland since 2002 till 2007. For Debt/Financial assets ratio for Slovenia the pre-crisis starts since 2001. The crisis period for Belgium, Denmark, Portugal and Sweden includes 2013.

Table 1 reveals the following: For debt/GDP ratio a) Great differences across countries (high ratios in Portugal and Belgium), b) Increase in the crisis period in old EU (9 from12). Exceptions are The Netherlands and Germany, c) In postsocialist countries sharp increase in Hungary and Slovenia and decline in The Czech Republic. For Debt/FA is remarkable a) Very steep increase in Greece and Spain, b) A more profound look analyzing year-to-year changes shows sudden increase in 2008 in 16 from 18 countries and a decrease or stagnation in the following years marking beginning deleveraging process.

3.2   Debt versus equity

Non-financial corporations generally need, besides internal funds, also external financing sources. Their decision making process on external financing-Johal-Vickerstaff (2012), Corporate Finance (2013), Bouis et.all. (2013), may be influenced by the availability of funds, as well as by their intentions to reach a certain proportion between debt and equity. It is well known that the debt has a lower cost of capital than the equity, therefore the debt serves as a lever to increase capital returns. The way firms choose their financial proportion between debt and equity defines financial structure. The information on the ratios of both debt to total liabilities and shares and equity to total liabilities is given in the Table 2.

Table 2: Debt and shares and equity to total liabilities in percent

	Debt/Li		Shares and Equity/Li	
country	pre-crisis	crisis	pre-crisis	crisis
AT	51.6	45.1	44.9	49.4
BE	36.6	34.7	59.9	64.2
DE	38.4	38.4	42.9	41.8
DK	37.7	39.4	53.0	55.0
EL	38.1	60.7	59.9	35.1
ES	29.1	41.4	50.0	43.0
FI	31.1	41.2	58.5	47.9
FR	27.6	29.4	57.9	56.4
IT	34.6	39.8	46.0	43.1
NL	37.3	37.5	49.9	51.3
PT	33.1	39.4	48.6	45.1
SE	34.9	35.3	53.4	57.2

Source: Own computations.

Note: For BE, DK, EL, PT,SE the crisis period includes the year 2013.

Worth of mentioning is the higher reliance on equity than debt financing in the pre-crisis period with the exception of Austria. In the crisis period the proportion of debt financing has increased in all old EU countries with the exceptions of Austria and Belgium. The great jump has been observed in the trouble making countries Greece (where the ratio of equity to total liabilities has significantly decreased) and Spain. In the postsocialist countries (not in the table) debt to total liabilities has been increasing in 5 countries excepting The Czech Republic.

4   Panel analysis

4.1   Investment, debt and profit share

It is well known that debt can improve economic welfare and spur investment and economic growth if it remains at moderate levels but when high it hampers both investment and growth, see Cecchetti etal. (2011), Checcherita-Rother (2010), Izak (2013) and others. Liquidity shortages in the interbank markets and mounting losses led to banks tightening credit conditions in order to repair their balance sheets. For the firms it meant to increase other sources of financing. In this respect the relevance of debt securities has increased. The level of indebtedness has therefore played an important role in corporations decision making, in particularly regarding investment.

The in the literature well known and utilized equation distinguishes economic growth or investment (growth of fixed capital formation-GFCF) as the dependent variable and specific independent variables :

$$y_{it} = \alpha\, Z_{it} + \beta\, D_{it} + v_i + \eta_t + \varepsilon_{it} \tag{1}$$

where y can be GFCF, Z some control variables, D specific independent variables, α and β are coefficients of interest ,v are specific cross-section coefficients, π are specific period coefficients and ε are errors of the equation.

In what follows we use fixed effects model explaining the investment dependent on debt variable (de) and profit share (ps) which is operating surplus gross to gross value added (GDP) in percent. Data are for 10 old EU countries (AT, BE, DE, DK, EL, FI, FR, IT, NL, PT) which are the members of the Euro-zone. Panel unit root tests indicate the unit roots in GFCF, debt and profit shares, hence first differences which are stationary series have been used. Table 3 represents the main results for the dependent variable gross fixed capital formation.

Table 3; Investment, debt and profit shares

Ind.var.		dde	dde(-1)	dde(-2)	dde(-3)
1996-2007	coefficient	0.067	-0.003	-0.088	-0.071
	t-stat.	4.03	-0.10	-2.02	-2.27
	dps coef.	697	774	386	813
	t-stat.	3.05	1.88	0.49	1.40
	c	1,459	4,563	7,866	7,055
	t-stat.	1.97	3.31	4.56	6.04
	R^2_{adj}	0.36	0.24	0.39	0.31
	N	105	97	89	81
2008-2012	coefficient	0.142	-0.057	-0.135	-0.091
	t-stat.	2.52	-1.61	-9.51	-3.47
	dps coef.	1,195	1,263	1,203	1,598
	t-stat.	1.86	1.69	2.28	3.41
	c	-3,091	1,335	5,133	3,738
	t-stat.	-2.81	1.17	8.08	3.11
	R^2_{adj}	0.09	-0.01	0.24	0.10
	N	50	50	50	50

Source; Own calculations.
Note: Method: Pooled EGLS (cross-section weights), White period st.errors & covariances. The coefficients for dde and its lagged values and for dps are common coefficients in the fixed effects models. Dde is the change of debt, dps is the change of profit share.

As concerns the impact of profit shares on investment the coefficients have in both periods positive signs and mainly statistically significant as expected. The impact of debt variable is negative for lagged values and statistically significant for the lags of 2 and 3 years. A stronger negative impact is in the crisis period where high indebtedness hampers investment activities.

4.2   Trade credit and gross value added (GDP)

The changing composition of corporate financing during the crisis years reflects the replacement of bank credit with alternative sources of financing. One of these possibilities is represented by trade credit.

Trade credit is a key element in financing especially working capital and as such is closely linked to economic activity. In a recession firms systematically reduce their purchases and trade credit quickly declines. When the situation is reversed, trade credit on the contrary increases. In the balance sheets trade credit is a special item in other accounts receivable. The evidence for 8 old EU Member States which belong to the Euro Area (AT,BE,DE,FI,FR,IT,NL,PT) is reflected in Table 4. In a comparison with Table 3 we had to omit EL and ES due to the lack of relevant data.The dependent variable is gross value added in the sector non-financial corporations (sectoral GDP). Panel unit root tests indicate the unit roots in trade credit, hence again the first differences, which are stationary series, have been used.

Table 4: Gross value added (GDP) and trade credit

Ind.var.		dtc	dtc(-1)
1996-2007	coefficient	0.195	0.175
	t-stat.	3.91	5.00
	c	14,289	15,209
	t/stat.	38.4	61.9
	R^2_{adj}	0.71	0.78
	N	96	88
2008-2012	coefficient	0.804	-0.027
	t-stat.	3.52	-0.26
	c	654.9	6,442
	t-stat.	0.38	7.16
	R^2_{adj}	0.35	0.14
	N	40	40

Source: Own computations.
Note: Method:Pooled EGLS (cross-section weights), White period st. errors & covariances. The coefficients for dtc and its lagged value are common coefficients in the fixed effects models.

In static models in both time periods the impact of trade credit is positive and statistically significant which supports the assertion that trade credit can replace the bank credit as an alternative source of short-term financing. In models with trade credit lagged by one year the bad sign (minus) in crisis period is statistically insignificant.

5   Conclusions

Having analyzed balance sheets of the sector non-financial corporations for the EU Member States in the pre-crisis (1995-2007) and crisis (2008-2012) periods we can summarize that several facts stand out. In measuring leverage as a debt/GDP ratio we have observed great differences across old EU countries and an increase in the crisis period. For a second measure a very steep increase in Greece and Spain in the crisis period has been remarkable. As concerns proportion between debt and equity the higher reliance on equity than debt financing in the pre-crisis period has been worth of mentioning. In the crisis period the proportion of debt financing has increased.

Panel models with fixed effects (common coefficients) have led to the following results. The impact of debt variable on investment has been negative for lags of 2 and 3 years and a stronger negative impact has been noticed in the crisis period where high indebtedness has hampered investment activities. Trade credit is one of the possible substitute for bank lending as a source of short-term financing. Its impact on the GDP created in the sector of non-financial corporations has been positive especially in static panel models because trade credit is a key element in financing working capital.

Acknowledgements

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How Public Finance Contribute to the External Sources of Microfinance Institutions

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Abstract. This paper investigates whether the macroeconomic environment and banking sector influence the rising demand of the MFIs for external sources. This examination was conducted on a sample of data from MFIs operating in 21 selected countries in Asia, Latin America and the Caribbean for the period 2007-2012. Our results confirm that macroeconomic development has a significant impact on the external funding of MFIs in the individual countries. To be more precise, a positive impact is revealed for the indicators of unemployment, public debt and the corruption index. Conversely, the external sources are negatively associated with the tax burden and increasing competition from commercial banks.

Keywords: external source, public finance, government expenditure, microfinance.

JEL Classification: E6, G21, O11.

1   Introduction

Generally, microfinance is usually considered to be a financing service aimed at low income people or microenterprises in the developing countries without access to standard bank services (Alimukhamedova, 2014a). A significant feature of microfinance is the provision of a small amount of loans to multi-member groups composed of a large proportion of female borrowers (Bauer and Chytilová, 2013). However, microcredit is not the only element of microfinance, since also other services, like a mutual insurance (Danhel et al., 2008; Rippel et al., 2012), are present in the microfinance sector.

The global expansion of microfinance is evident from the fact that, according to mixmarket.org, there were approximately 1,409 registered MFIs all over the world in 2007, which administered microcredits to 68.8 million low income borrowers. In 2012, the number of registered MFIs had decreased to 1,285, and the number of borrowers had grown to 94.7 million. Bruton et al. (2011) estimate the number of these institutions globally at 12,000 of which only about 1,800 are registered anywhere and their performance, however, could be dependent on demographic and social environment (Alimukhamedova, 2014b; Bauer et al., 2014).

The majority of the existing studies focusing on the performance of the microfinance sector or the research into the efficiency of the individual sources of fund is based on micro-level analysis without taking the causal relations in the broader macroeconomic context (Janda and Zetek, 2015). The lack of macroeconomic studies in the microfinance literature prevents a more complex argument about the possible causes of the enormous growth of the microfinance market in size and the number and size of the microfinance service providers. The general public believes that the microfinance performance is due to the growing number of clients, gradual reduction of operating expenditures and interest rates, the establishment of new technologies or better quality legislative conditions enabling greater transparency in the microfinance industry. We are lacking a more complex assessment of whether this success can also be significantly influenced by the environment where the MFIs work (Janda and Zetek, 2014a).

Insufficient attention in the microfinance literature is also paid to the detailed analysis of the external (debt) funding of the MFIs. The MFIs use, besides social capital in the form of donations or special purpose subsidies (Janda and Zetek, 2014b), their own capital or disposable resources gained from the client deposits for their business activities (Hollis and Sweetman, 1998). The external sources are the last funding option where we cannot find a more detailed study examining the causes of the growing demand for these resources by MFIs over the last few years. The aim of this study is therefore to verify whether these sources are positively influenced by internal variables and the macroeconomic environment such as Government expenditures, Public debt, Corruption, Rural population, Tax, the Exchange rate and the size of the Banking sector. The study is conducted on the panel data of 539 MFIs operating in 21 countries in Latin America and Asia from 2007 to 2012.

From a limited range of studies investigating the efficiency of external sources we may mention Ghosh and Tassel (2011), who came to the conclusion that increasing competition among the microfinance service providers in gaining the external sources leads to a higher social efficiency rate. Janda et al. (2015a, forthcoming) argue, on one hand, that external sources have a positive impact on the number of the female borrowers in the profit MFIs.

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On the other hand, it is also important to control the increasing share of these sources of the total assets of the MFIs, which leads to a deterioration in the quality of the credit portfolio, an increasing number of non-performing loans and higher client interest rates. In addition, the applicability of these sources proves to be more beneficial in the areas with a sufficient supply of sources of finance. If the supply is low, the MFIs should be subsidized (Ghosh and Tassel, 2013).

In order to achieve this objective, the article is structured as follows. The next section summarizes the general overview of the funding structure in all microfinance regions and the reason for the selection of the internal and macroeconomic indicators. Section 3 characterizes the selected panel data and methodology more closely. Our results are given in Section 4. The research findings are summarized in the conclusion.

2   External Funding and Microfinance Market

In our study exploring the growing demand of the MFIs for external sources, while taking into consideration the environment where these institutions work, we will proceed from the similar conclusions that were discovered in the banking sector (Bucher et al., 2013). Although the financial institutions (Commercial Banks, Cooperative Societies, and Public Banks) are the biggest creditors of the MFIs in the long term (Figure 1), we will not limit the size of the external sources (borrowings, overdrafts, bonds, subordinated debts and others) only to the banking sector but will consider each possible counterparty, such as government and international organizations, institutional or private investors.

The reason for increasing interest from the investors´ point of view is quite simple. Poverty is becoming a profitable industry. Janda et al. (2014), Janda and Svárovská (2013), Janda with Svárovská (2010) verified that it is possible to achieve a profit comparable to other debt instruments and appropriately diversify the investment portfolio by investment into the microfinance industry. The biggest demand from the side of the microfinance service providers is noted in the countries of Latin America and the Caribbean, East Asia and the Pacific and South Asia. The external investment into microfinance is besides its portfolio diversification, regulation and socially responsible investment characteristics very valuable for investors thanks to low propensity of MFIs to default (Kodera and Malek, 2007; Witzany, 2008).

Therefore we focus in our study on MFIs operating in these regions, distinguishing between profit and non-profit MFIs. Profit MFIs are characterized predominantly by their financial self-sufficiency, and thus we expect their higher demand for external sources and greater sensitivity to market shocks (Wagner and Winkler, 2013) than for non-profit MFIs largely dependent on donations and subsidies.

Figure 1: General overview of funding structure in all microfinance regions (2007-2012)
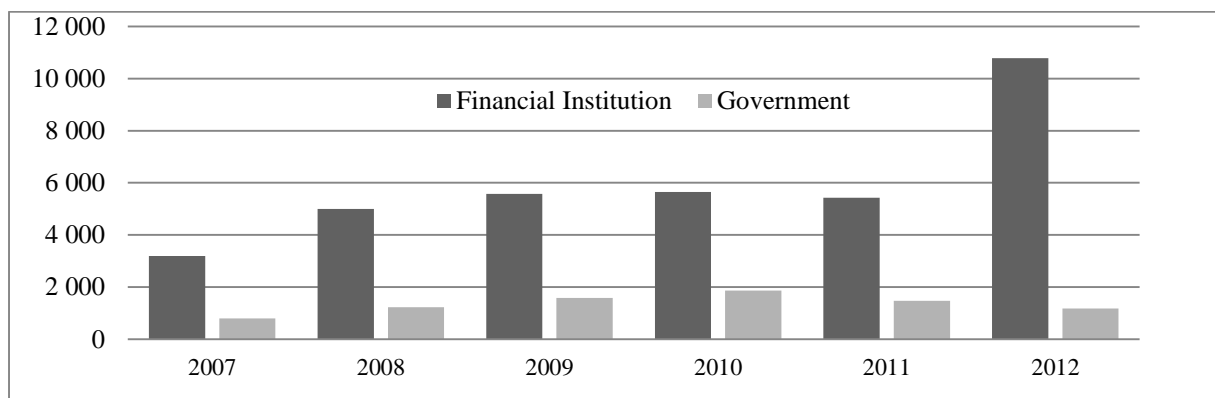
Note: The general overview of the funding structure (in thousands USD) does not include figures for Ecuador and Colombia in 2012. In these countries, MFIs borrowed external sources from Financial Institutions of 149 billion USD (Colombia) and Government 15 billion USD (Ecuador).
Source: Authors' calculations based on data from mixmarket.org.

Similarly, we will take into account some internal indicators and macroeconomic factors which have an influence on the banking sector (Makri et al., 2014) or microfinance performance (Ahlin et al., 2011) and where we can assume similar impact on the size of the demand for the external sources from the side of MFIs. Besides the indicators of social efficiency such as the Client´s interest rate, the size of Gross loan portfolio and the Number of active borrowers (Janda and Turbat, 2013) we will broaden the list of the explanatory variables with the internal indicator of the Average loan balance per borrower following the financial efficiency of MFIs (Janda et al., 2015b).

As far as the macroeconomic environment is concerned, we extend our research to some indicators that could have a significant impact not only on microfinance performance, but also on the range of funding sources (Vanroose, 2008). The global financial crisis after 2007 indicates that market turmoil has resulted in greater caution

in making investment decisions not only by financial institutions but also by the loan applicants. A number of modern factors which can influence the prices of assets and affect the decision-making process, including random effects, are clearly described in the research: Stádník (2013) and Stádník (2014).

The first indicator is economic growth. Ahlin et al. (2011) argue that MFIs achieve a higher level of profitability and larger size of the credit portfolio in areas with better economic growth. Furthermore, we believe that credits can be offered to MFIs in foreign currency (usually in USD), and the debt sources are more expensive and less popular with the MFIs themselves due to the depreciation of the domestic currency. The next indicator is unemployment growth (Kazi and Leonard, 2012). The number of unemployed people can increase their motivation to establish their own enterprises and also stimulate growth in the demand for microcredits and the need for their funding.

The government is an important (usually the only) creditor of many MFIs in less developed countries. Along with the growth of the government debt, we can expect a decrease of the supply of debt sources on the market and the growth of their price, either due to the decreasing supply or the higher risk of the country that is perceived negatively by the investors and the creditors. Similarly, we consider the government expenditures that could have a positive impact on the local economy (Izák, 2011) and therefore on the range of funding sources.

Obviously, besides the government and other external resources the MFIs rely in large extent on own resources of participating individuals. This is similar mechanism like the one user for example by building societies (Horvath and Teply, 2013). This multiplicity of financial sources of MFIs improves their financial stability (Jakubik and Teply, 2011) and in general contributes to higher stability of the financial sector as whole (Teply and Tripe, 2015).

The dependence of the MFIs on external sources can be related to the demographic viewpoint. The reason is the fact that the MFIs usually operate in the rural regions (Bauer et al., 2012) where the demand for microfinance services (Hlavacek and Hlavacek, 2013; Hlavacek and Hlavacek, 2007) and for external sources can depend considerably on the size of the population and the entrepreneurial environment. In addition, the demand can also depend on the corruption rate in the given country. The majority of the MFIs work in the developing countries where, along with greater corruption, there can also be a decrease in the supply of the external sources, higher prices and lower interest from the side of the MFIs. Finally, we consider in our study the level of the tax rate with an expected negative impact on the liability side of the MFIs.

3   Data and Methodology

The regression model with fixed and random effects is applied to panel data containing information concerning MFIs based in the following countries: Argentina, Bolivia, Brazil, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Peru, Bangladesh, India, Nepal, Pakistan, Sri Lanka, Cambodia, Indonesia, the Philippines and Vietnam. This data is regularly published on the mixmarket.org portal. We estimate our regressive model on the data from the period of 2007-2012 (Table 1).

The first indicator represents the size of external sources (*EF_ln*) and the proportion of these sources to the total assets of MFIs (*EF/TA*). We assume that the bigger the external sources both in absolute terms and in the relation to the total assets of MFI, the more liquid are the financial instruments which have MFIs at their disposal (Stadnik, 2011; Teply et al., 2012). MIX states under the name external sources: borrowings, overdrafts, bonds, subordinated debts and others. The next indicator (= interest rate) reflects the real yield from gross loan portfolio (*Yield_R*). The number of borrowers (*Num_ln*) and the size of gross loan portfolio to the total assets (*GLP/TA*) are chosen as the indicators of social efficiency. The last internal indicator reflects the average loan balance per borrower (*ALB_ln*).

The macroeconomic data for each country are taken from the database of the World Bank and the International Monetary Fund. Specifically, they are the Gross Domestic Product (*GDP*), Rural population (*Rural*), Government expenditure (*Expend*), Public debt (*Debt*) and Unemployment rate (*Unemp*). The score published by the organization Transparency International is used as an indicator of the corruption rate (*Legal*). It is a point assessment of the given country on a scale from 0 to 10, where 0 is large-scale corruption and 10 shows an un-corrupted environment. The next variable is the real exchange rate (*E*$_r$) calculated on the basis of the information from Oanda and converted to USD. The last variable shows the size of the tax rate (*Tax*) downloaded from the website of Deloitte. We use this indicator as a proxy variable showing the conditions of the business environment in the given country. The banking sector represents the last subject group (Jakubik, 2013; Jakubik and Schmieder, 2008; Jakubik and Heřmánek, 2008) where we consider the indicator of Net Interest Margin (*NIM*) to estimate the impact of the bank's interest rate (Sutorova and Teply, 2013) and *TA_ln* shows the size of banks' total assets in the given country. Both indicators are downloaded from Bankscope. By considering just Net Interest Margin as one characteristic number, we abstract from the complex consideration of term structure of interest rates (Baran and Witzany, 2014; Malek et al., 2007). The correlation matrix of all independent variables is described in Table 2.

Table 1: General description of variables

Variable	Description	Profit MFIs				Non-Profit MFIs			
		Obs.	Mean	Std.dev.	Median	Obs.	Mean	Std.dev.	Median
EF_ln	Final amount of external fund (abs.)	90	18.782	1.285	18.719	101	17.937	1.560	18.048
EF/TA	External fund / Assets (%)	90	26.555	14.616	23.950	101	34.384	20.949	33.935
Yield_R	Real yield on gross loan portfolio (%)	90	23.638	14.786	21.570	101	22.283	12.312	19.990
Num_ln	Number of active borrowers (abs.)	90	9.343	1.604	9.615	101	8.482	1.499	8.635
GLP/TA	Gross loan portfolio / Assets (%)	90	77.455	9.112	79.710	101	80.120	7.777	82.290
ALB_ln	Average loan balance per borrower (abs.)	90	6.478	1.016	6.609	101	5.913	1.034	5.961
Unemp	Unemployment total (% of total labor force)	90	7.109	1.921	6.775	101	6.852	2.222	6.750
Rural	Rural population (% of total population)	90	47.333	23.259	43.500	101	45.564	21.341	44.000
GDP	Gross domestic product (% change)	90	4.730	2.791	4.850	101	4.798	2.550	4.900
Legal	Corruption between 10 (clean) and 0 (corrupt)	90	2.916	0.554	2.850	101	3.039	0.697	2.900
E$_r$	Real exchange rate (% change)	90	-0.002	0.015	-0.002	101	-0.002	0.015	-0.002
Tax	Corporate tax rate (%)	90	28.756	4.358	30.000	101	27.946	6.807	30.000
Expend	General government total expenditure (% of GDP)	90				101			
Debt	General government gross debt (% of GDP)	90	43.333	16.431	40.627	101	43.503	16.851	40.950
NIM	Net interest margin (%)	90	421.76	731.49	229.62	101	535.38	795.39	301.14
TA_ln	Total assets (abs.)	90	11.052	1.921	10.530	101	11.259	1.688	10.982

Source: Authors' calculations based on data from mixmarket.org, worldbank.org, imf.org, oanda.com, transparency.org, deloitte.com, Bankscope.

For the above mentioned variables we construct a general regression equation (1), where the dependent variable Y_{ct} is *EF_ln*, or alternatively *EF/TA* and the independent variables are *Yield*, *Num_ln*, *GLP/TA*, *ALB_ln*, *GDP*, *Rural*, *Expend*, *Debt*, *Unemp*, *Legal*, *E$_r$*, *Tax*, *NIM* and *TA_ln* in time *t-1* and in country *c*.

$$Y_{ct} = \alpha_0 + \beta_1 Yield_{ct-1} + \beta_2 Num\_ln_{ct-1} + \beta_3 GLP/TA_{ct-1} + \beta_4 ALB\_ln_{ct-1} + \beta_5 GDP_{ct-1} + \beta_6 Rural_{ct-1} +$$
$$+ \beta_7 Expend_{ct-1} + \beta_8 Debt_{ct-1} + \beta_9 Unemp_{ct-1} + \beta_{10} Legal_{ct-1} + \beta_{11} E_{rct-1} + \beta_{12} Tax_{ct-1} + \beta_{13} NIM_{ct-1} +$$
$$+ \beta_{14} TA\_ln_{ct-1} + \varepsilon_{tc}. \tag{1}$$

Table 2: Correlation matrix

Profit		(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(0)	*Yield*	1													
(1)	*Num_ln*	-0.467	1												
(2)	*GLP_TA*	-0.058	0.096	1											
(3)	*ALB_ln*	0.023	0.132	0.328	1										
(4)	*GDP*	-0.134	-0.045	0.206	-0.208	1									
(5)	*Rural*	-0.542	0.182	-0.082	-0.621	0.199	1								
(6)	*Debt*	-0.060	0.113	-0.268	-0.405	-0.073	0.039	1							
(7)	*Unem*	-0.269	0.088	-0.003	0.132	-0.035	-0.160	0.189	1						
(8)	*Legal*	0.291	-0.146	0.183	0.069	-0.013	-0.423	0.140	-0.020	1					
(9)	E_r	-0.103	0.056	0.033	-0.183	-0.113	0.191	0.177	-0.047	-0.148	1				
(10)	*Tax*	0.142	-0.153	-0.374	-0.266	0.098	-0.238	0.500	0.192	0.334	-0.108	1			
(11)	*NIM*	0.427	-0.249	-0.025	0.021	0.028	-0.433	0.230	-0.012	0.414	-0.166	0.401	1		
(12)	*TA_ln*	0.491	-0.266	-0.220	-0.168	0.122	-0.405	0.278	-0.019	0.538	-0.294	0.582	0.599	1	
(13)	*Expend*	0.093	0.116	0.191	0.483	-0.080	-0.524	0.045	0.046	0.219	-0.113	0.094	0.311	0.303	1
Non-Profit		(0)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
(0)	*Yield*	1													
(1)	*Num_ln*	-0.092	1												
(2)	*GLP_TA*	-0.407	-0.007	1											
(3)	*ALB_ln*	0.080	-0.371	0.255	1										
(4)	*GDP*	-0.117	0.102	0.106	-0.143	1									
(5)	*Rural*	-0.566	0.378	0.090	-0.607	0.090	1								
(6)	*Debt*	0.000	0.060	-0.080	-0.227	0.011	0.051	1							
(7)	*Unem*	-0.001	-0.154	-0.051	0.219	-0.026	-0.305	0.241	1						
(8)	*Legal*	0.086	-0.288	0.199	0.435	-0.072	-0.432	-0.026	0.087	1					
(9)	E_r	-0.246	-0.061	-0.007	-0.157	-0.069	0.189	0.235	-0.091	-0.162	1				
(10)	*Tax*	0.175	0.060	-0.281	-0.098	0.145	-0.214	0.500	0.476	0.103	-0.027	1			
(11)	*NIM*	0.481	-0.245	0.010	0.178	-0.031	-0.532	0.288	0.075	0.414	-0.066	0.294	1		
(12)	*TA_ln*	0.355	0.029	-0.020	-0.149	0.232	-0.290	0.336	0.101	0.317	-0.244	0.381	0.664	1	
(13)	*Expend*	0.147	-0.225	0.206	0.304	0.015	-0.492	0.183	0.274	0.067	-0.034	0.292	0.440	0.372	1

Source: Authors' calculations

4 Results

Our results show that the demand for the external sources strongly depends on the environment where the MFIs work. The growing demand of the MFIs for external funding is positively influenced by the level of the unemployment rate, public debt and corruption index. For example, additional growth of the *Debt* indicator is associated with a 0.490 percentage point increase in the proportion of *EF/TA* in non-profit MFIs. Similarly, the annual change of the *Legal* indicator leads to a growth in the size of *EF/TA* of 16.421 (Profit MFIs) and 12.121 (Non-profit MFIs) percentage points. On the other hand, the growing tax burden rate and bank assets have a negative and very significant impact on the explanatory variables. The government's intention to raise a tax rate (*Tax*) causes a decrease in external resources of 4.2 % in the profit MFIs.

Table 3: Results for profit and non-profit MFIs (2007-2012)

	Profit MFIs		Non-profit MFIs	
	EF_ln	*EF/TA*	*EF_ln*	*EF/TA*
	FE	FE	FE	RE
Constant	9.232*	-26.267	38.903**	94.954*
	(0.006)	(0.753)	(0.022)	(0.086)
Yield	0.007	-0.144	0.001	0.270
	(0.6315)	(0.559)	(0.883)	(0.324)
GLP/TA	0.034*	0.674**	-0.017	-0.368
	(0.067)	(0.047)	(0.167)	(0.361)
Num_ln	-0.069*	-2.134***	0.117*	1.049
	(0.056)	(0.006)	(0.095)	(0.458)
ALB_ln	-0.102	-2.923	-0.294**	-2.903
	(0.581)	(0.131)	(0.011)	(0.390)
GDP	0.027	0.140	0.008	0.642
	(0.123)	(0.7053)	(0.725)	(0.356)
Rural	0.036	1.062	-0.308	0.091
	(0.588)	(0.404)	(0.152)	(0.736)
Expend	0.009	0.216	-0.011	-0.303
	(0.607)	(0.642)	(0.794)	(0.597)
Debt	0.015	0.410	0.004	0.490**
	(0.219)	(0.171)	(0.864)	(0.044)
Unemp	0.200***	3.636***	0.120*	0.428
	(0.001)	(0.007)	(0.085)	(0.777)
Legal	0.629**	16.421**	0.299	12.121**
	(0.041)	(0.013)	(0.578)	(0.043)
E_r	0.985	-67.821	6.625	170.319
	(0.693)	(0.553)	(0.174)	(0.196)
Tax	-0.042**	-0.571	0.067	-0.697
	(0.017)	(0.254)	(0.358)	(0.311)
NIM	-0.0005	-0.003	0.003***	0.015**
	(0.6034)	(0.436)	(0.000)	(0.038)
TA_ln	0.312*	-8.170***	-0.857	-6.741**
	(0.051)	(0.001)	(0.161)	(0.034)
R^2	0.959	0.858	0.925	0.644
F-test	0.000	0.000	0.000	0.000
Hausman test	0.000	0.000	0.000	0.265

Note: p-values are provided in parentheses below coefficient estimates; *, **, *** denote significance at the 10, 5, 1 % level.

Source: Author´s calculations

As far as internal indicators are concerned, we have revealed that the increasing number of active borrowers (*Num_ln*) significantly enhances the independence of profit MFIs from external sources. At the same time, the larger a profit MFI is (*GLP/TA*), the higher is its demand for external sources. Finally, non-profit MFIs face a decrease in the proportion of the external funds by 0.294 % when they plan to increase the average loan balance per borrower (*ALB_ln*). This partial result seems to be more likely for the profit MFIs. For the non-profit MFIs such a fact tends to indicate that the subsidy policy of the government bodies does not adequately cover MFIs'

demand for funding sources, and therefore these institutions need to top up the lack of supply in the market. However, the relevance of this statement should be verified in further studies.

5   Conclusions

The aim of our research was to verify, through a model with fixed and random effects, whether the macroeconomic environment and banking sector influence the rising demand of the MFIs for external sources. This examination was conducted on a sample of data from MFIs operating in 21 selected countries in Asia, Latin America and the Caribbean for the period 2007-2012, distinguishing between profit and non-profit MFIs.

The panel data regression has confirmed that macroeconomic development has a significant impact on the external funding of MFIs in the individual countries. To be more precise, a positive impact is revealed for the indicators of unemployment, public debt and the corruption index. Conversely, the external sources are negatively associated with the tax burden and increasing competition from commercial banks. The commercial banks have better access to financial sources and better diversify and manage their risks (Sutorova and Teply, 2014a,b; Teply and Klinger, 2014) and therefore have greater potential for future performance.

Acknowledgements

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Evaluation of Public Tender According to the New Procurement Directives

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Abstract. The paper analyzes the problems of assessing public procurement. Its benefit analysis is the evaluation of bids under the new procurement directives to be fully transposed into Czech law in 2016 as a new law on public procurement procedures, which was the first version drafted by the Ministry for Regional Development. The paper contains the evaluation of this proposal from the perspective of the evaluation of bids and discusses good practice in the evaluation of tenders.

Keywords: public contracts, evaluation, economic advantageous method, best practice.

JEL Classification: H83

1   Introduction and methodology

What is public procurement? In general, "Procurement" refers to the function of purchasing goods and services from an outside body. Thus "public procurement" refers to the acquisition by public bodies, such as government departments and municipalities, of the various goods and services that they need for their activities by equal, non-discriminatory and transparent way (Ochrana, Maytová, 2012). In the framework of any procurement begins with the planning decision to make the purchase. This will involve, for example, deciding whether there is need for the particular goods or services. The answers on the following questions. (e.g. is a new computer system needed? Or would it be better merely to upgrade existing system? Or to live for a year or two more with the current equipment?) Next phase is to choose how will be, for example, technical specification, type of award procedure and also criterion for evaluation (Nemec, Sumpikova, Klazar, et al., 2014, evaluation in the international perspective see in Bergman, Lundberg, 2013, Bovis, 2007). Public administration should, while respecting the principles 3E (Kubatova, Piatkova, 2014). Public procurement have more aspects, for example tax aspect (Kubicek, Vitek, 2010), green and environmental aspects (Jurčík, 2013). The evaluation of public contract is the key phase of public procurement procedure and this is reason for analysis of evaluation of public contracts according the new Procurement Directives. This is the main aim of this article.

Other objectives included the following. Which criterion and methods of evaluation are allowed and appropriate? Resolving these issues is important for public investment and public finances following the adoption of new procurement directives - Directive 2014/24/EU of the European parliament and of the council of 26 February 2014, on public procurement and repealing Directive 2004/18/EC (see more in Treumer, 2012, Pavel, Sicakova-Beblava, 2013). The research goals are solved in the chapters 2, 3, 4 with conclusion in chapter 6.

In the chapter 5 the author also deals with answering the question of what the sub-criteria evaluation are often used in Czech Republic.

2   Selcting the Winner – analyses of current situation

The evaluation process has to lead to the selection of the contractor (or contractors if more than one contract award is authorized). The two principal standards are: award on the basis of the lowest evaluated price or award on the basis of best value or most advantageous offer (as clearly defined in the procurement documentation, considering quality, price and others factors in accordance with the evaluation criteria set forth in the procurement documentation. The standard of award to the lowest evaluated price is used typically when simple, off-the shelf items are being purchased, or in procurements in which detailed specifications exist and quality can be adequately judged on the basis of a tender that unequivocally agrees to provide what the specification requires. The standard of award to the most advantageous or best value tender is used usually when quality is important or the buyer is relying on interested firms to propose technical solutions that will be evaluated and rated. The procuring entity can also use a "minimum threshold" or "low price technically acceptable" approach. In such an evaluation scheme, the procurement documentation could state in order to be considered for award, a tender must meet the minimum mandatory thresholds set forth in the procurement documentation. In the Czech Republic mostly procurement entities are using just criterion lowest price (Jurčík, 2015).

Evaluation of procurement entity when the evaluation is according to more criterion, were analyses from Věstník veřejných zakázek (2014) at the above thresholds contracts. This analyses is in Table 1.

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Table 1: The most often using criterion

Criterion	Characteristic
Criterion technical parameters	Criterion technical parameters maximization criterion because it is utility criterion. It is usually decomposed into a number of technical indicators (technical system performance, speed, memory size), which comprehensively demonstrate the technical performances of the technical system. When applying the "technical parameters" is appropriate to consider whether rationally limit some technical indicators so that we set reasonable ceiling for the indicator.
Technical level solution	Technical level solution is utilitarian criterion. In particular, it demonstrates the effectiveness of the public procurement and verifies it is offered to the public contract. This criterion should be used particularly in the case of public projects. In a similar criterion is the criterion that monitors its technical parameters.
Time of delivery or fulfillment of contract	It is a criterion which the contracting authority prefers a functional feature prefers time, e.g. to accelerate the construction of the highway.
Customer service	The criteria include utility type criterion customer service. They are maximization criteria, as expressed in units of time period for which the contracting authorities provided some benefits in the form of customer service. In determining this criterion is appropriate not to limit only for the provision of services, but also to monitor what the content services in a given period of time. It may happen that the bids Although differing time (or quantity) services, but also may vary in quality (content) services. If this distinction is essential, we should take into account when assessing public contracts, respectively. is integrated into the tender documents and contracts.
Organization of construction	It is the criterion relating to the method of implementation of public procurement and describe how the course will realize, for example. In terms of time and interdependence stages, mostly at works contract.

Source: Věstník veřejných zakázek (2014).

There were not using some criterion, for example, social aspects and number of employed disabled people and aesthetic and functional characteristics and number of local unemployed people (to this category see more in Finardi, Vancurova, 2014). From Table 2 we can see that procurement entities have more opportunities to evaluate public contract.

Table 2: International comparison

Legal regulation	Examples of evaluation criteria
§ 78 Czech Law on Public Contracts (no 137/2006 Coll.)	a tender price, quality, technical merit of the performance offered, aesthetical and functional characteristics, environmental characteristics, impact on the employment of people with disabilities, operational costs, cost-effectiveness, sales and after-sales service, technical assistance, delivery period or period of completion, other criteria which express the relationship between the use value and the price. Some criterion shall not be a partial evaluation criterion, such as: contractual terms and conditions, the purpose of which is to secure the obligations of the economic operator, terms of payment, qualifications prerequisites.
§ 78 Czech Law on Public Contracts amended from March, 6th, 2015 by Law no 40/2015 Coll, technical amendment of Law on Public Contracts	organisation, qualification and experience of staff assigned to performing the contract, where the quality of the staff assigned can have a significant impact on the level of performance of the contract; or after-sales service and technical assistance, delivery conditions such as delivery date, delivery process and delivery period or period of completion. r
World Bank Procurement Guidelines	There are more detailed. For example for services The evaluation and comparison of bids shall be on CIP (place of destination) prices for the supply of imported goods52 and EXW prices, plus cost of inland transportation and insurance to the place of destination, for goods manufactured within the Borrower's country, together with prices for any required installation, training, commissioning, and other similar non-consulting services.

Source: Author, legislation.

3 Evaluation criterion according to new procurement directives

Without prejudice to national laws, regulations or administrative provisions concerning the price of certain supplies or the remuneration of certain services, contracting authorities shall base the award of public contracts on the most economically advantageous tender. The most economically advantageous tender from the point of view of the contracting authority shall be identified on the basis of the price or cost, using a cost-effectiveness approach, such as life-cycle costing in accordance with Article 68 of the new procurement directive for public procurement entities (2014/24, European Commission, 2014), and may include the best price-quality ratio, which shall be assessed on the basis of criteria, including:

- qualitative,
- environmental and/or
- social aspects, linked to the subject-matter of the public contract in question.

Such criteria may comprise, for instance:

- quality, including technical merit,
- aesthetic and functional characteristics,
- accessibility,
- design for all users, social,
- environmental and innovative characteristics and t
- trading and its conditions;
- organisation, qualification and experience of staff assigned to performing the contract, where the quality of the staff assigned can have a significant impact on the level of performance of the contract; or after-sales service and technical assistance, delivery conditions such as delivery date, delivery process and delivery period or period of completion.

The cost element may also take the form of a fixed price or cost on the basis of which economic operators will compete on quality criteria only (European Commission, 2011):.

Member States may provide that contracting authorities may not use price only or cost only as the sole award criterion or restrict their use to certain categories of contracting authorities or certain types of contracts.

Award criteria shall be considered to be linked to the subject-matter of the public contract where they relate to the works, supplies or services to be provided under that contract in any respect and at any stage of their life cycle, including factors involved in: the specific process of production, provision or trading of those works, supplies or services; or a specific process for another stage of their life cycle, even where such factors do not form part of their material substance. Award criteria shall not have the effect of conferring an unrestricted freedom of choice on the contracting authority. They shall ensure the possibility of effective competition and shall be accompanied by specifications that allow the information provided by the tenderers to be effectively verified in order to assess how well the tenders meet the award criteria.

In case of doubt, contracting authorities shall verify effectively the accuracy of the information and proof provided by the tenderers. The contracting authority shall specify, in the procurement documents, the relative weighting which it gives to each of the criteria chosen to determine the most economically advantageous tender, except where this is identified on the basis of price alone. Those weightings may be expressed by providing for a range with an appropriate maximum spread. Where weighting is not possible for objective reasons, the contracting authority shall indicate the criteria in decreasing order of importance.

4 Using a life- cycle costing

Where contracting authorities assess the costs using a life- cycle costing approach, they shall indicate in the procurement documents the data to be provided by the tenderers and the method which the contracting authority will use to determine the life-cycle costs on the basis of those data. The method used for the assessment of costs imputed to environmental externalities shall fulfil all of the following conditions: it is based on objectively verifiable and non-discriminatory criteria. In particular, where it has not been established for repeated or continuous application, it shall not unduly favour or disadvantage certain economic operators; it is accessible to all interested parties; the data required can be provided with reasonable effort by normally diligent economic operators, including economic operators from third countries party to the GPA or other international agreements by which the Union is bound.

Whenever a common method for the calculation of life- cycle costs has been made mandatory by a legislative act of the Union, that common method shall be applied for the assessment of life-cycle costs. A list of such legislative acts, and where necessary the delegated acts supplementing them, is set out in Annex XIII. The Commission shall be empowered to adopt delegated acts in accordance with Article 87 concerning the update of that list, when an update of the list is necessary due to the adoption of new legislation making a common method mandatory or the repeal or modification of existing legal acts.

5   Harmonisation of new procurement directives

Harmonisation of new directives on public procurement will be done by the new Act on tendering, whose first draft was prepared by the Ministry for Regional Development. Unfortunately, his proposal is not public. Table 3 indicates the intent of Czech Republic in transposing the new procurement directives in relation to evaluation of public contract according to more criterion.

Table 3: Comparison of evaluation according to the new directives on public procurement and the Czech draft law on procurement procedures

New procurement directives	Draft law	Discussion
Fixed price and evaluation of other aspects	Contains	Until the adoption of this law is not such a procedure possible. Can only be welcomed, because in practice often occur commercial practices offers very low prices, which often generate low quality of subsequent performance,
Criterion: quality, including technical merit, aesthetic and functional characteristics, accessibility, design for all users, social, environmental and innovative characteristics and trading and its conditions; organisation, qualification and experience of staff assigned to performing the contract, where the quality of the staff assigned can have a significant impact on the level of performance of the contract; or after-sales service and technical assistance, delivery conditions such as delivery date, delivery process and delivery period or period of completion.	Contains	include the best price-quality ratio, which shall be assessed on the basis of criteria, including qualitative, environmental and/or social aspects, linked to the subject-matter of the public contract in question
Evaluation of life-cycle costing Life-cycle costing shall to the extent relevant cover parts or all of the following costs over the life cycle of a product, service or works: (a) costs, borne by the contracting authority or other users, such as: (i) costs relating to acquisition, (ii) costs of use, such as consumption of energy and other resources, (iii) maintenance costs, (iv) end of life costs, such as collection and recycling costs. (b) costs imputed to environmental externalities linked to the product, service or works during its life cycle, provided their monetary value can be determined and verified; such costs may include the cost of emissions of greenhouse gases and of other pollutant emissions and other climate change mitigation costs.	Contains	It is criterion contains operating costs. In this case, the content of the bid price only item on the acquisition of a public contract. However, if this investment is desirable neglect criterion operating costs. Otherwise, such an approach may lead sponsor for violation of the provisions of the Act on Financial Control and State Property Act on efficient and effective management of property.
Member States may provide that contracting authorities may not use price only or cost only as the sole award criterion or restrict their use to certain categories of contracting authorities or certain types of contracts.	Do not contain	The draft law does not use this possibility. Despite frequent complaints that the selection of the lowest tender price leads to low quality performance Czech Republic this common method confine. The mistake is that they do not lead technical discussions of suitable optional subjects performance in order to use this option.
Electronic procurement (compulsory) from 2017 also in the field of evaluation	Contains	There is impact on automatic methods of evaluation, e.g. electronic auction, dynamic purchase system (Pavel, Sicakova-Beblava, 2013)

Source: Author, legislation.

6   Simultaneous use of sub-criteria evaluation

When we analyze the most often using criterion in case of evaluation according the basic criterion the most economically advantageous tender, we come to these outputs. In the year 2014 (Věstník veřejných zakázek 2014) the most often criterion using in the Czech procurement practice were these:

- the offer Price
- time of realization
- the warranty period for the technological part / warranty for quality
- construction organization plan
- terms and conditions of sanction
- technical specification
- business solutions
- technical Solution
- pledges rent
- payment terms beyond the minimum requirements of the contracting authority
- bank Guarantees
- quality (quality) performance offered
- other (speed service intervention, distance from the metro).

7   Conclusions

Article focuses on analysis of the evaluation criteria set by the new procurement directives which place greater emphasis on the functional characteristics of the subject of the public contract. Based on the analysis in the evaluation of new procurement directives are proposed recommendations and procedures to implement the new legislation into Czech law. The aim is to fully use the possibilities offered by tendering the new directives on public procurement evaluation. Currently, the Ministry for Regional Development produced a first draft law on tendering (not on public procurement, as is the title of the Act currently). Critically, it is clear that this bill, which would take effect in 2016, does not fully use the new opportunities given by tendering guidelines. E.g. does not (and did not lead to a professional discussion) list of deliverables procurement, which would have prohibited the evaluation criterion used only the lowest bid price. The mistake entering the Czech system is that there is no professional body for the coordination of public procurement (e.g. in Sweden existing Public Procurement Office does not deal with the review, but technical support procurement, Arrosmith, 2005).

On the contrary, it shows that the state is able to provide only formal support award, the interpretation of ambiguous provisions of the Public Procurement Act, and it still delays. It is not able to develop a certified evaluation methodology e.g. according life-cycle costing. According to the analysis (see chapter 5), the most commonly used sub-criteria in the year 2014, the method of life-cycle costing is not used. Without the appropriate methodological support risk that even after the implementation of the new procurement directives will be limited to the evaluation criterion of lowest price, because the fear of the use of technically demanding solutions. Czech Republic should therefore develop appropriate evaluation methodology.

Acknowledgements

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Environmental Deduction from Personal Income Tax as the Compensation for Living in Polluted Regions of Russia

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Abstract. The conducted research allowed to develop tax mechanisms to reduce the damage to human health caused by environmental pollution. To investigate the influence of pollution on population health a mathematical model was designed based on statistical information on the morbidity of various groups of the population of different cities in the Irkutsk region, characterized by intense environmental and sanitary situation. In order to identify the pollution damage to health we estimated economic losses from the increase in the population morbidity in the Irkutsk region (Russia). We supposed that compensation for living in a polluted region should be affected through tax regulation, by compensating through personal taxes, first, personal income tax. This deduction should at least minimally compensate health damage (for example, at least it should be enough to purchase vitamins). Scale of environmental deduction can be differentiated depending on the contamination of the territory, based on the zoning of the Russian Federation subjects in terms of emissions of air pollutants. Thus, income tax paid by resident population on polluted territories would be lower, and aggregate disposable income higher. This would make possible at least partial compensation for detriment to public health caused by living on polluted territories.
Keywords: Environmental Deduction, Tax Deduction, Public Health, Environmental Pollution
JEL Classification: H 23, H 240

1   Introduction

It is well known that vital functions and everyday living conditions affect human health. Researchers believe that the impact of social factors is increasing, and that they are a primary cause for high mortality rate, morbidity, low birth rate and mental disorders (Baturin, Baturina & Bychkov 2005). According to WHO experts, public health, on average, depends on economic well-being and quality life style (50-52%) and on the environment (18-20%). More recent surveys conducted by WHO have shown that 25 to 33% of registered worldwide disease cases may be put down to poor environmental conditions (Akimova, Haskin 2006).

Detriment to public health caused by environmental pollution calls for an economic assessment and demands compensation. Social value of any product manufacture, of any economic activity that has a negative environmental effect, should take into account the costs of detriment to public health caused by such effect. As long as damage from negative environmental effects and detriment to public health have not been fully appraised, the quality of life will continue to deteriorate. Therefore, there is a call for developing an efficient mechanism for levies and distribution of means in compensation of detriment to public health. Such compensation could be implemented through taxes and payments.

To this end, it is important that an effective environmental tax system be worked out which, while facilitating budgetary inflows and procurement of financial means for environment conservation and restoration and public health rehabilitation, would be an integral part of the tax system as a whole. Effectiveness is an advantage of taxes over direct regulation measures, such as quotas, embargo and standards.

Ecotaxes induce manufacturers to reduce harmful emissions to the point at which the marginal cost will be equal to the tax. In this case, costs in terms of environmental protection will be minimal (static efficiency). Instruments based on market mechanisms are a serious incentive for the development of innovations (dynamic efficiency). Cost-effectiveness of tax may be somewhat reduced, taking into account the impact of ecotaxation on other market factors (e.g. labor supply). Tax instruments can also be used to reduce taxes on labor (this is one of the main arguments in favor of the green tax reforms). In the context of imperfect labor markets and involuntary unemployment green tax reform can, under certain conditions, generate a higher level of employment and a clean environment, thus creating a double benefit. The share of ecotaxes in the GDP of the OECD countries on the average makes approximately 3% (from 0.4% in Iceland and the United States to 9.7% in Hungary) (OECD official website, 2013). A most important issue in transition to sustained economic development is the issue of mechanisms

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for ensuring ecologically orientated development and efficient nature management. The global process of working out an economic mechanism for nature management that would incorporate taxation, subsidizing, preferential financing of nature conservation activity etc., continues. Taxes are an especially effective and widely used tool. The so-called "green taxes" help to compensate for ecological damage incurred by the polluting business itself, not by the society as a whole; they help to implement the "polluter pays" principle and facilitate costs internalization, or "costs closure". By taking an ecological angle, tax legislation could not only make effective the "polluter pays" principle, but also bring in effect the principle of consistent improvement of production and technology. A good example is given by some European countries where the use of renewable energy technologies is encouraged by exemption from energy tax. In many cases, tax benefits serve a good incentive for businesses to minimize the negative burden on the environment. The aim of this article is to select and justify tax mechanisms for reducing the damage to human health caused by environmental pollution.

2   Investigation of environmental pollution impact on population health

Public health may be affected by short-term (acute) and long-term (chronic) environmental conditions, the effects showing at different times after exposure. It may be assumed that the origin and development of such health conditions as respiratory, digestion, or cardiovascular disorders and malign neoplasms can be traced to environmental pollution, especially air pollution.

In the period from 2007 to 2011, a mathematical model was developed to study the influence of the factors of environmental pollution on the population health of the Irkutsk region. The source data for the model was statistical information on the morbidity of various groups of the population of different cities in the Irkutsk region, characterized by intense environmental and sanitary situation (State report, 2012).

Analysis of the impact of air pollutants emissions from stationary sources on the health of different age groups in the Irkutsk region, carried out at the first stage identified the following indicators:

x_1 – pollutant emission in the Irkutsk Region in solid form (th. tons);

x_2 – pollutant emission in the Irkutsk region in gaseous and liquid forms, including carbon monoxide, sulfur dioxide, etc. (th. tons);

y_1 – morbidity rate among children, (people);

y_2 – morbidity rate among adolescents (people);

y_3 – morbidity rate among adults (people);

y_4 – morbidity rate among all population (y_4, people).

Table 1 shows pointwise estimates from the available sample data

Table 1: Morbidity rates of the population and pollutant emissions

Year	y_1	y_2	y_3	y_4	x_1	x_2
2007	234,343.1	204,854.9	145,701.4	163,674	121.325	467.033
2008	223,926.6	207,250.9	142,759.8	159,518.7	119.703	485.045
2009	234,103.9	22,476.6	146,947.1	165,072.4	103.569	445.09
2010	233,164.2	216,537.8	146,119.6	164,115.1	107.056	475.917
2011	232,174.2	200,638.3	147,784.3	164,669.4	104.222	438.321

Source: Compiled by authors

Calculations on morbidity among adults and the whole population of the Irkutsk region showed a significant impact of emissions from stationary sources, both in the solid and in liquid and gaseous forms. At the same time the statistical relationship between the emissions is statistically insignificant. Obtained interval estimates confirm our conclusions. For example, with the reliability $\gamma = 0.95$ interval estimation for r_{y1x1} (pair correlation coefficient) is obtained in the form of $-0.6328 \leq r_{y1x1} \leq -0.998$.

The second stage of modeling of air pollutants emissions impact from stationary sources on the health of the Irkutsk region population was to build econometric models of linear and multiple regression with an analysis and interpretation of the results. Linear models of pair and multiple regression were built and analyzed. Further studies have been devoted to the investigation of other resulting indicators, i.e., indicators of mortality (Table 2):

Table 2: Mortality rates due to various reasons

Year	y_1	y_2	y_3	y_4	x_1	x_2
2007	35,157	4,628	1,770	5,873	121.325	467.033
2008	35,359	4,464	1,854	5,572	119.703	485.045
2009	34,898	4,791	2,017	5,241	103.569	445.09
2010	35,105	4,752	1,849	5,085	107.056	475.917
2011	33,910	4,816	1,898	4,690	104.222	438.321

Source: Compiled by authors

where y_1 – number of deaths from all causes;

y_2 – number of deaths from neoplasms;

y_3 – number of deaths from respiratory diseases;

y_4 – number of deaths from accidents, injuries and poisoning etc.;

x_1(th. tons) – pollutant emission in the Irkutsk Region in solid form;

x_2 (th. tons) – pollutant emission in the Irkutsk region in gaseous and liquid forms, including carbon monoxide, sulfur dioxide, etc.

The significance of the influence of factors was assessed by the method of least squares, verification of the model using analysis of variance in the regression and coefficient of determination R^2 and adjusted for the number of covariates normalized $\bar{R^2}$, and the pair correlation matrix.

In the estimated model

$$\hat{y}_1 = 24{,}006.934 + 6.559x_1 + 21.955x_2, \ R^2 = 0.71, \ \bar{R^2} = 0.42$$
$$\scriptstyle (5{,}123.17) \ (35.128) \ (15.20)$$

high value of the multiple correlation coefficient $R=0.84$ and coefficient of determination $R^2=0.71$ indicated a close relationship between the number of deaths from all causes (y_1)from the studied factors.

Econometric analysis (with elements of the theory of correlation and regression) of mortality from atmospheric contamination showed that with an increase in emissions of pollutants in solid form by 1% the number of deaths from all causes increased by 0.14%, while increasing emissions in gaseous and liquid forms on the same 1% mortality rate increased by 0.32%. Negative evaluation exponent of covariates x_1, x_2 for y_2, y_3 characterize the feedback for the number of deaths from neoplasms and respiratory diseases from the pollutant emissions in the solid, liquid, and gaseous forms.

For the number of deaths from accidents and traffic injuries (y_4) relative indicators are quite high. So by an increase in emissions in solid form at 1% the number of deaths by such causes increase at almost 1% (elasticity $E_{y4x1} = 0.96$), while increase in emissions in a gaseous or liquid forms at 1% mortality rate increased by 1.21% (Kireenko et. al., 2014; Kireenko et. al., 2013).

3 Evaluation of damage to human health caused by environmental pollution

Assessment of health damage is based on medical knowledge, statistics and mathematical methods, but, despite all the efforts, it is almost impossible to ascertain exact damage.

Sufficient material of medical and statistical studies is not yet accumulated, thus we should define the very possibility of damage assessment and compensation. In order to identify such possibility we estimated economic losses from the increase in the population morbidity in the Irkutsk region (Russia).

Increased morbidity causes direct costs of treatment and medical care. As well as indirect economic losses: losses from temporary disability; lost budget revenue, compensation cost for production etc. (Ryumina, 2009).

Calculation of damage can be made according to the formula:

A = (a + b + c + d) *e * k,   (1)

where:

A – costs associated with population unhealthiness;

a –cost of sick leave, rub.

b– cost of medicines purchasing, rub.

c – indirect economic loss, rub.

d – average cost of hospital treatment, rub.

e – number of cases over a class of diseases.

к – coefficient of pollution influence.

Indirect economic loss (c) estimates as the sum of enterprise losses in connection with sick leave, budget losses from taxes not assessed and loss of families of sick workers affected by difference in the payment of sick leave and average wage.

For the calculation we used:

- data from the Social Insurance Fund of the Russian Federation (Federal State Statistic Service, 2012);
- estimated data of medicines purchasing costs and indirect economic losses associated with temporary disability (Baturin, Baturina, Bychkov, 2005);
- cost of treatment regulations established by the territorial programs of state guarantees (Resolution of the Government of the Irkutsk region from 28.12.2010)
- statistics on the number of diseased.

Population health damage for the Irkutsk region was calculated by the proposed formula and presented in Table 3.

Table 3: Environmental damage to population health and environmental charges for emissions of pollutants in the Irkutsk region, 2007-2009

Name of environmental indicators	2007	2008	2009
Damage caused by air pollution, million rubles	1,735.6	1,844.9	2,067.4
Emissions into the atmosphere of the most common pollutants, ths. tons	554	632	560
Environmental charges for emissions of pollutants, million rubles	599.1	872.0	619.9

Source: Compiled by authors

Comparison of the calculated amount of damage to the amount of environmental payments for the same period showed that the damage to population health is several times larger than the environmental payments. Environmental payments should be spent on environmental activities. Therefore, they can not compensate emerging social damage. Therefore, in our opinion, there is a need in the creation of a new mechanism to compensate the harmful effects on the environment and on human health. In this regard, we can take advantage of tax regulations, which would take into account the damage to public health.

4   Tax compensation of damage to human health caused by environmental pollution

Compensation for damage to the environment through the mechanism of payments used in Russia helps to fight negative ecological aftereffects rather than their causes; it is passive in character, as it does not serve as an incentive tool for businesses. At the same time, major air polluters are solvent economic entities that, therefore, could pay more for the damage they cause to the environment and public health.

Ecological taxes are designed to achieve a well-defined ecological effect again at a minimum of excess burdens (Backhaus, 1999). Having studied steps in tax regulation that could be taken to help compensate for detriment to public health, we suggest to introduce a regional income tax ecology deduction, its calculable size depend on the degree of pollution on a particular territory (Kireenko, 2012) . Such use of tax revenues in order to compensate households and businesses is proposed in foreign literature, it is noted that compensation may take the form of income tax reductions or tax credits targeted at specific groups, compensation should be provided to all households in a sequential package to meet a macroeconomic stability outcome (Freebairn, 2009). It is claimed in the Garnaut Climate Change Review, that for those low-income households that do not stand to benefit from tax cuts, adjustments could be made to indexation arrangements for pensions and benefits that protect against disproportionate increases in the prices of particular goods and services that these households consume in unusually high proportions. Full compensation and not overcompensation should be the objective and any additional inequities would need to be corrected by targeted support for households with exceptional energy requirements for health and other reasons (Garnaut Review, 2011).

In case pollution affects the air breathed by the entire resident population of a given region, and levies are not specifically targeted, compensation for living in a polluted region should be affected through tax regulation, by compensating the population for personal taxes, first of all, personal income tax.

Мы предлагаем ввести в законодательство о подоходном налоге новый вычет: экологический налоговый вычет. Income tax paid by resident population on polluted territories would be lower, and aggregate disposable income higher. This would make possible at least partial compensation for detriment to public health caused by living on polluted territories.

Environmental deduction will act as other deductions from personal income tax — taxable income will reduce for the amount of deduction (2).

Calculation of personal income tax (PIT) can be made according to the formula:

$$PIT = (I - D_{st} - D_s - D_p - D_{ec}) \times t \qquad (2)$$

where: I -taxable income;

D_{st} – standard deduction;

D_s – social deduction;

D_i – property deduction;

D_{ec} – ecological deduction (new);

t- tax rate.

Justification of the new deduction based on the following conditions:

- the deduction should at least minimally compensate health damage (for example, at least it should be enough to purchase vitamins).
- significant reduction in personal income tax revenues should not be allowed, as this tax goes to the local and regional budgets and is a source of financing, including social obligations.
- scale of environmental deduction mast be differentiated depending on the contamination of the territory
- social significance of the deduction ought to be taken into account by setting a maximum level of income to which the deduction is available
- payment to non-working groups through the provision of deduction for dependents to working citizens

The maximum size of the ecological deduction for personal income tax proposed to establish in the amount of 500 rubles per month per person for the most contaminated areas. This amount is the maximum environmental deduction offered by analogy with another tax deduction related to radioactive contamination. This is a standard tax deduction on personal income tax for people living in communities previously exposed to radioactive contamination.

Scale of environmental deduction can be differentiated depending on the contamination of the territory, based on the zoning of the Russian Federation subjects in terms of emissions of air pollutants. Federal Service of State Statistics developed this zoning and grouping.

The proposed amount of tax deductions, are presented in Table 4.

Table 4: Scale of environmental deduction depending on the territory contamination

Emissions of air pollutants, th. tons	Amount of the deduction, rubles
50 and less	0
51 to 100	100
101 to 200	200
201 to 500	300
501 to 1,500	400
1,500 and more	500

Source: Compiled by authors

In the current situation with the contamination of areas, the deduction of 500 rubles will be used, for example, in the Krasnoyarsk region, 400 rubles – in Moscow and Irkutsk region etc.

Thus, income tax paid by resident population on polluted territories would be lower, and aggregate disposable income higher. This would make possible at least partial compensation for detriment to public health caused by living on polluted territories. However, the suggested ecology deduction might result in decreasing tax revenues in territorial budgets. Such income cuts, it is suggested, might be compensated for by increasing the transport tax. It seems feasible, as the number of automobiles used on the territory in question keeps growing, resulting in deterioration of the ecological situation caused by the ever growing exhaust emissions in the air. Introduction of the suggested ecology tax deduction would compensate for the detriment to public health caused by the alarming ecological situation in the region.

5   Conclusions

The study shows the influence of environmental pollution on the population health. We see that the environmental payments can not compensate emerging social damage. We offer the new mechanism to compensate the harmful effects on the environment and on human health. In our opinion, the best practice would be a tax environmental deduction that is, solving the problem of filling the budget and funding activities to protect the environment, be able to take into account the damage to public health.

Initiation of environmental deduction for personal income tax, on the one hand, will increase the income of people living in the contaminated areas, and will serve as a compensation for health damage.

The disadvantages of the proposed deduction include a general problem of tax benefits misuse of benefits. Nevertheless, the direct funding is also not always used for its intended purpose. Besides that, any tax deductions are state expenses, which should be covered by other revenue sources. Desire to reduce costs, should encourage public authorities, both at the regional and municipal levels to pursue policies to encourage the reduction of emissions. Emissions reduction is also possible to encourage by funding the installation of additional treatment facilities, and by reduced tax burdens for more environmentally friendly vehicles, or by restricting the use of vehicles in cities etc. All these measures stimulated by the introduction of environmental deduction for personal income tax, should lead to an improvement of the environmental situation and quality of the population life.

In all conscience, use of the proposed environmental deduction will not allow to compensate all the health damage from the pollution. However, we believe that the current situation of pollution and disease requires state regulation. Tax deductions can be one of the inexpensive and convenient tools of such regulation.

Acknowledgements

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Does the CCCTB System Constitute a Threat for the Czech Republic?

Kateřina Krchnivá[*]

Abstract: The Common Consolidated Corporate Tax Base (CCCTB) should comprise common and clear definition of the tax base for the companies operating on the territory of the European Union. The publishing of the CCCTB Draft Directive on 16 March 2011 initiated the extensive debate of many researchers and politicians with the objective to evaluate the main consequences of the introduction of new tax system. In the first voting the most of the European Union Member States rejected the CCCTB system mainly because of the breach of proportionality and subsidiarity principle by the system. Moreover, many states were afraid of the impact of the implementation of the CCCTB system on the volume of tax revenues. Also the negative position of the Czech Republic is mainly influenced by the insufficient evidence the introduction of the system on tax revenues. However, the introduction of the CCCTB system will not have just tax revenues consequences and also the administrative burdens may rise. The paper discusses the provisions of the CCCTB Draft Directive in the light of the Czech tax legislation with the objective to provide an answer for the question if the CCCTB system should constitute a threat for the Czech Republic.

Keywords: Common Consolidated Corporate Tax Base, Corporate income tax, Tax revenues

JEL Classification: K34, H25

1   Introduction

The introduction of the Common Consolidated Corporate Tax Base (CCCTB) as a tool for the harmonization of direct tax system within the European Union started huge debate both of the scientific community as well as the politicians of the involved countries. While the politicians are mainly focusing on the revenue consequences of the introduction of the CCCTB system, the scientist are trying to evaluate the CCCTB system for the broader perspective, i.e. to highlight the main pros and cons of the proposed CCCTB system.

The CCCTB system was initially introduced at the long-term target of the European Union in 1999, whereas as the short-term target was presented the system of the Home State Taxation based on which the companies should be taxed according to the taxation rules of the country where are seated or where is the seat of their effective management.

From the very beginning the CCCTB system was introduced as a tool for the defining of common and clear rules for the determination of the tax base with the objective to simplify and ensure a greater transparency of the national tax systems. Therefore the CCCTB system does not impose the harmonization of corporate tax rates. However, according to Oestreicher and Spengel (2007) in the process of convergence of the tax systems should be obtained a higher harmonization level than the common definition of the tax base. In particular, the minimum tax rates taking into account the subsidiarity principle should be determined. Oestreichre and Spengel (2007) also mentioned that the harmonization of tax rates may increase the attractiveness of the European market mainly due to the allocation of the multinational investments on a homogeneous market characterized by the empirically verifiable correlation in relation to nominal tax burdens.

The recent action of the European Parliament with regard to the CCCTB system is in the line with above mentioned. The European Parliament in the amendment on the CCCTB system of 12 April 2012 suggested the introduction of the minimum level of the corporate tax rates with the objective to strengthen the economic equality.

The paper discusses the provisions of the CCCTB Draft Directive published on 16 March 2011 in the light of the Czech tax legislation and provides the answer if the CCCTB system should constitute a threat for the Czech Republic.

2   Theoretical overview

The Common Consolidated Corporate Tax Base (CCCTB) constitutes according to the European Commission the only way how to eliminate the tax burdens which arise within the business activity of an enterprise beyond the borders of one country. While the main contribution of the CCCTB system are presented the completion of the Single Internal Market, the improvement of the economic growth and the employment rate as well as the

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strengthening of the competitiveness of the European companies, as the main shortcomings may be according to Mintz (2007) considered the increase of the business uncertainty and also high implementation costs.

The publishing of the CCCTB Draft Directive on 16 March 2011 was explicitly rejected by nine (Bulgaria, Ireland, Malta, Netherlands, Poland, Slovakia, Sweden, Great Britain and Romania) of the European Union Member States, since proposed provisions are not in the line with the subsidiarity and the proportionality principle. Also the other EU Member States disagreed with some parts of the proposal. According to Herzig and Kuhr (2011) the most of the EU Member States are afraid of the consolidation of the tax base within the company group and its follow-up distribution among individual members of the CCCTB group based on the allocation mechanisms.

The above mentioned is also the reason for the rejecting of the CCCTB system by the Czech Republic. The Czech Parliament (statement no. 379-E) predicted tax revenues loss in an amount of milliards of CZK. The Czech Republic initially supported the initiative for the harmonization of the tax base, however only if the rules for the harmonization of the tax base will not have negative impact on the tax revenues. Therefore the objective of the Czech Republic in the approval process of the CCCTB system is to work on the quantification of the impact of the CCCTB system on the national budget as well as on the quantification of the impact for the Czech business enterprises.

Among the extensive work of many researchers it is possible to identify few works which are mainly focused on the impact of the introduction of the CCCTB system on the national tax revenues, for example Fuest et al (2007), Deveruex and Loretz (2007), study of Ernest & Young (2010) or van der Horst (2007). According to them it is impossible to strictly recognize the main losers and winners from the implementation of the CCCTB system, since the final results mainly depend on the way of the implementation of the system CCCTB; either on optional or compulsory basis, with the possibility for the loss compensation within the members of a CCCTB company group or without; and on the specific setting of the allocation mechanism for the distribution of the consolidated tax base. However, Fuest et al (2007) concluded that the implementation of the CCCTB system will lead to average decrease of the European tax base by 20 %, contrary the study of the company Ernest and Young (2010) indicated that the compulsory CCCTB system will cause the increase of the tax revenues nearly by 0.2 %.

The other group of researchers are focusing on the comparison of the CCCTB system with the current system of separate accounting (Alshuler and Gruber, 2008, Gresik 2010 or Ortmann et al, 2014) with the objective to evaluate what kind of effect will have the introduction of the CCCTB system for an individual company. Irrespective to the fact that the CCCTB will constitute new rules for the calculation of the tax base, it will not affect the national general accepted accounting principles (GAAP) of involved countries, therefore each company will calculate its own profit/loss based on the national accounting rules, which will be adjusted into the tax base according to the provisions for the CCCTB system. With the respect to the Czech tax and accounting legislation it has to be mentioned, that the procedure for the determination of the tax base will not be different in comparison with the currently used system in which the calculated profit/loss is outside the accounts adjusted on the tax base and where the provisions of the Czech Accounting Act (Zákon o účetnictví 563/1991 Sb., as amended) are not fully consistent with the provisions of the Czech tax legislation mainly represented by the Income Tax Act (Zákon o daních z příjmů, 568/1992, Sb., as amended), these are for example the provisions for the depreciation of fixed assets or for bad debts.

The Czech Republic also disagreed with consolidation of the tax base and with the optional implementation of the CCCTB system. Based on the opinion of the Czech government, the Czech Republic will pursue for the most beneficial setting of the allocation mechanism with the objective to eliminate the possible negative consequences of the implementation of the CCCTB system on the national budget. Despite of the negative position of the Czech Republic, the Czech Parliament stated that the CCCTB Draft Directive contains plenty of rational provisions which can be beneficial also for the national tax legislation. These are mainly provisions for bad debts, offsetting of the tax loss only against to positive tax base without the time limit or the possibility for the depreciation of the assets as the "set of assets".

The paper focuses on the main differences for the determination of the tax base stated by the CCCTB Draft Directive and the Czech tax legislation as were defined in the statement of the Czech Parliament on CCCTB system no 379-E and their application on the model examples to highlight the identified differences in practice.

3   Objective and methodology

The problematic provisions of the CCCTB Draft Directive were identified in the light of the Czech tax legislation, afterward these provisions were discussed and applied on the model example with the objective to highlight the differences between compared provisions.

For the identification of the most problematic issues of the Czech tax legislation in comparison with the provisions of the CCCTB Draft Directive was the statement of the Czech Parliament no. 379-E mainly exploited. The comparison of the Czech Income Tax Act provisions is provided for the amendment effective since 1. 1. 2015.

4   Results and Discussion

With respect to the rules for the determination of the tax base according to the CCCTB Draft Directive it is possible to identify few of them which are in the line with the rules for the determination of the tax base according to the Czech Income Tax Act (ITA). These are as following:

- a computed profit/loss according to the national GAAP as the starting point for the determination of the tax base;
- a compliance of the accrual and realization principle for costs and revenues recognition;
- an exhaustive list of deductible costs, wherein as the eligible costs are considered these which are spent for the purpose of the business of a respective company;
- special provisions for bad debts and reserves;
- three categories of fixed assets, where the financial assets and plants, artworks and collections are not eligible for depreciations as well as all tangible and intangible fixed assets which purchase price does not exceed a set limit;
- special provisions for the transaction arising between the related parties (arms-length-principle);
- the possibility for the tax loss offsetting against to the future profit;
- the definition of the tax period as the period of 12 consecutive months;
- special rules for the determination of definition of valuation of different types of assets.

The above mentioned list indicates the main common features of the Czech ITA and the CCCTB Draft Directive regardless to the fact, whether these provision determine completely the same rules or not. Some significant differences can be identified after detailed analysis. For example, according to the Czech ITA are entertainment costs considered as non-deductible costs, with the exemption of the distribution of promotional gifts labeled by the trading name of a respective taxpayer if its purchase costs without VAT do not exceed the amount of 500 CZK. According to the provision of the CCCTB Draft Directive will be entertainment costs deductible in their 50% amount.

The exhaustive list of deductible costs also cover the value of donations provided to charitable bodies operating on the territory of the European Union. The amount of deductible costs on this kind of donations may reach up to 0.5 % of profit of a respective tax period. According to the Czech ITA are all donation considered as non-deductible costs, but provided these costs fulfill special provision of Art 20 of ITA a tax payer may claim for the tax allowances up to 10 % of calculated tax base decreased by the tax loss of previous year(s).

The next very important difference is the tax loss offsetting relief against to the future profits. According to Art 34 of the Czech ITA, the tax loss occurred in a taxable period may be offset against to the future profits in the following five years. Whereas the possibility for the loss offsetting is limited by the Czech ITA, the CCCTB Draft Directive allows for the loss offsetting without any time limitation. Moreover the CCCTB Draft Directive allows the loss offsetting within the members of the same CCCTB company group. It should be noted that as the eligible company for the CCCTB group will be considered that one which fulfill the criterion of ownership with a threshold of >75% share on capital, criterion of control with requirement of >50% proportion on voting rights and >75% share on rights profit. The possibility for the loss offsetting within the company group constitutes for the most European Union Member States a threat, since they are worried about of the decrease of overall tax base.

Their assumption may not be met, since the distribution of consolidated tax base will be based on three macroeconomic factors which should have the highest impact on the generated profit of a respective company. These are average volume of tangible fixed assets, volume of sales and payroll costs in the combination with the number of employees. These factors will be reflected in the allocation formula (i.e. formula apportionment) with equal weight. The proportion of a respective member of the CCCTB company group on the consolidated tax base will be calculated as its share on overall volume of these factors. Therefore the distributed share to the respective company member should reflect the proportion of carried out economic activity by this company, respectively the actual amount of the tax base taxed by a respective company will be mainly influenced by its proportion on overall volume of these three factors. This situation can be easily shown on following example in Table 1, where the one company in a group reports positive tax base, while the other operates with loss. In situation of possible loss offsetting, the overall tax base reaches up to 20,000 EUR and each member of a group will tax part of this tax base which will be calculated based on the allocation formula. In case of application of common rules for the determination of tax base without its subsequent consolidation, the Company A would tax 50,000 EUR whereas the tax liability of Company B will be zero.

With regard to the consolidation of the tax base within the company group has to be also mentioned that this system is not allowed by the Czech tax legislation. Specific group companies are obliged to consolidate their accounts, but they are not obliged to consolidate their tax base, while the purpose of the consolidated reporting of the group company is to provide the results of the whole group.

Table 1: Consolidation of tax base with possible loss offsetting

in thousands EUR	Company A	Company B	Total for a group
Tax base	50	-30	20
Volume of tangible fixed assets	4	9	13
Volume of sales	8	12	20
Number of employees	17	15	32
Labor compensation	11	7	18
Share on consolidate tax base	42.63%	57.37%	100.00%

Source: Own adaption

Another important differences between the tax legislation imposed by the Czech ITA and the CCCTB Draft directive are the rules for the recognition of fixed assets and its depreciation. Assets will be recognized as fixed assets if its acquisition costs exceed the amount of 1,000 EUR and if this asset can be effectively used for the period a longer of one year. As an eligible assets for the depreciation will be according to the CCCTB Draft Directive considered tangible fixed assets with the exception of lands, artworks and collection and intangible fixed assets. While the fixed assets is divided into six depreciation categories according to the Czech ITA, the CCCTB Draft Directive distinguishes between two depreciation categories: buildings and other assets. For the purposes of depreciation there will be no difference on operation of a respective building, i.e. all buildings will be depreciated for the period of 40 years. The depreciation period for other assets will be for 15 years. The intangible assets will be depreciated for the time of its life time if it is specifiable, or will be depreciated for the period of 15 years. Moreover only the linear depreciation method will be applicable. The following examples show how the different depreciation method can significantly influence the calculated tax base.

Table 2 provides comparison of depreciation of a personal business car, which will be according to the CCCTB system recognized as "other assets". This type of assets will be depreciated for its lifetime which is considered as 15 years on linear basis, therefore the depreciation rate will be set as 6.67 % of acquisition costs per year. Under the Czech rules for depreciation a personal car is categorized in 2 depreciation category and depreciated for the period of 5 years. Based on the depreciation period is clear, that the depreciated amount calculated in CCCTB system will be lower, which will have positive effect on tax base from the perspective of tax liability, resp. tax revenues.

Table 2: Depreciation of personal business car

	Czech system	CCCTB system
Purchase price in EUR	17,000.00	
Depreciation period in years	5	15
Depreciation rate	11 %; 22.25 %	6.67 %
Depreciation in 1 year in EUR	1,870.00	1,133.90
Depreciation in 2 year in EUR	3,782.50	1,133.90

Source: Own adaption

Last examples in tables 3 and 4 show, what will be the effect of different depreciation method for depreciation of buildings. In this respect has to be mentioned that the CCCTB system does not introduce the different depreciation period for the manufacturing building and buildings for the administrative purposes, which is in contrary with the Czech tax legislation, where the administrative buildings are depreciated for longer period than manufacturing buildings. The difference in depreciation period may reach up to 20 years. These difference is observable on following example, where two buildings with different business purposes are employed. While the shorter depreciation period for administrative building will have negative effect on the tax base and therefore on the tax liability, the longer period for the depreciation of manufacturing period will do opposite.

Table 3: Depreciation of administrative building

	Czech system	CCCTB system
Purchase price in EUR	1,800,000	
Depreciation period in years	50	40
Depreciation rate	1.02 %; 2.02 %	2.25
Depreciation in 1 year in EUR	18,360	40,500
Depreciation in 2 year in EUR	36,360	40,500

Source: Own adaption

Table 4: Depreciation of manufacturing building

	Czech system	CCCTB system
Purchase price	1,800,000	
Depreciation period in years	30	40
Depreciation rate	1.4 %; 3.4 %	2.25
Depreciation in 1 year	25,200	40,500
Depreciation in 2 year	61,200	40,500

Source: Own adaption

In addition to the depreciation of fixed assets has to be also mentioned that for the depreciation will be eligible an economic owner of the asset. This is in contrary with the Czech tax legislation, which permits for depreciation legal owner of an asset. Another important difference in the provision for fixed assets is also in the recognition of technological improvement. According to the CCCTB Draft Directive as a technological improvement will be recognized each progression of fixed assets which acquisition price exceeds 10 % of its historical acquisition price. Therefore it is clear that the minimum acquisition price of an improvement of fixed assets needs to be a higher of 100 EUR. For completeness note, that the value for the recognition of a technological improvement according to the Czech tax legislation is stated as 40,000 CZK.

The paper summarized the most important differences in the provisions set by the Czech tax legislation and the CCCTB Draft Directive. Based on performed analysis can be concluded, that even if there are many of them which are consistent, the most crucial difference with possible significant effect on the calculated tax base constitute the rules for recognition and depreciation of fixed assets. In general, a longer depreciation period may have positive effect on calculated tax base from the perspective of a higher tax liabilities. The paper does not provide the evidence on the collection of tax revenues and also do not reflect the possible administrative costs from the implementation of the CCCTB system into the national legislation as well as the possible change of tax compliance costs.

5   Conclusion

The paper discussed common features of the provision for the tax base determination according to the Czech tax legislation and the legislation imposed by the CCCTB Draft Directive. The crucial differences in these rules were applied on model examples to highlight their impact on the calculation of a tax base in practical use. The results of the paper show that there are many common provision of both legislation, but indicated differences may significantly influence the calculated tax base. However, it is impossible to provide clear conclusion on the acceptability of the CCCTB system by the Czech Republic without the application of the provision of the CCCTB system on real data. On the other hand it has to be also mentioned that while the CCCTB may seem to be acceptable by the Czech Republic based on provided empirical evidence, the reality may be different in the case of achieving of the stated objectives of the CCCTB system to increase the competitiveness of the European companies.

Acknowledgements

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Factors Affecting the Backward-Looking Firm-Specific Effective Tax Rates in the EU Countries

Květa Kubátová[*] – Renata Josková[†]

Abstract. The aim of this paper is to find out, what affects the amount of effective corporation tax rates in member states of EU. Backward-looking firm-specific effective tax rates are used here. These are rates, which are based on the accounting of individual companies (microdata) and they are the proportion of the really paid tax and the accounting result of the company. This indicator simply summarises impacts of the tax act (tax base adjustment, various deductions and tax credits, exemptions etc.) on the effective burden of the company, and at the same time it reflects behavioural effects, where companies try to evade taxes. The method of simple regression on the basis of 50 randomly chosen European companies is used to find out, if the total GDP, number of employees, costs on research and development and depreciation time of machinery and buildings have any impact on the effective tax rate. As for GDP, the size of the company according to the number of employees and costs on research and development the correlation with the ETR ratio was confirmed on the 5 % level of the significance, however, depreciation time of machinery and buildings do not have any statistically significant impact on ETR.

Keywords: effective tax rate, factors of effective tax rate, corporation tax rate

JEL Classification: H25

1 Introduction

It is generally known that effective tax rate of companies does not depend only on the nominal tax rate, but it is a result of other factors (see e.g. Jakobs and Spengel, 1999, or Kubátová, 2011 for various methods of effective tax rates). This concerns both factors, which are directly incorporated in tax laws and determine the tax base, on which the rate is applied, and behavioural effects, as tax subjects try to evade taxes by means of a changed behaviour.

The indicator, especially in the international comparison, has some weaknesses. Jakobs and Spengel (1999) point out the limited expressive capabilities of the indicator. They claim that these weaknesses include above all a complete omission of the taxation of shareholders, the problem of foreign source income (as the companies profits include foreign source income while only domestic tax). Even so, it is possible to consider the indicator quite robust for measuring of tax burden of companies.

2 The overview of literature

The study of Elschner and Vanborren (2009) dealt with the calculation of EATR (effective average tax rate) for individual member states of EU and explored, what affects them. The authors calculated rates as ex ante and fictitious on the bases of tax laws and known or expected values of certain indicators, which affect effective tax rates (e.g. assumptions about the structure of investments, interest rate etc.) The main factors for EATR were stated to be GDP in % EU, the amount of the statutory rate, various methods of depreciation of machinery buildings and intangible assets, various types of financing of investments or enterprise and the existence of investment incentives. Ex ante rates directly depend on the mentioned indicators, as they are a part of the algorithm of their calculation.

Fernandez-Rodriguez a Martinez-Arias (2012) conduct a comparative analysis of the tax burden for listed companies in China and the United States and studies the factors that determine the effective tax rate (ETR). The application of panel data estimation procedures finds that the tax burden is determined by the characteristics of each company (size, capital structure, asset mix, profitability) and the tax policy of the government. A nonlinear relationship between ETR and size, leverage, and capital intensity was found.

Olhoft (2003) used the regressive analysis on a sample of selected corporations in the USA 1990 – 1997 to find out that ceteris paribus, larger corporations have higher effective tax rates and companies with greater pre-tax income have lower effective tax rates. This study worked with real ex post rates.

More analyses deal with the impact of effective rates on the selected dependent variable, than with the reserved relationship– the impact of selected factors on effective rates (e.g. Mazur, 2007, Kostohryz, 2013). However, the relationship is apparently mutual – certain factors (especially legal standards) have an impact on effective tax rates; companies try to adapt, they optimise taxes by changing these factors (behavioural impacts of taxes). As regards

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a simple regression, which is gradually used in this article on various variables, the direction of relationship is not decisive (the correlation coefficient is not affected).

3   Data

The effective corporation tax rate is calculated as the proportion of corporation income tax and the total economic result before taxation. From the point of view of the theory of effective tax rates, this is the method of backward-looking microview or real effective tax rate.

The data necessary for the calculation of the effective tax rate in 2011 are obtained from the database Amadeus (2014), as well as the amount of inflation, number of employees, amount of costs on research and development. The random number generator (Online generátor náhodných čísel, 2014) generates 50 companies from the file of 5 003 417 companies from individual EU member states and these 50 companies represent 22 countries from 27 EU member states. Five countries, which were not generated, include Estonia, Cyprus, Latvia, Lithuania and Malta.

The GDP values of individual countries expressed as % from the total GDP in EU-28 for 2011 are obtained from the World Economic Outlook (International Monetary Fund, 2014). The depreciation time of machinery and buildings is obtained from publicly accessible information about tax systems of individual member states. Calculations were made by means of the program Gretl (2012).

4   Descriptive statistics

The method chosen to enumerate the real tax burden of companies in different industries of European countries in 2011 was the method of backward-looking microview, in particular the real effective tax rate, which uses the real ex-post data from financial statements of particular companies. The data obtained from the database Amadeus was inserted into the formula created beforehand. The manner, on the basis of which individual industries were divided, is derived from the Classification of Economic Activities (CZ-NACA).

According to the similar level of rates, individual European states were divided into six groups, which differed by the range of rates. Effective rates in all industries typically reach relative low and positive values (around 10%) for the first group, which includes Romania, Bulgaria and Czechia. France, Croatia, Latvia, Hungary, Slovakia and Slovenia form the second group with positive effective rates in the range of 3 - 30%. Belgium, Germany, Austria, Lithuania, Sweden and Luxembourg are in the third group, where the rates have both positive values (2 - 35%) and negative values (od -2% do -27%). What is common for Finland, Great Britain and Greece, which form the fourth group, is that only one different industry reaches relatively high rates around 50% and then other positive rates move in the range from 3% to 23%. The fifth group with low positive effective rates and very low negative rates includes Estonia and Netherlands. The last group, where effective rates reach up to 100%, include Poland, Spain, Malta and Italy. Denmark is the only country, which does not pertain to any of the mentioned groups. Most of its industries have positive rates, which move from 1% to 40%, the effective rate has negative values (-56%) only in the industry "Agriculture, forestry and fishery" (A).

Effective corporation tax rates reach positive values in the range of 0 – 20 % in most industries of EU, then in the range of 20 to 40% and very few effective rates reach other ranges. The most frequent representation of effective rates in the interval 0 – 20% are in the industry "Education" (P) and the rates in the interval 20 – 40% in the section "Water supply; activities related to waste water, wastes and remediations" (E). On the contrary, most effective rates with negative values in the range -20 – 0% appear in the industry "Production and distribution of electricity, gas, heat and air-conditioning" (D).

5   The relationship of selected factors and effective tax rate

The relationship is gradually searched for between the effective tax rate and the following factors taking into consideration the overview of literature mentioned above:

- GDP in % EU-28
- size of companies according to the number of employees
- costs on research and development
- depreciation time of machinery
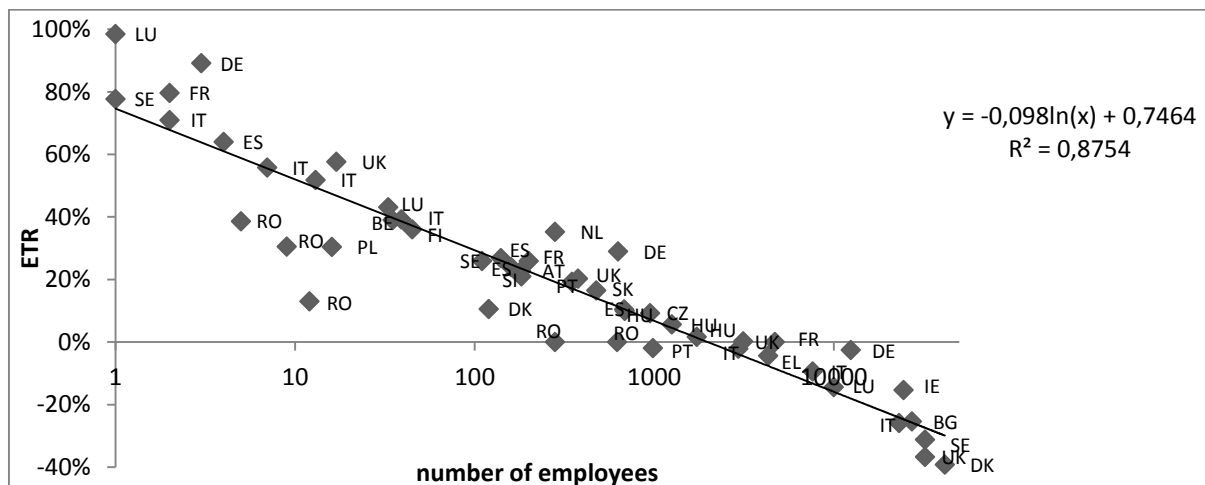- depreciation time of buildings.

In the study of Elschner and Vanborren (2009), GDP in % EU-28 was one of the basic factors, which affected the amount of the fictitious EATR. The question is, whether GDP in % EU-28 has any impact on the effective tax rate as well. The file of 50 randomly selected companies includes companies from the same country (e.g. VB, FR, IT, …). These repeated identical values of GDP of companies from the same country could lead to distortion of results and this is why just one representing company was selected for these countries on the basis of the size of assets. The relationship of effective tax rate on GDP is verified only for 22 from 27 EU member countries.

Figure 1: The relationship between GDP in % EU-28 and effective tax rate in 2011

Source: database Amadeus (2014), IMF (2014), one's own calculation and adjustment

The relationship is graphically illustrated in the Figure 1 and the test of the correlation coefficient refuses the zero hypothesis on the significance level. A strong positive relationship between GDP in % EU-28 and ETR was confirmed.

One of the potential factors, which can have an impact on the amount of effective tax rate, is the size of the company. It is possible to determine the company size on the basis of several criteria. This work uses the criterion of the number of employees. The information about the number of employees of 50 selected companies are available for 22 of 27 EU member states, so the following hart 2 illustrates data of the file of 50 companies from 22 European countries.

Figure 2: The relationship between the number of employees and effective tax rate in 2011

Source: database Amadeus (2014), one's own calculation and adjustment

The relationship between the number of employees and the effective tax rate seems quite clear at the first sight. The correlation coefficient reaches -0.66. There is a negative correlation between the size of the company and the effective tax rate, which is also proved by the significance test on the significance level 0.05.

We can assume that a larger company would have greater possibilities of adjusting the tax base by means of various deductions, or how to directly affect the amount of taxes by various credits. Of course, it also depends on the fact of how much deduction and credits the given state provides. This hypothesis can be best demonstrated on the case of Luxembourg and Romania.

You can see on the Figure 2 that the effective rate of a company in Luxembourg, which employs just one employee, reaches up to 99%, while a company employing 10,010 employees has the effective tax rate -14%. This is caused by the fact that larger companies with free financial funds can invest for example into environmental protection and then apply a tax deduction of 7% (investments up to 150 thous. €) or 3% (investments above 150

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thous. €). It is worth it for companies in Luxembourg to invest into new technologies as well, as they can then use the deduction of 30% from the nominal value or up to 30% of the taxable income. Also employing of long-term unemployed persons is supported here in the form of a tax deduction of 15% of the annual salary of the given person. You can also deduct 10% of costs for a professional training of employees.

On the contrary, the effective tax rate of Romania decrease with the increasing number of employees, however, effective tax rates differ by 39% percentual points between the smallest company (5 employees; ETR 39%) and the largest companies (621 employees; ETR 0%). The lower decrease of the effective tax rate is caused by the fact that companies in Romania can apply just one deduction in 2011, i.e. 50% of costs expended on the professional training of employees.

Another form of a deduction, which has an impact on the effective tax rate in companies of various sizes, is a tax loss and its possibility of transfer. The Luxembourg companies can transfer their tax loss forward without limits in 2011, while companies in Romania can only transfer it to 7 years in the future.

The research and development brings tax benefits and it is otherwise supported in most European countries. However, this type of support differs in the individual member states. The support of research and development is sometimes even combined with investment incentives. Taking into consideration the unavailability of information about research and development costs, it is not possible to explore the relationship between these costs on research and development (R&D) and the effective tax rate in each member state. That is why the file of 50 companies is narrowed down to the file of 17 companies from 7 European countries.

Yet, the results appear very clear – see the Figure 3. The logarithmic function, by means of which 88% variability effective tax rate was explained, was selected as the best possible function to balance the data file. According to the correlation coefficient there is a strong negative relationship (confirmed at the significance level 0.05) between the costs on R&D and the effective tax rate.

Figure 3: The relationship between costs on research and development and effective tax rate in 2011
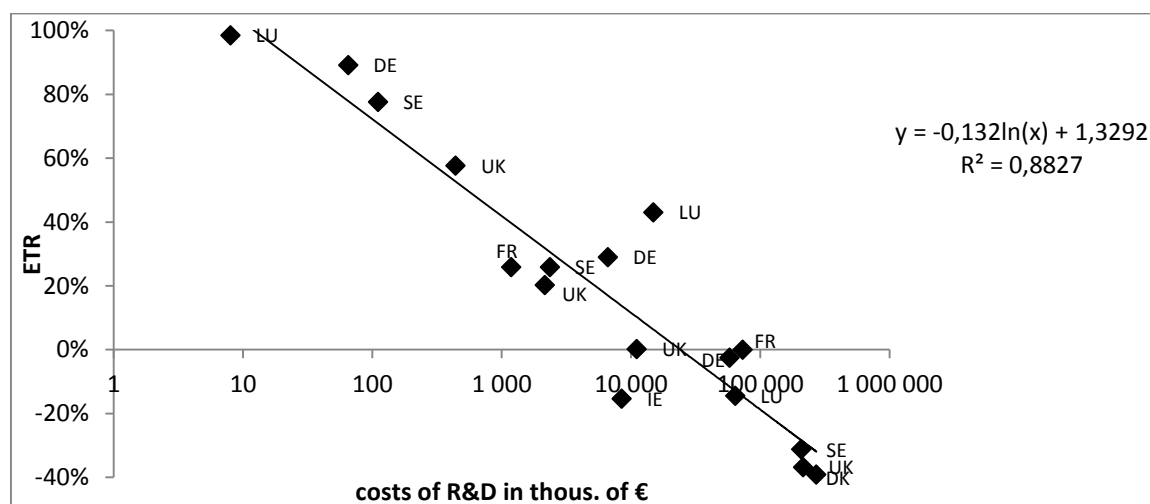
Source: database Amadeus (2014), one's own calculation and adjustment

Costs on research and development can be deducted from more than a hundred per cent in some states. This system exists in the above-mentioned countries only in case of Great Britain and Denmark. In Great Britain, small and medium companies can deduct 175% in 2011 and large companies 135% (limit 12,600 €), while it was only 125% in Denmark. This explains why the lowest effective tax rates appear in Great Britain and Denmark. Germany has the possibility of deduction of up to 50%. In France, the amount of deduction is derived from the time of expended costs on research and development. The deduction is 40% in the first year, 35% in the second year and 30% for 100 mil. € and only 5% for more than 100 mil. € in the third year. The only finding for other states (Luxembourg, Sweden, Ireland) was that costs on research and development are tax deductible.

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Figure 4: The relationship between the depreciation time of machinery and effective tax rate in 2011
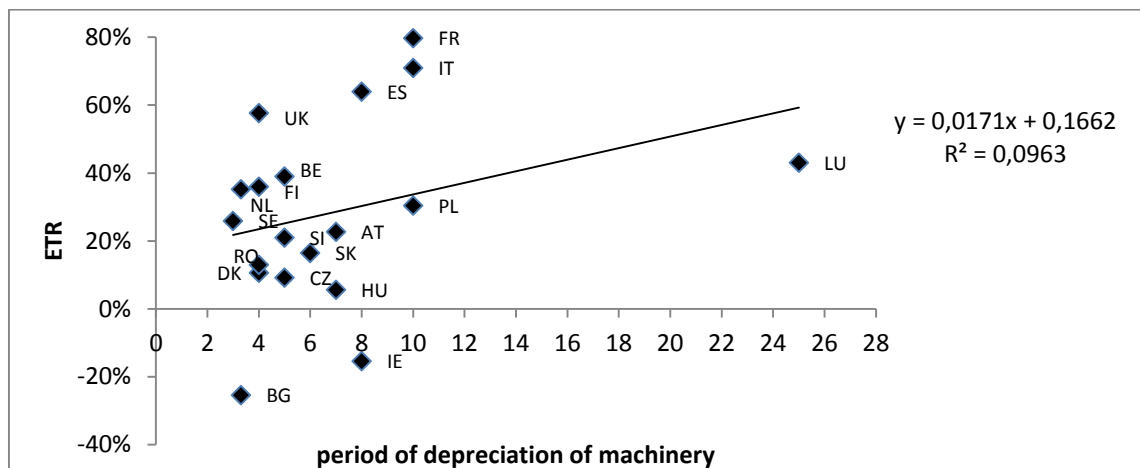
Source: database Amadeus (2014), one's own calculation and adjustment

The impact of the depreciation time of machinery is explored in this work for the reason of its proven impact on the effective tax rate in other methods of calculation of the effective tax rate. 19 companies representing the individual European countries were selected from the file of 50 companies, in order to compare the depreciation time and the effective tax rate. The data for Malta, Cyprus, Estonia, Latvia and Lithuania are not available. The data for Germany, Greece and Portugal are not mentioned either, although the effective tax rate in these countries is known, as the information about the depreciation time of machinery was not available.

It follows from the distribution of points in the Figure 3 and on the basis of the test of significance that depreciation time of machinery is not a factor, which would affect the level of effective tax rate. Also the relationship between the depreciation time for ETR has not been proven (we don't show the Figure anymore).

6   Conclusions

The article dealt with the factors, which affect effective corporate taxes in EU countries. Ex post effective microeconomic tax rates were calculated for randomly chosen 50 companies in EU on the basis of the database Amadeus and a correlation analysis was used to explore the relationship between this indicator and GDP in % EU, size of the company according to the number of employees, costs on research and development, depreciation time of machinery and depreciation time of buildings.

As for GDP, the size of the company according to the number of employees and costs on research and development the correlation with the ETR ratio was confirmed on the 5 % level of the significance, however, depreciation time of machinery and buildings do not have any statistically significant impact on ETR. Results concerning the impact of GDP and the size of companies are in compliance with the previous research of other authors; the impact of costs on science and research was not usually confirmed. The result concerning depreciation times is in a seeming contradiction to the fundamental study of Elschner and Vanborren (2009), but we must realise that these authors used the ex ante fictitious index and the depreciation time is significant in its construction and directly determines it, although depreciation times may not be reflected in the real index.

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Possibilities of Revenue Increase in the Health Care System

Lenka Láchová[*] – Alena Maaytová[†]

Abstract. The CR utilizes the national health insurance model that is based on statutory obligation of every citizen to pay health insurance. The aim of the text is to verify a possibility of increasing the financial funds collected within the health insurance and to contribute to more consistent application of the ability to pay as well as in case of different income types. For the analysis there were applied the data of the income tax returns by individuals for the taxation period of 2012, available from the ADIS tax return database of the Ministry of Finance and the Financial Administration of the Czech Republic. In respect to the differentiated drawing rate of health services in dependence on the age structure and gender, the data was classified according to these two criteria.

Keywords: public health insurance; redistribution; personal income tax

JEL Classification: H 21, H 23, I 13

1   Introduction

First as to ensure a functional system of health care it is necessary to specify properly priorities, a proper organizational structure of health care, a working information system and determination of method of health service financial security. The economically developed countries respect the principle of solidarity in health policy. The emphasis on solidarity of health care financing is confirmed by the Declaration of the World Health Organization (WHO of 1998) with the aim to support the program the Health for everybody in 21st century. Health in the Declaration as well as in the Constitution of the Czech Republic is one of the principal human rights; health improvement is then the main objective of the social and economic development. Realization of this principle requires justice and solidarity (e.g. "Funding health services and allocating resources," calling for "sustainable financing and resource allocation mechanisms for health care systems based on the principles of equal access, cost–effectiveness, solidarity, and optimum quality "HEALTH21: Health - for–all. Ministry of Health). In creation of health policy management the most of OECD countries respect the following principles:

- drawing the health care does not depend on socioeconomic position of the individual,
- payment to health service does not depend on health condition of the individual (Hsiao, Heller).

The existing health care systems are connected to social, economic, cultural and political development of the individual countries. It may be distinguished a mixed system with superiority of liberalistic elements, the system based on compulsory health insurance (Bismarck), National health service and socialist model (Gladkij). The system of national health service and the one of public health insurance correspond to the principle, according to which there are collected financial funds. In both systems the individuals contribute according to ability to pay. The difference between the systems consists in the fact that in the public health insurance the "health tax" i.e. the public health insurance is paid whereas in the National Health Service system, the funds are collected within general taxes. (Kutzin, Kashin, Jakab, 2010)

2   Starting points

The public health insurance system financed by compulsorily paid solidary financial contributions, that are redistributed, enables for insured persons a general accessibility to health services. For the public insurance it applies that:

- does not exist a link between the health condition and amount of paid insurance,
- drawing the health care is made according to objective needs and health condition (Goulli, Mertl, Pasovská).

The system applied in the Czech Republic (Bismarck type), is based on the existence of the general health insurance, which is compulsory for the majority of inhabitants. In the CR according to the rules provided by the law, the government reimburses the premium for the citizens that are not economically active. The premium amount and manner of payment are regulated by Act No. 592/1992 Coll. on premiums for general health insurance, as amended by Act No. 362/2009 Coll. The health insurance paid by government for certain categories of insured persons is not "insurance" in the true sense of the word, but it is a certain subsidy, by means of which the government regulates the fund volume in the public health insurance fund. Insurance premium rate is 13.5%. The rate does not respect the health condition of an individual, but it respect individual's ability to pay.

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Under the Act No. 592/1992 Coll., on general health insurance premium, the premium has been redistributed since 1st January 1993. Active payers of health insurance pay ca. 76 % of the public health insurance, but consume ca. 40 % of the health insurance expenses (MZ ČR, MF ČR 2012).

Figure 1: Structure of revenues from health insurance premiums in years 2005 - 2012
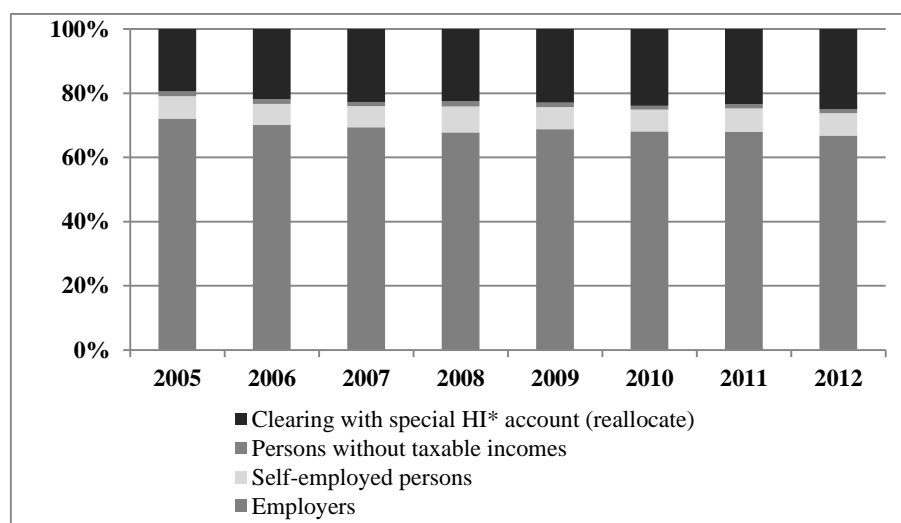
Note: *HI Health Insurance
Source: Economic Results of Health Insurance, online:< http://www.czso.cz>

Data presented in Figure 1 show different volume of revenue obtained from the different types of the insured persons. The major contributors are employees while the self-employed contribute less.

The subject of examination is to verify if the active payers group of health insurance would be, apart from persons that earn income from employment and from independent gainful activity, extended also by persons that earn income derived from capital or lease. It refers to the income that, nowadays, is not liable to public health insurance premium. Its beneficiaries, if at the same time do not have income from employment or independent gainful activity and/or are not the state insured persons, are included into the group of the so called persons without taxable income (OBZP- a person without taxable income is the insured person that for the entire calendar year is not either a state insured person or an employee or a self-employed person.

This group of persons, if having a permanent residence at the territory of the Czech Republic, is liable to pay a monthly health premium in the amount of 13.5 % from the minimum wage, valid in the given calendar year. In 2012 this sum was 1,080 CZK (8,000 CZK *0.135). In 2014 with the minimum wage in the amount of 8,500 CZK the monthly premium payment without taxable income, is 1,148 CZK. Income derived from capital and lease can reach a considerable amount by a number of persons at the same time and the question is if its beneficiaries should participate in solidary insurance according to their ability to pay when preserving the aforesaid minimum payment limit.

Income derived from capital and also from lease can be another source of income also for employees or entrepreneurs. In these situations then a natural person does not pay any premium for the health insurance from the given income types. And in concurrence of several employments or business and employment alone the summary of these incomes is taken into account in the ability to pay and influences the total sum of paid premium. Thus it comes to distortion, when a real ability to pay influences the sum of paid premium differently as per the income source type. Thus income from independent gainful activity and especially from employment is, as compared to income derived from capital and lease, disadvantaged.

Another group of persons that can earn income derived from capital and lease, is the state insured persons. For these persons the government is the premium payer for the public health insurance. If the state insured persons earn income derived from capital or lease, this ability to pay of theirs does not lead to obligation to pay premium. However if the person that is the state insured person, in this context it may refer to especially the persons receiving the old age pension or to dependants, earning income from employment or business, he/she is liable to pay the health insurance premium from these incomes as to their amount. Circumstance that it is about the state insured person, is in this case taken into account by the fact that to these persons it does not apply the obligation to pay premium at least from the minimum assessment base because the government is the premium payer for them at the same time.

The public health insurance yield serves to solidary financing of health service, and nowadays in the Czech Republic there is not a link between the amount of individual payment of premium and the level of health care

provided to the given premium payer. In terms of the solidarity principle and its relationship to the ability to pay there is not an objective reason that the income derived from capital and lease would not be liable to the health tax. On the contrary, in the case of social security the exemption of this income type from payment to annuity assurance is reasonable, because this insurance shall protect in situations that limit significantly the insured person in his ability of economic activity. However the income derived from capital and lease is earned by the persons without dependence on their ability of active activities and is a result of the paid-in capital.

The income derived from capital is liable to the premium, for example, in Slovak Republic (Ministry of health of SR 2014). The premium rate is 14 % and corresponds to the sum of premium rates paid by an employee and employer and to the rate paid by self-employed persons. Within the same rate amount the premium of other income including the income from lease is also collected. Dividends paid and profit shares are subject to insurance. Capital revenue, which constitute a separate tax base such are e. g. interest, are taxed by withholding tax, are not subject to premiums for public health insurance.

3   Data and Analysis

The analysis starting point is the data on the amount of the income derived from capital and lease that could be subject to the premium of the public health insurance, obtained from the personal income tax return for the taxation period of 2012. This data is recorded summarily in the ADIS system of the Ministry of Finance and the Financial Administration of the Czech Republic. This income type is classified in the partial tax base of the income derived from capital (§ 8 of the Act on income tax). Similarly the income from lease is classified in the partial base of the lease tax (§ 9 of the Act on income tax) in the personal income tax return.

In respect to the differentiated drawing rate of health services in dependence on the age structure and gender (Figure 2), the data was classified according to these two criteria.

Figure 2: Average health care costs covered by health insurance companies per one insured according to age groups (in thousands CZK) in 2012
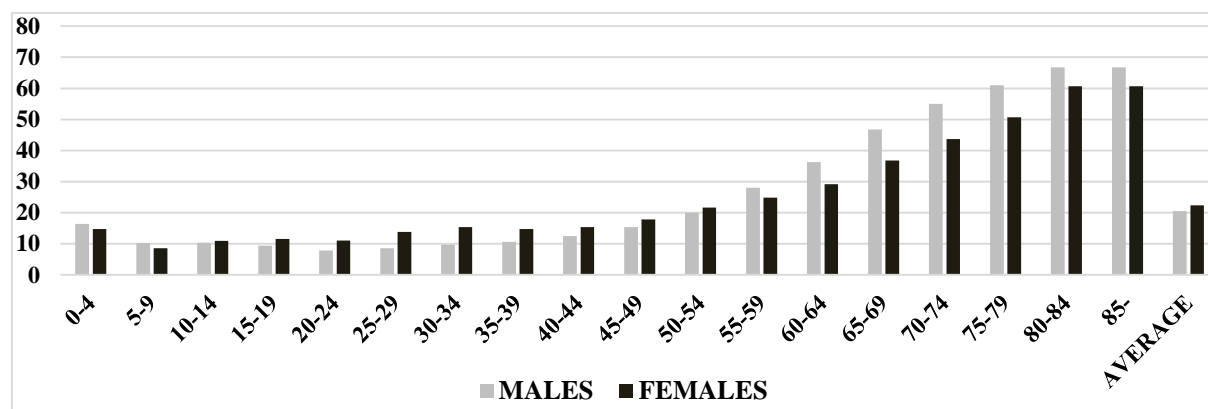
Source: Health service as a part of national economy 2013, own calculations.

For the given groups there were calculated the data on the number of taxpayers in the given classification groups, on their average partial tax bases and also on total amount of these partial bases for the selected taxpayer groups. In this structure there have been analysed also the data on the amount of partial bases of the tax on business activity and other self-employment (§ 7 of the Act on income tax). A part of the income derived from capital within the personal income tax is taxed with a special withholding tax at the source and thus is not reported in the personal income tax returns. The data on this group of income derived from capital can only be estimated on the basis of the collection of withholding tax on income of individuals. Information on the tax revenues collected by the withholding tax of personal income is released in the Tax Statistics published on the page of the Ministry of Finance and in the Information on the activity of the Financial Administration of the CR.

For the analysis there were applied the data of the personal income tax returns (Under the Act on income tax) for the taxation period of 2012, available from the ADIS database of tax return of the Ministry of Finance and the Financial Administration of the Czech Republic. Furthermore there were utilized the data on the withholding tax collection development of the personal income tax for years 2005 to 2012. However within this income group it is not possible to distinguish which part is earned from the income derived from capital and which one from other income types taxed by withholding tax such as, for example, the income of contract of work to certain amount.

4   Results and Discussion

From the processed tax return data the personal income tax for the taxation period of 2012 it implies that the income in the partial tax base from income accruing from capital pursuant to § 8 (of the Act on income tax) was

reported in the tax return by total of 183,467 payers, from them the majority (135,301) is represented by male payers. In the male group the biggest age category was the one from 40 to 49 years that, at the same time, attained the highest average income and the total tax base of this age group of men was more than 3.6 bn. CZK, which is more than 55 % of the total partial tax base of the income derived from capital for the male group in total. Significant share (28.4 %) in total income derived from capital in the male group belongs also to the age group of above 60 years, where it is possible to expect a high share of the state insured persons. The female group participates in the total income amount in the partial tax base of income from capital at more limited degree (26.4 % of the total number of payers with this income type) and attained only 12.3 % of the total partial tax base summary. The average tax base structure of the income derived from capital according to gender and age structure is shown in the Figure 3. High level of the average tax base is shown also by the age group under 19 years with both gender. However it refers to a group with a small number of payers (in total 49).

Figure 3: Average partial tax base from income accruing from capital pursuant to § 8, from lease pursuant to § 9 and form business activity and other independent gainful activity pursuant to § 7 of the Act, 2012
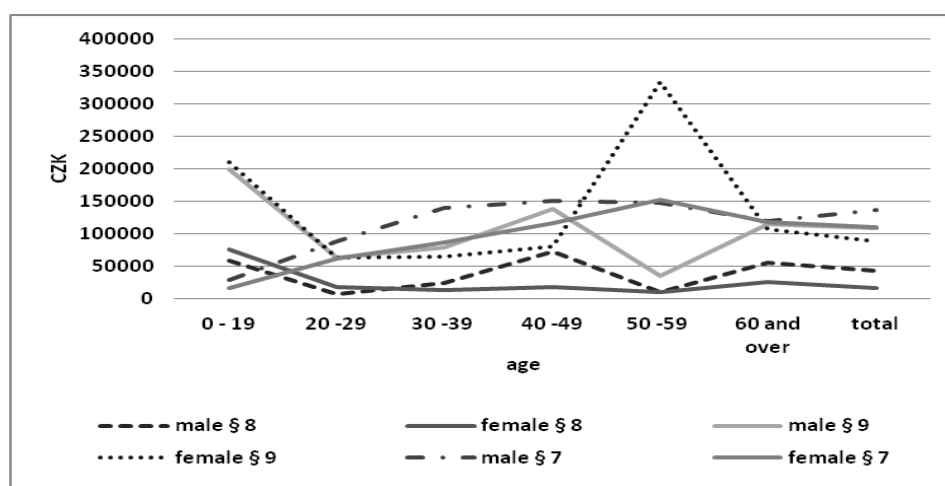
Source: General Financial Directorate (2014), own calculations

If we abstract from the use of minimum and maximum assessment base and at use 13.5 % rate, we can expected potential receipts from health insurance from taxpayers with capital income reported on the tax return of approx. CZK 0.9 billion (0.8 bn. from male payers and 0.1 bn. from female payers). As mentioned, within income types taxed by withholding tax at the source, it is not possible to distinguish, which part of the collection is earned from the income derived from capital and which one from other income types taxed by withholding tax at the source such as the income of contract of work to certain amount etc. Last years, as shown in Table 1, the income tax collection amount at the rate of 15 % reaches the sum of ca. 10 bn. CZK, which, applying the additional health insurance premium amount of 13.5 % for the income derived from capital could create an annual additional source of income in the sum of ca. 4.5 bn. CZK.

Table 1: Revenue from Personal income tax from withholding tax 2005-2012 in bill.CZK

year	2005	2006	2007	2008	2009	2010	2011	2012
bill. CZK	6.42	7.43	8.58	10.38	10.13	10.19	11.05	13.24

Source: General Financial Directorate (2013), Informace o činnosti Finanční správy ČR, own calculations.

In the case of income from business activity and other self-employment (§ 7 of the Act on income tax) the number of tax payers exceeds 967 thousand - 67 % of them are represented by men and 32.5 % by women. In both gender groups there is a similar frequency of payers in the individual age groups. However, significant differences can be observed in the average tax base amounts with age groups in connection to the reproduction cycle (Figure 2). From the gender point of vimw we can assume with the age groups of women between 20 and 39 years the influence of care of children. In the period from 50 years and more the gender differences of the above reported tax bases balance. The reported amount of average tax bases with the individual groups of age and gender points to significant application of minimum assessment bases in collecting the public health insurance premium. Potential of the public health insurance premium in applying the rate of 13.5 % for the assessment base in the amount of the business income tax base (without applying the parameter 0.5) and without impact of minimum assessment bases the collection amount could reach ca. 16.7 bn. CZK, or in applying the assessment base reduction to 50 % of the tax base, the sum of 8.3 bn. CZK (6 bn. from male payers and 2.4 bn. from female payers).

In the personal income tax return, the incomes from lease are classified in the partial tax base from lease pursuant to § 9 of the Act on income tax. From the processed data of the personal income tax returns for taxation period of 2012 it implies that the income in the partial base income from lease in the income tax return was reported by total of 255,082 payers. In this income bracket the representation of men and women is more balanced than in case of the group of the income derived from capital and is 56.5 % for male and 43.3 % for the female group. As well as the attained income level of both genders is more balanced. The age groups potentially including the state insured persons (dependants and persons receiving the retirement annuity) thus the group under 19 years of age and the one above 60 years) attain in average the relatively high average income, which documents their ability to pay. The highest average income (334 thousands CZK) was attained by women in the age group 50 to 59 years (Figure 2). The average partial tax bases reach similar values as the average of the partial tax base from from an independent activity pursuant to § 7 of the Act of income tax. The advantage of the partial tax base in the form of income from lease is its stability and independence on the age of the taxpayer and independence on the phases of the reproductive cycle and childcare.

Summary amount of the partial rental income base was 25.4 bn. CZK in 2012, which in abstracting from a possible application of minimum and maximum assessment base and use the rate 13.5 % represents the potential of the health insurance premium collection in the amount of ca. 4.3 bn. CZK (2.1 bn. from male payers and 2.2 bn. from female payers).

5 Conclusions

The subject of examination was to verify if the active payers group of health insurance would be, apart from persons that earn income from employment and from independent gainful activity, extended also by persons that earn income derived from capital or lease. The analysis was based on the data obtained from the personal income tax return for the taxation period of 2012 from the ADIS system of the Ministry of Finance and the Financial Administration of the Czech Republic. Furthermore there was utilized the data on the withholding tax collection development of the personal income tax for years 2005 to 2012. With regard to the differential cost of health care by age structure and gender criteria data were classified according to these two criteria. For the given groups there were calculated the data on the number of taxpayers in the given classification groups, on their average partial tax bases and also on total amount of these partial bases for the selected taxpayer groups.

At capital income in the male group the biggest age category was the one from 40 to 49 years that, at the same time, attained the highest average income. 28.4 % in total income derived from capital in the male group belongs to the age group of above 60 years, where it is possible to expect a high share of the state insured persons. The female group participates in the total income amount in the partial tax base from income accruing from capital to a more limited degree.

In the partial tax base income from lease pursuant to § 9 of Act on income tax the representation of men and women is more balanced than in case of the group of the income derived from capital (56.5 % for male and 43.3 % for the female). As well as the attained income level of both genders is more balanced. The age groups potentially including the state insured persons (dependants and persons receiving the retirement annuity) thus the group under 19 years of age and the one above 60 years) attain in average the relatively high average income, which documents their ability to pay. The average partial tax bases reach similar values as the average of the partial tax base from business activity and other self-employment.

There was estimated the potential revenue from the health insurance: in case of capital incomes to 0.9 bill. CZK, capital incomes taxed by withholding tax to 4.5 bill. CZK and rental incomes to 4.3 bill CZK. These estimates are based on the data from the tax declarations and the premium rate of 13.5%. Additional increase of the revenue from the health insurance is possible through the change in the assessment of the self employed when this base would be harmonized with the partial base of the tax on business activity and other self-employment, i.e., elimination of the parameter 0.5.

Further possibilities of revenue increas of the health insurance funds
- Annual adjustment in dependence on inflation.
- Change of payment for state insured persons – amendment of the act – (children – parents – higher rate).
- Changes in rate and assessment base amount of independent business person. Extension of the income groups that are liable to premium for the public health insurance by the income derived from capital and lease. To collect from this income the premium according to the ability to pay applying the minimum assessment base under similar conditions as in case of independent business person.

Income derived from capital or lease could be the subject to insurance also in the case that payer is a person that is a state insured. Similarly as well as the incomes of state insured persons earned from employment or business are subject to insurance with the exception of the application of the minimum assessment bases. However for this group of persons the insurance impact mitigation represents the non-application of the minimum assessment bases. The advantage of the tax base in the form of income from lease and in the form of income from capital is its

stability and independence on the age of the taxpayer. This type of tax base is not affected by the phases of the reproductive cycle and childcare.

Acknowledgements

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Systemic Corruption in Public Procurement: Case of the Czech Republic

Ivan Langr[*] – František Ochrana[†]

Abstract. Within analysis of corruption in public procurement, economic papers tend to concentrate on the search of quantified relationships between openness, transparency in public procurement and corruption. This examination is appropriate to supplement by qualitative structural and functional analysis that may explain the origin of the "working mechanism" of systemic corruption in public procurement. Based on cases of public procurement in the Czech Republic, the presented paper develops a qualitative explanatory model of systemic corruption in public procurement. Within systemic corruption there emerge parallel informal structures that interfere with the preparation of public contracts even before the public tender is officially announced. They prepare plans of large-scale public investments and still ahead of the official tender announcement decide upon who shall implement the given public contract, which firms will participate with subcontracts and how to "split the prey". Following the official announcement of the tender, rigged formal phases of public procurement (pre-bidding, bidding, post-bidding) only "secure" the already agreed upon outcome of the public tender.

Keywords: public contracts, corruption, systemic corruption, explanatory structurally-functional model of systemic corruption.

JEL Classification: D23, H57

1   Introduction

The problem of corruption ranks among topical theoretical and practical problems, addressed by major international institutions such as World Bank (see e.g. Ware et al., 2007), OECD (see 2009), European Commission (see EU, 2013) and Transparency International (TI, 2006). TI (2009) specifies in total twelve factors of corruption. These include lack of sanctions, indifference, desire for personal enrichment, lack of transparency, lack of motivation, arbitrariness in career advancement, abuse of clerical power, poor running of administration, lack of clear administrative rules and standards, pressure from superior or higher-ranking personnel, excessive protection and guardianship, respectively, other factors. Corruption may be found in various domains. One of the areas where we encounter corruption is public procurement (Vlach and Nemec, 2001).

The research subject of this paper is the problem of corruption in public procurement in the Czech Republic. The aim of this paper is to clarify the structural and functional links of the systemic corruption in public procurement and to design a clear explanatory structurally-functional model that explains systemic corruption in public procurement. The data source represent primarily analysis of the large-scale corruption case in public procurement on the level of a local government (the city of Liberec) and secondarily analysis of data contained in the document compiled by Anticorruption Endowment (2014) describing corrupt practices in public procurement at the Ministry of Defence of the Czech Republic. In preparation of the study was also drawn on the knowledge of authors gained from their multiyear-long work activity on both mentioned segments of public administration.

2   "Traditional" economic reflection of the problem of corruption in public procurement

Experts dealing with the issue of public procurement both abroad (see e.g. Domberger and Rimmer, 1994; Nemec et al., 2014; Strand et al., 2011) and in the Czech Republic (Jurčík, 2012, 2014; Kameník et al., 2011; Pavel, Kubík, 2011) note that openness of public competition reduces the risk of corruption. That is to say, corruption is related to the lack of transparency of processes in the public sector. Openness of a tender has also an impact on the final price of a public contract as shown on a large set of public contracts in the Czech Republic by Nikolovová et al. (2012). Openness of the public contest not only reduces the final price of a public contract but also increases the transparency of a public tender. It can be assumed that transparency of the competition probably also reduces the risk of corruption. This issue may be examined based on the dependence between the Corruption Perceptions Index (CPI) and the type of award procedure (see Ochrana and Maaytová, 2012). For this end there may be adopted the

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Spearman correlation coefficient (the so-called rank correlation coefficient = r_{Sp}) that allows to determine the degree of dependence between two observed attributes. For calculation of the Spearman correlation coefficient applies the relationship:

$$r = 1 - \frac{6 \sum (Rx_i - Ry_i)^2}{n(n^2 - 1)} \qquad (1)$$

The calculated coefficient is compared with tabulated critical values of the Spearman correlation coefficient. Provided $|r_{Sp}| > r_{Sp(\alpha, n)}$ then the rank correlation coefficient is significant at the level of significance α (correlation of the monitored variables has been established). If $|r_{Sp}| < r_{Sp(\alpha, n)} =>$ rank correlation coefficient is not significant at the level of significance α (correlation of the monitored variables has not been proven). Results of calculations are shown in Table 1.

Table 1: Dependence (Spearman's coefficient) between CPI and the given type of award procedure

	open	Restricted	negotiated	negotiated without publication	accelerated restricted	accelerated negotiated	competitive dialogue
r_{Sp}	-0.1774	**0.4853**	**0.4750**	**-0.5965**	0.0769	0.0513	0.3095

Critical values **r_{Sp}**

n =27	α = 0.05	0.3822
n =27	α = 0.01	0.4915

r_{Sp} Spearman correlation coefficient
n countries EU - 27 (Denmark, Sweden, Finland, Netherlands, Luxemburg, Austria, Germany, Norway, Ireland, U.K., Belgium, France, Slovenia, Estonia, Spain, Cyprus, Portugal, Malta, Czech Republic, Hungary, Latvia, Slovakia, Italy, Greece, Lithuania, Poland, Bulgaria).
Source: Median values of the number of bids in individual countries see Strand, Ramada, Canton (2011, Table 2.25); CPI values see TI (2009). Own calculations.

The value of correlation coefficient r_{Sp} points towards a certain degree of dependence between the Corruption Perceptions Index (CPI) and some types of awarding procedures (restricted, negotiated and negotiated without publication). By comparing r_{Sp} values with the relevant critical value of 0.3822 we may reject the hypothesis of independence at the 5% level of significance. These results confirm the statistical dependence between CPI and selected types of award procedures. However, this approach has its explanatory limitations. It rests on the fact that the aforementioned quantitative analysis does not explain how corruption occurs and what type of corruption is being involved. Such an explanation provides the structurally-functional analysis of corruption in public procurement, as presented in the next section of this paper.

3   Individual and systemic corruption in public procurement

When examining corruption, it is important to find out what is the nature of corruption. Experts dealing with corruption point out that corruption may be caused both by an individual failure (Nye, 1967) or it may assume the nature of a wholly (coherently functioning) corrupt system (Persson et al., 2013). In the first case we refer to "individual corruption" while in the second case to "systemic corruption".

3.1   Individual corruption in public procurement

Individual corruption in public procurement occurs as a result of the failure of an individual. It may be one of the actors (principal, agent) of public procurement as specified by tender procedures (EU, 2013). The given individual deliberately acts to the detriment of public finances to gain its own benefit. Corrupt acting of the given actor is located into one of the stages of public procurement: T_1 (pre-bidding), T_2 (bidding), T_3 (post-bidding).

Pre-bidding involves a decision of the public administration to contract a certain good or service, including specification of characteristics of the future contract. Bidding in turn comprises the contracting process itself together with an announcement of the winning bid. Post-bidding is an implementation stage, i.e. containing the implementation of the contract and its monitoring. Individual stages are accompanied by corruption risks in awarding public contracts. Within corruption there comes to a violation of integrity of the procurement process (see TI, 2006; OECD, 2009). According to the European Commission (see EU, 2013), corruption includes 27 risks.

Among preventive measures that should reduce or even eliminate corruption risks are in turn mentioned for example principles of strengthening the integrity of public contracts (see OECD, 2009). Recommendations for monitoring, assessment and sanctioning of deviant individual behaviour are then based on the "principal – agent" model (Pratt, Zeckhauser, Arrow, 1985), based on an effective control of the involved agents (officials who prepare tender documents) and principals (politicians) who decide whether with regard to the given problem there shall be

announced a tender. Provided the politicians are "principled" principals, they may effectively assess the possible corruption risks, reveal breaches of tender rules and draw the corresponding remedy measures. That is to say, a principal is empowered to select appropriate agents to administer the public procurement, motivate them to properly conduct through various rewards and sanctions, strengthen monitoring and transparency of contracting, demand compliance with internal codes of ethics, etc. (Klitgaard, MacLean-Abaroa, Parris, 2000).

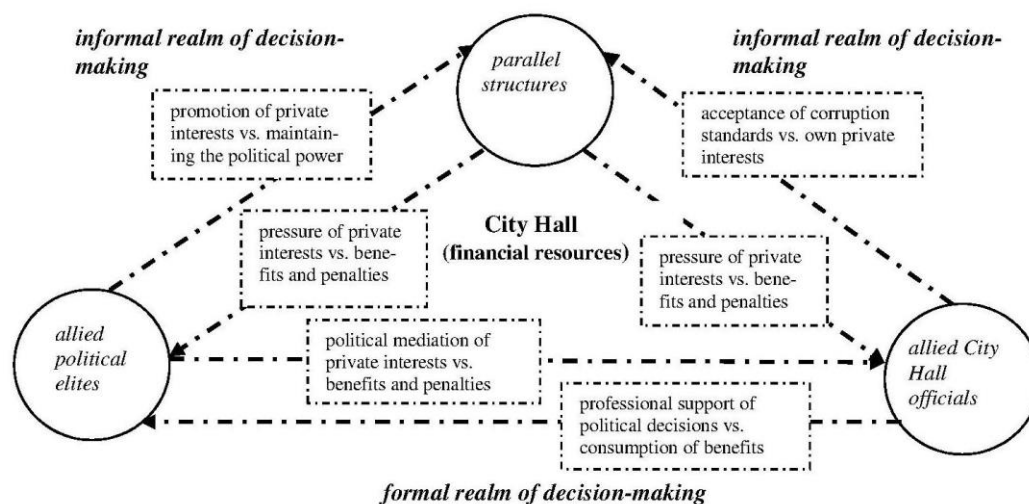## 3.2 Systemic corruption in public procurement

However, practice shows that the problem of corruption in public procurement may be more complicated than in the case of an individual failure. The cases of corruption in public procurement in the Czech Republic under our investigation show that corruption in public procurement may take the form of systemic corruption which is much more sophisticated and has a different working "mechanism" than individual corruption. Systemic corruption is a "collective action" (Persson, Rothstein, Teorell, 2013). It represents a manifestation of a failure of the whole system in which gets corruption-distorted also public procurement. The negative consequence is that such corruption-interlocked actors have the potential to corrupt both the supply and demand side of public procurement. Systemic corruption establishes new (corruption) standards. In this case, to eradicate corruption is therefore not enough to detect one or several corrupt officials, politicians and businessmen with sagging morale, respectively, deviant tendencies. In order to eradicate corruption, it is necessary to correct (liquidate) the sophisticated system that corrupts whole authorities, creates entirely new norms of corruption while requiring their compliance. This corruption system works so that it displaces non-corrupt individuals.

Within systemic corruption there emerge informal structures whose actors are not members of any elected or appointed body but they nevertheless simultaneously manage and regulate from their positions the running of public administration with the aim to promote their private interest. For such structures is also in the Czech Republic over the past decade coined the term "godfathers". This term refers to the traditional mafia relationship between a patron in the managing position and its client in a subordinate position (Langr, 2014). There comes to a mutual interlocking of corrupt structures. Such features are exhibited by the case at the Liberec City Hall.

3.3 The case of systemic corruption in the Czech Republic

When examining corruption at the Liberec City Hall, it has proven that corrupt relations have assumed the form of a triangle (see Figure 1) where key players of the corruption scandal (political elites, bureaucrats and parallel structures) entered into reciprocal, bilateral relations.

Figure 1: Institutionalised informal system of systemically corrupt decision-making at the Liberec City Hall (2000-2010)

Source: authors

Diagrammatic illustration of the examined case of corruption at the Liberec City Hall shows that it relates to systemic corruption in public procurement. This is confirmed by the revealed system information and decision-making flows of the given actors. From the figure it becomes clear that godfather informal structures coordinate and control their political and bureaucratic contacts, distribute benefits and impose sanctions while political elites oversee the corrupt operations within the formal role of their authorities. Bureaucracy has a control over resources. From the uncovered links it becomes further evident that within the domain of decision-making there interweave two levels: an informal level, operating mainly in the direction from top to bottom between the parallel structures

and political elites as well as between the parallel structures and allied officials, and a formal level, which is a part of the hierarchical operation of the institute of public administration.

The design of such a system (parallel-made structures) aims to gain an illegal profit from public finances. Such a profit is in turn distributed according to the rules of the "corrupt game of private profit from public finances". In the case that one of the involved actors violates those rules, it gets sanctioned by other actors of systemic corruption. This conclusion is consistent also with current theoretical knowledge of authors who give the general outline of systemic corruption (see e.g. Persson et. al., 2013; Vanucci, 2009). The aim of parallel structures is to extract their own economic gain from public finances. A concurrent goal of political elites is an illegal funding of their parties and campaigns.

However, the "profit mining" from public resources takes in the case of systemic corruption another (procedural and structural) nature when compared to the case of individual corruption. In systemic corruption there does not operate the institute of "principled principals", i.e. actors who within procurement processes protect the public interest (public demand for the tendered subject represented by purchases of goods, services or constructions). Principals are equally as agents within the environment of systemic corruption corrupted. The above-mentioned measures towards an increase in transparency and control, adopted to crush individual corruption, are ineffective.

Along similar lines reasons also Lambsdorff (2002) who explains the emergence of systemic corruption in the context of social relationships embedded in a certain social structure. However, the guaranty over corrupt agreements may also assume political parties whose existence depends upon illegal sources from public procurements or businesses of public administration. This may be also the case described by the already mentioned study by Anticorruption Endowment (2014). This study describes practices of corruption within the acquisition system at the Ministry of Defence of the Czech Republic, created in the 1990s during the era of the economic deputy M. Kalousek. According to this study, the system was based on two pillars: "The first pillar represents a transfer of legal responsibility from the Minister and himself onto subordinates. The second pillar is to avoid a situation when the army could acquire its military equipment directly from the manufacturer and forced it to use services of intermediaries" (Anticorruption Endowment, 2014: 27). This case of public procurement demonstrates similar features to those we have identified within the analysis of corruption in public procurement in the city of Liberec.

For systemic corruption in public procurement (unlike in individual corruption) is characteristic that there comes to corruption behaviour already within the stage T_0, i.e. ahead of the "official stages" (T_1, T_2, T_3) of public procurement. Within the stage T_0 we may identify the following individual steps of corrupt structures: In the first step of the stage T_0 the informal parallel (godfather) structures themselves prepare plans of large-scale investments or with a high intensity participate on them with the aim to make a private profit from public resources. It was so for example in the city of Liberec in the case of a multifunctional hockey arena over the period 2000–2003 or during the World Cup in cross-country skiing during the period 2007–2009. Within the second step of the stage T0 follows the decision of the corrupt structure specifying which of the related firms within the conglomerate of systemically corrupt accomplices shall implement the public contract, i.e. enter the upcoming tender procedure with the best offer, and which firms will contrariwise participate only as subcontractors. Also these collusive agreements take part at the discretion of parallel structures that operate outside the scope of official public administration. Only then the contracting authority (public administration) officially announces the public contract. There are starting up the "official stages" (T1 – T3) of public procurement. In reality, however, these stages are rigged. They are only formal since the tender outcome had already been decided (agreed) within the stage T0. In fact, stages (T1, T2,, T3) serve only as a "pretext" to cover up corrupt practices. Even in these stages ($T_1 – T_3$), however, the corrupt structures "secure" the prearranged outcome e.g. by selecting a co-operating external firm to provide the advisory and awarding activity.

If we analyse the case of the city of Liberec, instead of a procedure open to all interested contestants there was mostly adopted a method of direct addressing of several pre-selected tenderers. This call was often repeated via addressing identical participants in the form of a call for tender bid submissions. (So that from 136 construction contracts undertaken by the city of Liberec over the period 2000–2010, the public tender took place only 18x, call to several candidates have been adopted 67x, direct award of a contract without publication was in turn used 15x).

If we follow the case of the city of Liberec from the perspective of formal structures of the contracting authority (bureaucracy, representatives of the city), the whole process of public procurement is monitored and managed by actors (related accomplices) involved in components of systemic corruption structures (Figure 1). There comes to a distortion in the relationship "principal – agent" as known from expert studies (see e.g. Pratt et al., 1985). Distortion is based on the fact that in our examined case corrupt "principals" in managerial posts (politicians supervising officers) could through an effective pressure (career advancement, financial rewards, threats, job loss, etc.) monitor the corrupt agents in subordinate positions whether they proceed in line with the set corrupt rules of the game. To the extent they break those rules, they are sanctioned. Politicians themselves are in turn similarly monitored by parallel structures that usually command a significant influence over the continuation of their political careers as well as their fat financial rewards.

The last phase of systemically corrupt contracts is the stage T_4. This again takes place outside the structures of public administration. This is a step in which the parallel structures, respectively related firms, resolve among themselves "mutual debts and receivables" from previous collusive agreements (usually through subcontracts). In the Liberec case this stage had taken an additional form of a financial libation in favour of the private hockey club, long-term owned by the strongest supplier and also a key element of the parallel structures (company Syner).

As in the case of Liberec, also when examining procurement at the Ministry of Defence there may be recognised individual time stages $T_0 - T_4$ along with the existence of managing informal structures in the background, linked via personal bonds to political figures who within their intentions outright fabricated individual military acquisitions and contracts (see Anticorruption Endowment, 2014). These were in turn formally planned, approved and implemented by various bodies of the Ministry of Defence. In parallel there thus worked also the formal system of public procurement. However, similarly to the case of Liberec it was built on non-transparent ways of contracting. For example, according to data by Anticorruption Endowment (2014), in 1997 the Ministry of Defence awarded 727 public contracts of which 535 were awarded to a single candidate without any public tender, 183 were awarded to more candidates and only 9 public contracts were tendered using an open award procedure. Although over the time the internal structure (respectively organisation) of the Ministry of Defence had changed, the system of public procurement has retained even at the beginning of the new millennium similar characteristics as mentioned in the study by Anticorruption Endowment (2014). Over the first decade of the new millennium, at the Ministry of Defence there were awarded about 90% of contracts without competition. There were also uncovered and judicially resolved several cases of rigged public contracts. This suggests that even in this case we deal with systemic corruption in public procurement (this time at the central government level).

4   Conclusions

The problem of corruption in public procurement represents one of topical social problems which need to be examined. In economics there clearly outweighs the quantitative and formalised approach towards examining factors (such as openness and transparency of public tenders) which impact corruption. Such an approach is needed, but it does not provide a more comprehensive view of the "working mechanism" of corruption. Effective prevention or fight against corruption requires exposing the nature of corruption, its actors and links among them. Such a view provides qualitative structurally-functional analysis. On its basis it is possible to distinguish whether there is present individual or systemic corruption. Individual corruption is the result of moral failure of an individual who interferes with the process of public procurement within one of the official stages of a public contract (pre-bidding, bidding, post-bidding). This type of corruption is possible to eliminate (or reduce its risk, respectively) by means of an effective control of procurement procedures and a corresponding setting of tender parameters. Much more complicated is the case of systemic corruption. It acts in the form of a parallel structure that we illustrate using the proposed structurally functional model which describes the mechanism of systemic corruption and mutual relations among individual corruption actors. The model shows two levels of actors. The first one (informal) is a parallel structure that decides on the public contract still ahead the official decision to announce the tender. This parallel structure has under its influence and control the formal (second) level of public procurement. Informal corrupt structures have therefore under their control also all the stages of public procurement (pre-bidding, bidding, post-bidding). These formally proceeding stages are there to "obscure" from the general public the fact that on the outcome of the tender there had been decided even before the tender had started. If we look at the problem of public procurement from the perspective of the "principal – agent" relationship, it has a deformed form. Corrupt principals in managerial posts (politicians) oversee corrupt agents (officials) and check whether they proceed according to the agreed upon rules of corrupt conduct. Politicians themselves are in turned being monitored by the parallel structures which usually assume a significant influence on continuation of their political careers. Individual actors of these informal structures and their relationships are illustrated using the presented structurally functional model. This model allows to better clarify the relationship among individual actors of public procurement and to explain the dominance of informal (corrupt) parallel structures in public procurement. The proposed model allows explaining how systemic corruption emerges in public procurement. It provides information on what circumstantial evidence belong to systemic corruption of public contracts. This way it may contribute to further understanding of systemic corruption in public procurement as well as be an inspiration on how to subvert systemic corruption.

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Selected Factors Influencing Public Procurement in the Czech Republic

Petr Man[*] – Martin Vyklický[†] – Rudolf Heidu[‡]

Abstract. The authors present their results concerning quantitative analysis of secondary data obtained from the Journal of Public Contracts in the Czech Republic which is the integrated place for publishing of basic information about public contracts procured pursuant to Act No 137/2006 Coll., On Public Contracts. On a sample of selection data, the authors have performed regression analysis with the purpose to examine correlation of an explained variable (the tendered price of a public contract) and selected independent variable of the described model. Using the linear regression analysis, the shape of the regression plane has been calculated, describing dependence of the tendered price on the number of submitted bids and the type of tender. With the use of Pearson correlation coefficient, a low positive dependence has been identified between the number of submitted bids in the tender and the difference of the price (defined as the difference of the anticipated value of the public contract and the offered price in the tender).

Keywords: Public procurement, factors of competition, correlation, regression analysis.

JEL Classification:

1   Introduction

Public contracts are a significant part of expenses of every state budget. Only in the Czech Republic, the estimated "flow-through" of public contracts is 500 to 600 billion CZK every year. For some firms, public contracts are an important, and many times the only source of income. The matter of public procurement in the Czech Republic is frequently discussed by the professional community. The matter decided by the Office for Protection of Competition, as the supervising authority over public procurement, and the matter frequently judged by courts. In the territory of the Czech Republic, the matter of public procurement is provided namely by Act No 137/2006 Coll., On Public Contracts, as amended (the Law). The main reason for regulation of the public sector and public contracts is to ensure parallel operation of public markets and private markets. Lawmakers are now becoming aware of a special nature of public markets and focus on creation of such conditions which will be similar the conditions of private markets operation (Bovis, 2007).

Some authors associate increased efficiency of public procurement with the possibility of an easier access of small and medium enterprises to the public contracts market (for example Nakabayashi, Lundberg, 2013, Loader, 2011).

According to authors, an important role in the final result of a tender fall also to the method for assessment of bids chosen by contracting authorities in tenders when, for example, the method quality-to-price is recommended, allocating certain value of money to a certain quality level which should be, as such, more transparent and should guarantee a higher rate of comparability of bids in relation with their quality and price (Bergman, Lundberg,, 2013).

According to authors, the public contracts market as a specific socio-economic system can be analysed using standard tools utilised in statistical physics (for example with the use of Maxwell-Boltzmann distribution function), while interesting results are achieved (e.g. an application of exponential distribution function on the number of bids in individual tenders) which can be applied to the public contracts market and result in a changed policy in the field of public procurement (Krištoufek, Skuhrovec, 2012).

In view of the authors, it is important to mention also the fact that efficiency of public contracts itself is based, last but not least, on the "quality" of the legislation framework for public procurement. Some authors concentrate on criticism of, for example, so called European public procurement law (Korthals et al., 2010).

In the field of public procurement, an important role is that of the rate of corruption which strongly devalues the quality of economic competition in individual countries. Therefore, some of authors deal with the influence of corruption in public contracts on economic competition (Ateljevic, Budak, 2010).

It is possible to refer to other authors dealing with efficiency in public procurement, this for example in public procurement of contracts for cultural heritage conservation works in Italy (Guccio et al., 2014) or it is possible to

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cover, in relation with assessment of efficiency of public contracts, the context of so called electronic public procurement which, according to many authors, improve its efficiency (Costa et al., 2013).

The performed analysis is based on the assumption idea that an efficient spending of public funds through the public contracts market depends on a sufficient level of competition on the offering side. That intensity can be approximated through the average number of bids submitted in a tender. A sufficient number of bids enables, thanks to the competition effect (reciprocal proportion between the number of submitted bids and the tendered price), to achieve prices beneficial for the contracting authority. That price beneficial for the contracting authority is seen from the perspective of the anticipated value of the public contract which was, pursuant to the Public Contract Law, defined by the contracting authority prior to commencement of the tender based on market research. It means generally, that we take as the basis a simple assumption that the more open (published, publicized) the tender is, the more potential tender bidders can get to the "information", the more bids will be submitted which, in itself, will intensify the level of competition in the tender. We examine that model with the defined dependent variable and independent variables in the regression analysis performed below.

In this context, the authors consider important that the specialised or research community should subject the legislative provision of public procurement process to constructive criticism from the position of exactly defined rules for public procurement on the side of contracting authorities and of contractors, this with the primary objective to "make cheaper" the whole process of a public contract tender, like for example in (Jurčík, 2012), as well as to set the rules which will be motivating for the public contract market, comparably with the relevant market of the European Union (Jurčík, 2009, Jurčík, 2010, Jurčík, 2011).

In relation with the effort of the state for efficient spending of public funds on purchase of goods, services and construction works, it seems to be helpful to perform relevant analysis of efficiency of tenders themselves with the aim to best identify individual factors influencing the rate of competitiveness on the side of contractors and their willingness to participate in a tender.

2   Material and methods

To describe a possible dependency of selected parameters influencing the intensity of competition, we have performed the quantitative analysis of secondary data obtained from the Journal of Public Contracts, i.e. of a sample covering tendered public contracts pursuant to the Public Contract Law. The authors have therefore left aside public contracts not tendered under the Law (small contracts). The data have been chosen using systematic selection and cover only the period of 2013, it means a sufficiently long period after the effectiveness date of a large anticorruption amendment of the Public Contract Law (the amendment became effective on 1.4.2012). Due to a high error rate of the secondary data (missing values or two different tendered prices (the tendered price is the price offered by the winning bidder in the tender who carried off the contract) within one tender, the authors had to remove the faulty data because of impossibility to correct them. Together 1000 records have been selected and validated.

In the analysis, only the data have been processed concerning over-the-limit and under-the-limit public contracts contracted by public contracting authorities and selected types of tenders. It means, in particular, open tender procedures called under Section 21 (1a) of the Public Contract Law, and restricted tender procedures called under Section 21 (1b) of the Public Contract Law.

The reason for that narrowed selection of only two types of tender procedures is their high incidence within the total number of tenders implemented in the specific year, as well as their high proportion in the total financial value of public contracts in the Czech Republic (Table 1). Intentionally, data from negotiated procedures without publication have not been included into the analysis, although their proportion in the number of tenders is higher than that of restricted tender procedures, because only one bid is submitted into those procedures because of their nature.

Table 1. Structure of tender procedures in the Czech Republic

2013	Number of called tenders	Proportion of concluded contracts (%)	Value of tenders (billion CZK)	Proportion of tenders value (%)
Open procedure	4,825	30.5	113	58.1
Restricted procedure	333	2.1	22	11.4
Total	15,843	100.0	194	100.0

Source: MMR, 2014, Authors

For examination of the intensity of dependence of selected variables, the authors of this article used the Pearson correlation coefficient (r).

As dependent variable of the model we have decided to choose the total price (TP) of public contract because in the CR public procurement environment the total price of the Public contract is almost the most important performance indicator.

The independent variables are:

- X1 – The anticipated value of the tender – AV: Before the publication of the tender the contracting authority (CA) has to determine the expected value of the tender based on market survey. We expected positive influence of AV on TP of the public contract because the tenderers in many cases come out with the determination of bid prices from AV settled by CA.
- X2 – The number of bids in the tender – NoB: This variable shows the level of competition in the public tender. We expected the negative influence of the total number of bids in the tender (more tender bids mean lower TP of the tender).
- X3 – the type of the tender (open and restricted) – ToT: This variable is so called dummy variable and we expected the positive influence on TP (higher TP) when the restricted procedure (CA invites only a limited number of suppliers to submit a tender bid) is chosen by CA and negative influence on TP (lower TP) when the open procedure is chosen by CA.

Based on the all mentioned above we can specify the objective of this article that is to formulate the regress econometric model based on the examining the dependence of TP (Dependent variable) on AV, NoB and ToT. The model should be demonstrative and should reveal which variable influences the TP the most.

3 Results

The authors endeavoured to estimate, using the regression function, the regression plane coefficients expressed through a linear regression function [Marek et al., 2013].

$$Y = \beta_0 X_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \mathcal{E}$$

Where: Y is the value of the explained (dependent) variable , $X_1 \ldots X_3$ are values explaining the variables (regressors), $\mathcal{E}$ is an unsystematic (random) element

Because we are interested in the possible influence of explaining variables, namely the type of tender procedure (X1 as the anticipated value of the tender – AV), number of bids in the tender (X2) – NoB and the type of the tender (open and restricted X3 – ToT), on the explained variable defined as the tendered price offered by the winning bidder (Y) – TP, we have included the above mentioned explaining variables into the model below. Having performed the calculations, we provide the following values (Table 2):

Table 2. Regression statistics

Regression Statistics	
Multiple R	0.89
Reliability value R	0.80
Given reliability R	0.80
Standard error	12,802,663.59
Observation	1000

Source: Authors

Table 3. Anova model (Source: Authors)

	Difference	SS	MS	F	Importance F
Regression	3	6.69442E+17	2.23147E+17	1,361.41683	0
Residua	996	1.63253E+17	1.63908E+14		
Total	999	8.3265E+17			

Source: Authors

It is clear from the value of the adjusted coefficient of determination R2 = 0.80 (Table 2) that the above explained regression model can explain 80% of the variability of values of the explained variable. That value is considered as reasonable and acceptable for the authors to formulate their conclusions.

For complex evaluation of the model, we used the aggregate F-test expressed as follows:

$$F = \frac{\dfrac{ESS}{p-1}}{\dfrac{RSS}{n-p}},$$

Where: ESS is estimated sum of squares, RSS si residual sum of squares, $p = k + 1$ is number of parameters of the regression function and where the critical value is $F_c = F_{1-\alpha}(p-1, n-p)$.

The tested hypothesis includes the preposition that all regression parameters ßj (j=1 …, k) are, except for the constant parameter ß0, equal to zero, therefore there is no explaining variable Xj in the model which has statistic importance.

H0: ß0 = c; ß1= ß2= … ßk=0

H1: non H0

Table 3 shows that P-value of the F-test is 0 < α = 0.05, therefore we reject the zero hypothesis about an improper model.

Besides, we have performed partial t-tests. They enable testing of justified presence of the explaining variable in the regression model. We gradually tested the hypothesis of ß0 parameter and of ß1, ß2 and ß3 parameters. Based on the calculated reliability intervals, we rejected the tested hypotheses for ß0, ß1, ß2 and ß3.

Performance of partial t-tests where individual tested statistics have the following formula:

$$t = R\sqrt{\frac{n-2}{1-R^2}} \text{ and where the critical value is } \tau = t_{1-\alpha/2}(n-2).$$

Having tested the hypothesis on ß0 parameter and on ß1, ß2 and ß3 parameters, it is possible to state that both the constant, and all three explaining variables: type (X1 as the anticipated value of the public contract), number of bids in the tender (X2) and the type of the tender procedure (open and restricted as X3) contribute to explanation of the model.

Resulting regression equation has the following shape:

TP = 14,759,872.46 + 0.687842783 x AV − 216810.0502 x NoB − 12,796,602.77 x ToT

Therefore, if the type of tender is the restricted procedure, it results from the equation that the tendered price will increase (in this case, ß3 parameter has 0 value).

As to suitability of inclusion of all above mentioned explaining variables, it means exclusion of multicollinearity, the following correlation matrix has been completed (Table 4).

Table 4. Correlation matrix

	Anticipated value	Number of bids	Type of tender procedure (open)
Anticipated value	1		
Number of bids	0.120329469	1	
Type of tender procedure (open)	-0.303944149	0.014829867	1

Source: Authors

Based on the correlation analysis performed above, we can state that none of the explaining variables included in the model need to be excluded (interdependence between the included explaining variables has not been proven) and therefore, they have their importance in the model.

The authors have also pursued to determine the level of dependency of selected variables. They used the Pearson correlation coefficient (r) to determine intensity of the relation.

On the obtained sample of secondary data, they have measured a positive correlation r = 0.061679315 for dependency of the tendered price on the number of submitted bids in the tender. Considering the positive value and the level of r, we can therefore speak about a week dependency (r ranges within the interval <-1;1> and does not reach, in our case, marginal values. Possible interpretation could be: an increased number of bids has very week, but still positive, influence on the amount of the tendered price.

Besides, a strong dependency between the tendered price and the anticipated value of the public contract has been measured (r = 0.889580495). The Pearson correlation coefficient, in this case, converges the marginal positive value of its interval; it is therefore possible to state that the tendered price strongly depends on the anticipated value of the public contract. This finding can serve as a strong argument for the really responsibly set anticipated value of the public contract by contracting authorities during preparation of the tender procedure. It is getting proven that it is exactly this factor what can influence the efficiency of the tender procedure.

4   Conclusions and Discussion

In this part of the text the authors consider as important to mention that the data collected from the JPC were burdened with high error rate so the important part was to cleanse the data to mined the data relevant for the conducted analysis. We have to recommend to provider of the JPC to set the rules and methodology for completing of individual forms that are important for statistical processing of data in these forms. There should be better revision of each form field before the contracting authority saves the changes made in the form. Otherwise this

insufficient process of revision causes that some fields of forms are filled by contracting authorities with nonsesnes and it makes high error rate.

For example we can mention that federal government procurement data in Brasil was analysed by (Luo et al., 2014) who analysed inter alia antiretroviral drug expenditure. We can also mention (Guccio et al. 2014) who evaluate the public procurement contacts on cultural heritage conservation works in Italia and use the government data to make the analysis. Public procurement data was also used in (Schaltegger et al., 2014) who analyse eight product categories and four European Union member states due to sustainable and importance of public procurement in the European Union.

We also consider as important to mention the work of (Ochrana, 2008, Nekola, Ochrana, 2009) who intensively solves problems with public sector effectivity and its evaluation in the area of Czech republic with focus on public procurement. For further research is also very interesting the work of (Pavel, 2007) who is involved in economical aspects of public procurement in the Czech Republic.

We consider as important to mention these authors (even foreign authors, even czech authors) and the relationship with this study because these authors also who use the analysis of public sector data and they try to study dependences between different variables in their models. We believe that we can achieve very interesting results using of public procurement data in the context of dependeces of each other.

We can summarize the outcomes of this study as the formulation of regress econometric model based on the examining the dependence of TP (Dependent variable) on AV, NoB and ToT that as we can claim is demonstrative and and reveals which variable influences the TP the most. We have made regression statistics of the model and coming out of the adjusted coefficient of determination R2 = 0.80 we can consider that this value is reasonable and acceptable for the authors to formulate their conclusions. After completition of F-test and t-test we can also conclude that selected variables contribute to explanation of the model. After testind the variables of this model to multicolinearity we can also state that none of the explaining variables included in the model need to be excluded (interdependence between the included explaining variables has not been proven) and therefore, they have their importance in the model.

The main contribution of this study we behold in identification of variable (the anticipated value of the public contract) that very strongly influences the final price of the tender. It means that contracting authorities in the CR should be very careful and rigorous during their market research before they publich tne planned public contrect (public tender) because the anticipated value indicates indicates to tenderers (supplyers) the ceiling price of their tender bids.

Based on the mentioned results, the authors of this article will continue dealing with the analysis of secondary data obtained from the Journal of Public Contracts with regards to regional classification of contracting authorities by the specification (Jurčík, 2013), as well as with extension of the regression analysis model with further regressors having the potential to have important influence on the tendered price and through that, also on efficiency of public tenders in the Czech Republic.

It seems very inspiring to compare results of examination by individual years with description of differences of the found results of the comparison depending on legislation changes in the field of public contracts.

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Cluster Analyses of Environmental Taxes in EU

Lenka Martínková[*]

Abstract. This paper shows the relationship between states of the EU and percentage environmental taxes to GDP. EU 27 is assessed in this paper. The data is consistent with Eurostat's data. Cluster analysis is used for better vision. It is compared in the both the years of 1995 and 2012. Based on cluster analyzes and Euclidean distance, we can assess which countries are the closest. In the years 1995 and 2012, it is possible to see the different clusters. Environmental taxes have changed, over the years. This paper, in the first part, describes clusters in 1995. This method is created in Excel. In the second part environmental taxes to GDP on the figure in 1995 and 2012 are compared. In the third part cluster analyses in 1995 and in 2012 are compared. Data shows a very different development of the cluster. E.g. Estonia has higher environmental taxes to GDP by about 1.8 % in 2012 than in 1995. Because of this growth, the clusters have to be different in 2012 than in 1995. By contrast, Portugal has a different development. Environmental taxes to GDP are lower by about 1.21 % in 2012 than in 1995.
Keywords: cluster analysis, EU 27, Environmental taxes, GDP.
JEL Classification: H23

1   Introduction

Environmental taxes belong to the corrective taxes. Their aim is to correct market failures. The environmental taxes are trying to achieve defined goals in the environmental field. The first idea of environmental taxes was formulated by Pigou. His conception of these taxes (Pigou, 1932) cannot be feasible in practice. This idea was good for other research. Baumol a Oates (1971) created a concept, which is easier to apply but not completely Pareto-optimal like the concept of Pigou. Many Czech authors dealt with environmental taxes, for example: Ščasný (2002), Jílková (2003), Šauer (2007), Kubátová (2010), Pavel and Vítek (2012).

There is no consensus of economists in the definition of environmental taxes. Kubátová (2010) gives two definitions. In the first group are taxes, which in fact did not affect the amount of pollutants produced. In the second group are the taxes that were not created for the benefit of the environment.

Another concept of environmental taxes was developed by Weisbach (2012). It concludes that environmental taxes should be set equal to expected marginal harm from pollution given the current availability of information and should be neither accelerated nor delayed because of the prospect of learning or irreversible harm.

This paper processes cluster analysis of environmental taxes of EU 27 in 1995 and 2012. This paper describes and compares clusters in these years. The concept of cluster analysis was first used in 1939. Kelbel and Šilhán (2002) define a cluster analysis as the creation of clusters of objects where members of the cluster were similar, but they are not similar to objects outside of the cluster. Objects are grouped based on their similarities. Pospíšil, Klimek and Kozumplík (2013) say in their article, Analytic analysis of ECG signal that it is possible to choose from several clustering methods. The smallest distance between objects used SLINK, the Single Linkage Clustering Method. The method of the nearest centres of gravity was used in the next clustering. This method describes Meloun and Militký (2004) in Advantages of the analysis of clusters in multivariate statistical analysis. The method which was chosen for the determination of the calculation using Excel is called UPGMA (unweighted pair-group method using arithmetic averages). Nei and Kumar (2000) wrote more about this method. Dyczkowska (2010) uses cluster analysis in the paper Usefulness of K-means Method in Detection Corporate Crisis. Author analyses a set of construction companies.

A dendrogram is a diagram which figureically shows the results of cluster analysis. It is a binary tree. The figure shows the distribution of values in the selection. Clear projection of the results is shown in this paper using a dendrogram for each year. Kubátová, Vančurová and Foltysová (2008) use cluster analysis with dendrogram. Authors analyse Tax Mixes in OECD Countries. Odehnal and Michálek (2011) use cluster analysis in business environment.

2   Data and Methodology

In this paper we use the value of the share of environmental taxes in the EU-27 GDP. Values were taken from Eurostat. In this paper, cluster analysis, Euclidean distance, nearest neighbor method and a dendrogram are used. The programs that are used are Excel and Matlab. The calculation in Excel is manually inserted through a formula and it is used more for the final inspection specified programming in Matlab. The most commonly used calculation

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in Excel is the average of a Euclidean distance. Divergences and incorrect calculations are frequent, for this reason Matlab was used, which confirms the individual values. Programming values of the matrix were necessary in the programming for it to form a dendrogram.

The first step applied was Euclidean distance to selected data:

$$\sqrt{(x_1 - x_2)^2},$$ (1)

where x_1, x_2 Vectors with the same number of elements (environmental taxes to GDP).

The Result was a 27x27 matrix of various distances. Thanks to selecting the smallest distance, the first clumps were created. Another merging cluster necessitated the creation of a new method; the chosen procedure was through K-means. This led to the conversion of clusters on average values and to re-determine the Euclidean distance. This procedure was repeated until all states were included in the cluster.

In Matlab the following program was created:

data=[...]
mv=pdist (data,'cityblock');
z=linkage (mv, 'centroid');
dendrogram (z, 'orientation', 'down');
kmeans (data,2, 'Distance', 'cityblock');

The program originated results of a cluster and ultimately a dendrogram, which figureically displays the results of adjustment of the input data matrix.

Table 1 shows the number, which are assigned to states. Everything is taken from Eurostat. The table is presented here because of specifying the values of the dendrogram. Matlab displays only the assigned numbers on the x-axis.

Table 1: The assigned numbers of states

1	Austria	7	UK	13	Netherlands	19	Poland	25	Hungary
2	Spain	8	Finland	14	Italy	20	Bulgaria	26	Malta
3	Germany	9	Luxembourg	15	Denmark	21	Lithuania	27	Slovenia
4	Belgium	10	Ireland	16	Estonia	22	Slovakia		
5	France	11	Portugal	17	Latvia	23	CR		
6	Sweden	12	Greece	18	Romania	24	Cyprus		

Source: Eurostat

3   Results

3.1   Environmental taxes to GDP in 1995

Because of the potential scope of the paper, two years are compared. The first year is the base year (1995). This year is compared with the year 2012. These years were chosen for better comparison of the results of cluster analysis. It is possible to assess how individual clusters vary over time. The sequences of states, which are in the results, were taken from Eurostat.

Thanks to this analysis, the kind of links between the shares of the environmental taxes to GDP in the specified states was found. It is possible to say that states were based closely on this indicator, thus having these similar shares. Determination of dependence between individual attributes was not necessary, since we have only one - the percentage share of environmental taxes to GDP. It wasn't necessary to standardize the matrix, since the correlation is obvious.

Table 2 shows clusters of EU 27 for the year 1995 according to the calculation in Excel. The left column shows the additional numbers particular clusters. Abbreviations and numbers are used for states. They are taken from Eurostat. The right column then shows the individual values of the average percentages of environmental taxes in GDP generated clusters. First clusters are formed by states with the smallest Euclidean distance, i.e. a group of 1 to 10. After that, thanks to diameters, the next groups were combined. The calculation from the average distance between the clusters of 1 to 10 can be seen in Table 3. The last column indicates the smallest distance, namely those clusters which can connect in the next step together.

Table 2: Clusters EU27 in 1995

Cluster	States										Aver.
1	AU	SP									2.17
2	DE	SK									2.34
3	BE	FR									2.46
4	SWE	UK	CR								2.78
5	HU	FI	LUX	CY							2.93
6	EL	NL	IT	PT							3.49
7	EST	LA									1.03
8	POL	BUL	LITH	RO							1.82
9	SLO	DEN									4.31
10	IRE	MAL									3.06
2+3	DE	SK	BE	FR							2.40
5+10	HU	FI	LUX	CY	IRE	MAL					2.99
2,3+1	DE	SK	BE	FR	AU	SP					2.32
5,10 + 4	HU	FI	LUX	CY	IRE	MAL	SWE	UK	CR		2.91
5,10,4+6			,,				EL	NL	IT	PT	3.09
1,2,3+8	DE	SK	BE	FR	AU	SP	POL	BUL	LITH	RO	2.11
5,10,4,6+1,2,3,8	HU, FI, LUX, CY, IRE, MAL, SWE, UK, CR, EL, NL, IT, PT, DE, SK, BELG, FR, AU, SP, POL, BUL, LITH, RO										2.67
5,10,4,6,1,2,3,8 + 9	plus Slovenia, Denmark										2.80
5,10,4,6,1,2,3,8,9 + 7	plus Estonia, Latvia										2.67

Source: Eurostat, own processing

We can see that the same values were also based on a calculation in Matlab. Nevertheless, this procedure was also repeated in Excel for the year 2012, for reasons of scale of the paper, the table calculation did not show. The results are the same as in Matlab for this year. It was therefore only considered for the dendrograms. The decrease in Portugal might be explained by low company car taxation and a lack of indexation of taxes.

**Table 3: Clusters 1- 10 in 1995 and Euclidean distance**

Number of cluster										
1	2	3	4	5	6	7	8	9	10	min
0.00	0.17	0.29	0.61	0.76	1.32	1.15	0.35	2.14	0.89	0.17
0.17	0.00	0.13	0.45	0.59	1.16	1.31	0.51	1.97	0.72	0.13
0.29	0.13	0.00	0.32	0.47	1.03	1.44	0.64	1.85	0.60	0.13
0.61	0.45	0.32	0.00	0.14	0.71	1.76	0.96	1.52	0.27	0.14
0.76	0.59	0.47	0.14	0.00	0.56	1.90	1.11	1.38	0.13	0.13
1.32	1.16	1.03	0.71	0.56	0.00	2.47	1.67	0.82	0.44	0.44
1.15	1.31	1.44	1.76	1.90	2.47	0.00	0.80	3.28	2.03	0.80
0.35	0.51	0.64	0.96	1.11	1.67	0.80	0.00	2.48	1.23	0.35
2.14	1.97	1.85	1.52	1.38	0.82	3.28	2.48	0.00	1.25	0.82
0.89	0.72	0.60	0.27	0.13	0.44	2.03	1.23	1.25	0.00	0.13

Source: own processing

3.2 Comparison of environmental taxes to GDP in EU 27

Figure 1 shows the share of environmental taxes to GDP in the EU 27 in 1995 and 2012. From this figure it is clear that Estonia and Latvia have very different values in these years. Therefore, the cluster of these states in 2012 will be very different. The obvious reason is the growth of GDP, but also a very sharp increase in environmental tax revenues. In Estonia there over the years taxed environmentally demanding sources. In 2011, the tax rate for electricity was 4.47 Euro / MWh (almost four times more than in the Czech Republic). In Latvia also grow energy taxes levied on transport fuel. On the contrary, as in Portugal, values are lower in 2012 than in 1995. Although there has been a growth in revenues from environmental taxes, there was also a greater increase in GDP.

**Figure 1: Environmental taxes to GDP in 1995 and 2012**
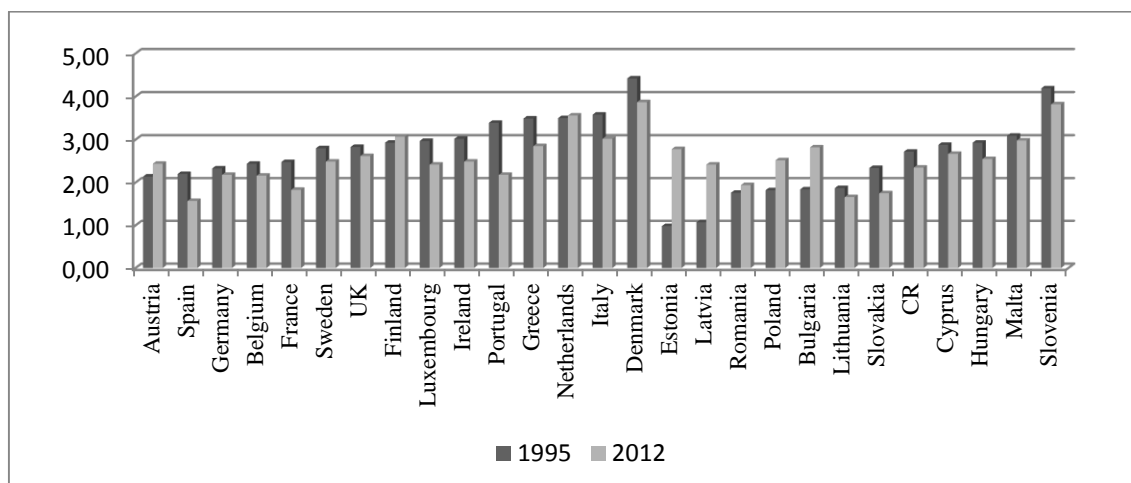
Source: Eurostat

3.3   Comparison of cluster analyses in 1995 and 2012

A dendrogram cluster analysis can capture a clearer picture; see Figure 2 and 3. The x-axis shows the individual States. The y-axis shows the Euclidean distance between the States and the various clusters. E.g. Figure 2 shows a cluster of 16 and 17, which is a cluster of Estonia and Latvia. It is formed from a cluster of the rest of the countries of 1.77. This is also obvious from Table 2, wherein are the averages of clusters. A cluster 7 has an average of 1.03, and the remaining cluster is averaged at 2.80.

With this method, it was found that the percentage of environmental taxes to GDP in 1995 was much different in the states of Estonia, Latvia, Slovenia and Denmark. For the smallest distance considering those whose Euclidean distance is max. 0.2. Created as six different groups. These are Hungary, Finland, Luxembourg, Cyprus, Ireland, Malta, Sweden, the UK, and the CR. Another group to the distance of 0.2 is composed of Portugal, Greece, Netherlands, and Italy. The third group distance of 0.2 is Germany, Slovakia, France and Belgium. The fourth group consists of Austria and Spain. The fifth group consists of Poland, Romania, Lithuania, and Bulgaria, and the sixth group is Estonia and Latvia. Denmark and Slovenia are higher than this distance.

Figure 2: Dendrogram in 1995
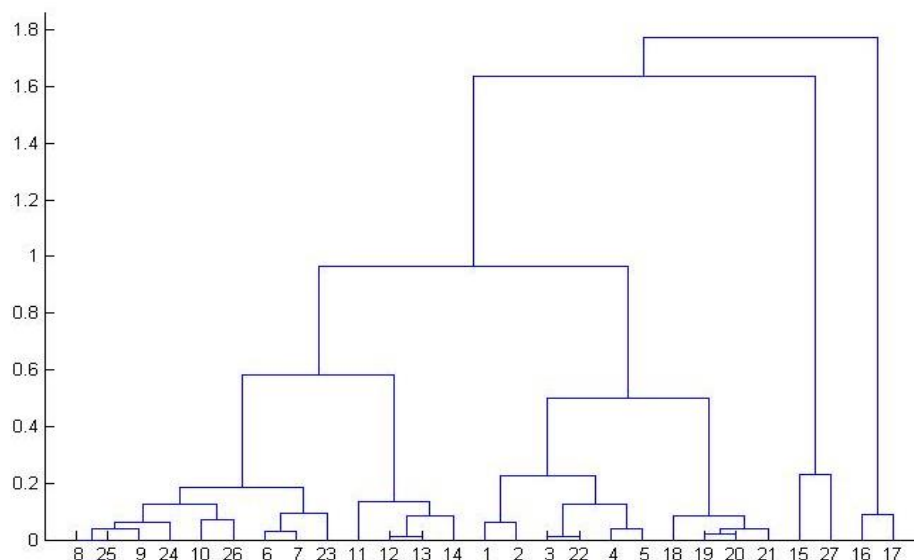
Source: Eurostat, own processing

In 2012, 7 clusters were created with the smallest distances (it is Euclidean distance max. 0.2). The first cluster consists of Luxembourg, Latvia, Austria, the Czech Republic, Sweden, Ireland, Poland and Hungary. The second cluster consists of Germany, Portugal, and Belgium. The third cluster includes of the UK, Cyprus, Greece, Bulgaria and Estonia. The fourth cluster consists of Finland, Italy and Malta. The fifth cluster consists of Spain and

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Lithuania. The sixth cluster includes France, Slovakia and Romania. The last cluster consists of Denmark and Slovenia. All other states are clustered in the distance.

The clusters are already at first sight different in 2012 than in 1995; see Figure 3. The similarity percentage of environmental taxes to GDP has clearly changed. The same values are in the states of Latvia and Luxembourg, Sweden and Ireland, Germany and Portugal. In 1995, the only states that have the same values are Finland and Hungary.

Figure 3: Dendrogram in 2012
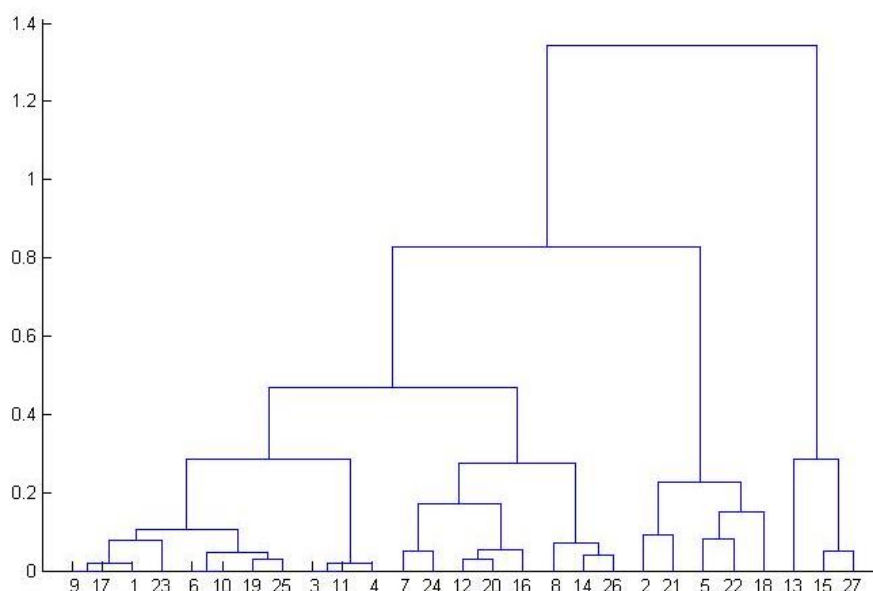
Source: Eurostat, own processing

In 1995, the most varied values were the states of Denmark, Slovenia, Estonia and Latvia. In 2012, the most varied states were the Netherlands, Denmark and Slovenia. The GDP was about 85% higher in the Netherlands in 2012 than in 1995. In 2012 in this country, environmental taxes were increased by 88%. The Netherlands recorded a rise in the proportion of 0.06%. Latvia in 2012 reached 2.42 percentage of the share of environmental taxes in the GDP and in 1995, this share was 1.7. In 2012, the GDP grew by 23.137 billion USD. Environmental taxes increased by 63.059 billion USD. Denmark has the highest value among all the states in 1995 and in 2012. Estonia has the lowest percentage of environmental taxes in the GDP in 1995 (in 2012 it was the 9th largest). The GDP increased by 18.299 billion USD in this country in 2012. Environmental taxes this year increased by 58.722 billion USD.

In 1995, Portugal belonged to the states with the highest percentage of environmental taxes in the GDP. It created a cluster with Greece, the Netherlands and Italy. In 2012, Portugal was almost in the middle group of states. It created a cluster with Germany and Belgium.

4   Conclusions

The paper shows clustering of EU 27 in 1995 and 2012. It is possible to compare clustering in both years on the bases of the results. It could evaluate the difference of the percentage of environmental taxes to GDP in EU 27. Dendograms show big differences between clusters. Estonia and Latvia have significant differences. These states have the smallest shares of environmental taxes to GDP in 1995. Latvia made a cluster with Luxembourg and Austria (Luxembourg had one of the biggest percentages of environmental taxes to GDP). Estonia made a cluster with Bulgaria and Greece. Estonia is in the top one-third of states with the highest share of environmental taxes to GDP.

The most important change was detected in Estonia, Latvia, Denmark, Portugal and Bulgaria. These values are very dissimilar in 2012 than in 1995. So clusters must be different in these years. Environmental taxes were increasing but the GDP was as well. It is important which of these factors was more on the increase in these states.

Acknowledgements

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The Concept of Tax Expenditures in Russia: The Evaluation Methodology of Effects

Igor Mayburov[*]

Abstract. The purpose of this paper is the need to develop an evaluation methodology of the tax expenditures efficiency as well as tax incentives efficiency for the purpose of tax accounting and optimization. The basic structure of taxes and the normative structure of taxes are distinguished in the article. The basic structure of taxes did not originally contain any advantages for certain activities or groups of taxpayers, representing some ideal theoretical tax construction. As a normative structure of Russian income authors consider taxation in various degrees (different rates applied) of different types of income, and the taxation of one part of the total income according to the model Schantz-Haig-Simons. The authors propose an algorithm for tax expenditures estimating. A method of tax expenditures estimation according to the analyzed tax incentive for the estimated period is proposed. The initial requirements for assessing the tax incentives efficiency are formulated. It is proposed to distinguish between four types of effects (fiscal, social, economic, budget, and ecological) and the same types of efficiency. The ways to calculate these types of efficiency are suggested. Budgetary effect of tax incentives may be represented as the sum of the fiscal, social and economic effects.

Key words: tax expenditures, the basic structure of tax, the fiscal effect, the social effect, the economic effect, the budget effect.

JEL Classification: H20

1 Introduction

As known, tax incentives are not the ideal instrument of state regulation and stimulation of priority processes. Significant use of tax benefits leads to a lower neutrality of the tax system, increases the cost of tax administration, and as a result - reduces the efficiency of the tax system, differentiates the tax burden between different industries and categories of taxpayers, and therefore, reduces the system's fairness and complicates the construction of taxes and the system in general. An alternative tool is the direct government financing (subsidies, grants, loans), which often demonstrates greater flexibility and stimulation targeting.

The competition between the instruments of tax and fiscal stimulation is obvious. It makes it necessary to give preference to one or another instrument. But this choice has to be made not on the basis of theoretical reasoning and qualitative assumptions, as it is being done in Russia now, but it has to be made on the basis of comparative analysis of the alternative instruments efficiency and quantitative estimations (and not only direct estimations, but also side-effects). It should be noted that in Russia the use of fiscal stimulation instruments has long been accompanied by more or less effective control of their expenditure and evaluation of the efficiency of their use. The use of tax incentives is burdened only by the tax authorities' control procedures, quantification of tax expenditures and evaluation of their performance in Russia, unlike most developed countries, is still not being carried out.

The basis for the solution of these problems in Russia should be made up from the works of the founders of the assessment practices of the tax expenditures in the United States (Minarik, 2009; Altshuler, 2011; Boadway, 2007; Bierbrauer, 2014; López-Laborda J., and Zabalza, A., 2015). The studies of the best practices of tax expenditures assessment in the United States and OECD countries are also extremely important (Swift, 2006; Choi,G.-Sh., 2014).

A methodological approach to the assessment of tax expenditures and evaluation of the efficiency of their implementation in Russia will then be proposed. However, together with that we want to emphasize that the originality of the approach is related only to the methods of costs and efficiency estimation. The essence of the approach is based on the famous "concept of tax expenditures" (Surrey, 1957). The positive practice of using this concept in the USA and OECD countries during 40 years confirms the need to follow the developing economies in line with this concept.

In general, the assessment of the costs and the assessment of their efficiency are the two independent and large-scale problems, but they are consistently connected: the second problem cannot be solved without the first. In addition, these two problems have different scales of solution. They are necessary for assessment of tax expenditures and their efficiency in the whole country, and also for estimation by industry, regions, and

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municipalities, as well for estimation of each of tax incentives (or type of tax expenditures). Together with this the solution of the first as well as of the second problem is connected with some issues that are not solved even by those countries that have been practicing the concept of tax expenditures for a long time, not to mention those who have recently joined or are only going to join the process.

The purpose of this paper is the need to develop an evaluation methodology of the tax expenditures efficiency as well as tax incentives efficiency for the purpose of tax accounting and optimization.

2   Understanding of tax expenditures

The founder of the concept of tax expenditures S. Surrey argued that any tax is made up of two elements (parts). The first part is the structural norm, which is necessary for the normal functioning of the tax. The second part are the norms introducing special incentives. He wrote that "these provisions, often called tax incentives and tax subsidies represent deviations from the normal tax structure and are designed for particular industries, activities or groups of taxpayers. They take many forms, such as permanent exclusion from taxable income, deductions, deferred tax liabilities, tax credits and special tax rates. Whatever form they take, these deviations from the normative tax structure are the government expenditures on exempt activities or groups of taxpayers and made through the tax system rather than through direct expenditures, loans, or other forms of state assistance (Bierbrauer, 2014; Bittker, 1969).

In our opinion the first two features are seen as really necessary to identify tax expenditures, and the other two are redundant. But it takes one more - an additional feature - creation of any advantages for certain activities or groups of taxpayers. This is a very important feature, because it allows considering the basic structure of taxes as one that did not originally contain any advantages for certain activities or groups of taxpayers, representing some ideal theoretical tax construction.

However, the OECD (Bierbrauer, 2014) recommends distinguishing between the basic and normative tax structure. If the basic structure of taxes should demonstrate uniqueness and universality for the different countries, the normative structure of taxes should reflect the national identity of the tax, i.e. those rules which are recognized as essential parts of the considered tax in the country, although those rules are not established in the framework of the basic structure. And, accordingly, these rules cannot be considered as tax expenditures in this country. This distinction is a very important and promising feature of the process of adaptation of the basic theoretical structure of taxes to the existing national practice of their application, and as a result – of a more precise definition of the standard against which national identification of tax expenditures and a more precise calculation is made.

For example, the basic structure of the income tax, as it is known, is considered to be the comprehensive income Schanz-Haig-Simons model. At least, S. Surrey insisted on it (Surrey, 1985). This model provides for taxation of the difference between revenues and expenses incurred from obtaining these revenues. However, this model provides for taxation in equal measure of all income from all sources: salary, income from business activities, capital income (dividends, interest, rents), inheritance, gift, transfers from the budget (pensions and social assistance), imputed rent for the use of your own home, goods produced and consumed in the household or your own company, and other income. Such a model of the tax is unlikely to be administered in practice.

As a normative structure of Russian income we can consider taxation in various degrees (different rates applied) of different types of income, and the taxation of one part of the total income according to the model Schantz-Haig-Simons. In particular, the taxation of the following is excluded from full income: the imputed rent for the use of own housing, goods produced and consumed in a household or a private firm. Thus most often only those parts of income are excluded, which are almost impossible to administer. Accordingly, if the normative structure of tax (and not the base tax structure) is used as a standard these deviations should not be treated as tax expenditures (incentives). Thus, we offer the following definitions.

The basic tax structure is a set of structural elements (rules), that provides a such tax construction, which does not produce any benefits for certain activities or groups of taxpayers.

The normative tax structure is a set of structural elements (rules) and deviations from them, that provides a tax structure that is adapted to the practical implementation in the current national tax administration system and thus is most relevant to the principle of minimizing the administrative costs.

Tax expenditures are losses of tax revenues of the budget system connected with the application by the legislation of various deviations from the normative tax structure, which in this case provide some benefits to certain types of activities or groups of taxpayers.

Thus, assessment of tax expenditures in Russia should be made for a separate article (tax incentives), for a particular tax, by type of tax, for all taxes and fees. A sequence of estimations of tax expenditures for a specific tax is given below.

Overall assessment of tax expenditures will be the result of adding quantitative estimations of these expenditures for the full range of Russian taxes and fees. Most practical relevance is the method of income loss. According to experts (Boadway, 2007), it is the most simple and reliable method. A practical way of calculating the tax cost of this method is reduced to the following steps. To assess the existing incentives one should consider

the difference between the amount of tax that would have been obtained in the absence of the analyzed tax incentives, and the actual amount of the tax, which comes to the budget system in terms of the incentives.

3 Evaluation of annual tax expenditures

3.1 Evaluation of annual tax expenditures based on the analyzed incentives

The formula for this calculation will be the following:

$$TE^t = TI^i_{w/i} - TI^i + \Delta ICTA^i + \Delta ICTH^i,$$

(1)

where i – year, of the given incentives' introduction; TE^t – tax expenditures i-th year; $TI^i_{w/i}$ – the sum of tax revenue from taxpayers using this incentive, calculated in the absence of incentive in i-year (if data are used by i-1, they need correction and reduction to the i-th year); TI^i – the sum of tax revenue from taxpayers using this incentive, calculated in terms of providing incentives in the i-th year; $\Delta ICTA^i$ – the increasing of the tax administration costs due to additional costs of administering state incentive in the i-th year; $\Delta ICTH^i$ – the increasing of the tax harmonization costs due to additional costs for the use of taxpayers' incentives in the i-th year.

3.2 5 Evaluation of tax expenditures for the period analyzed incentive

For the purpose of tax incentive efficiency evaluating the tax expenditures should be evaluated not for one year but for period from its establishment to the display of effect - t. Then all parameters are summarized by year. In addition, for comparability they are brought to the same point in time by discounting. The simplified formula would look like:

$$\sum_{i=1}^{t} TE^t = \sum_{i=1}^{t} TI^i_{w/i} - \sum_{i=1}^{t} TI^i + \sum_{i=1}^{t} \Delta ICTA^i + \sum_{i=1}^{t} \Delta ICTH^i,$$

(2)

where t – the period of time from the establishment to the end of the display of effect of this incentive; $\sum_{i=1}^{t} TE^t$ – tax expenditures of the period t; $\sum_{i=1}^{t} TI^i_{w/i}$ – the sum of tax revenue from taxpayers using this incentive, calculated in the absence of incentive of the period t; $\sum_{i=1}^{t} TI^i$ – the sum of tax revenue from taxpayers using this incentive, calculated in terms of providing incentives of the period t; $\sum_{i=1}^{t} \Delta ICTA^i$ – the increase of the tax administration costs due to additional costs of administering state incentive of the period t; $\sum_{i=1}^{t} \Delta ICTH^i$ – the increase of the tax harmonization costs due to additional costs for the use of taxpayers' incentives of the period t.

Taking into account the time lag of the incentive action and the costs of tax administration increases the accuracy of the estimation. But even taxation expenditures calculated by such a complicated way will be not exact. The main sources of these errors are:

- this method takes into account only the primary effects of tax incentives, it is not possible to take into account its secondary effects on changes in the tax base, in particular, due to changes in the behavior of recipients of incentives;
- enability of accurate determination of the amount of the tax that the state loses by giving exemptions to taxpayers, especially if this exemption is valid for a long time;
- the complexity of an accurate assessment of time t can lead to using as a time t the period of incentives exemption or any extended period (5-6 years), when the effect of benefits must clearly appear. All these assumptions will reduce the accuracy of the estimation;
- the precise estimation of the increase of the tax administration costs and tax harmonization costs is a costly and difficult task, simplified procedures will not consider these indicators.

So the simplified formula for calculating the tax expenditures for the period would have the form:

$$\sum_{i=1}^{t} TE^t = \sum_{i=1}^{t} TI^i_{w/i} - \sum_{i=1}^{t} TI^i.$$

(3)

4   Initial requirements for assessing the incentives efficiency

Significant problems arise in formulating this methodology. Evaluation of tax expenditures has been learned by most developed countries (this process has been improved there for decades, especially in the USA), but adequate assessment of the efficiency of these tax expenditures still has not been elaborated. Moreover, there are opinions that a scientifically based methodology for evaluating the efficiency of incentives is extremely difficult to create. There are several reasons. Let`s formulate them.

First, during the provision of incentives it is impossible to predict how the process of its shifting in each case will end, who will get this benefit, who will be the final beneficiary of it. The shifting processes in the taxation are difficult for studying and exact description in general. All this applies also to the incentives shifting. Even a long-term operation of an incentive sometimes doesn't allow identifying who is the final beneficiary, predicting its future behavior and carrying out its planning. So it is impossible to plan who would bear the newly introduced incentives.

Second, the time lag before the affect appears after the introduction of appropriate incentives is not certain, which (lag) may be specific for each incentive, so it is not clear when the expected effect of incentives will be experienced. It should be noted that the existence of a significant time lag between the introduction of the incentives and the real impact of its actions is a characteristic feature of this type of preferences. Identification of the time lag is required to adequately relate the cost of the relevant tax period (year) to the corresponding effect (fiscal, economic, social) of the period, in which the effect becomes visible. Correct time correlation of tax expenditures and effects is a necessary requirement (if it comes about an adequate assessment) for an adequate assessment of incentives.

Third, besides identification and accounting the time lag under the circumstances of a significant inflation the problem of the different cost of tax expenditures and the corresponding effect (fiscal, economic, social) of the period arises. It is necessary to reduce the values being compared to the same period of time by discounting.

Fourth, it is not always clear how much the resulting effect of the introduction of the incentives will be free of influence from the actions of others (objective and subjective) factors that lead to the formation of the same effect, regardless of the application of the privilege. Thus it is required to separate the effect of incentives from the effect produced by the action of a general economic process and other economic instruments: stimulating (budget subsidies, for example) and other regulatory.

Fifth, it is important to consider the process of interdependence of some tax bases, which leads to the fact that the tax incentive for one can influence the change of revenues for other taxes to which this incentive was not introduced. Thus, incentives administered by a specific tax can also affect a different tax due to the interpenetration of the tax bases. For example the tax base for the personal income tax and social contribution and income tax, business property tax, and transportation taxes are interdependent. For example, the incentive of the income tax in the form of accelerated depreciation reduces not only the income tax in the early periods of equipment using, but also deform obligations of the enterprise for the property tax, as the residual values begin to be measured nonlinearly. This process can bring a significant distortion into the determination of the tax incentives efficiency (monetary, fiscal). Interdependence of tax bases on the value added tax and profit is more obvious, so any benefit to the value added tax will deform the profit obligations of the enterprise.

The problem of the tax expenditures efficiency measuring requires finding the adequate indicators of tax incentives. The Russian practice of assessment is very inferior and methodologically undeveloped. It is formed in a pioneering manner at the municipality level, and sometimes – at the level of the subjects of the Russian Federation. In this case, regional and local practice of incentives assessment is based on a "random walk". After analyzing more than 20 of these techniques, one can make the following conclusions, which are not comforting.

- There are no typical methods. Every municipality is developing their own indicators and way of incentives selection for their use.
- In general fiscal and social efficiency indicators are measured, the first - quantitatively, the second - qualitatively.
- Efficiency evaluation is often replaced with the estimation of annual effect as some gross indicator, for example, the tax base increase as a result of the incentives.
- These techniques do not consider any of the above requirements for assessing the efficiency.

5   The essence of the proposed approach

It is offered to evaluate the efficiency of tax incentives proceeding from the definition of the economic, social, fiscal and budgetary efficiency. It is important to understand that calculations for different types of efficiency of the aggregate activity of tax incentives are not very needed (except to prove the efficiency of tax incentives as a whole). It is important to evaluate the efficiency of every specific incentive, in some cases – of a group of incentives that focus on recurrent or unidirectional effects. Also we do not take into account factors of taxes shifting, but it is

offered to consider the time lag of the incentives, inflation, the process of the tax bases interaction, as well as the presence of other factors that influence the receipt of this effect.

In addition, it is important to understand that during the introduction of incentives all kinds of effects should not become apparent. They will still appear, but their value and even the direction is different. And we cannot claim only the positive evaluations of the effects of any specific incentives (excluding the effect on the budget). Therefore, different effects should be considered, because the objectives of each different incentive are different, so the situation when the incentives achieve just one or two kinds of effect including a budgetary one is normal. This incentive shall be considered effective. We want to offer an original methodological approach to the definition of the relevant types of effects and the efficiency of tax incentives.

The fiscal impact of the tax incentives should be a subsequent increase in tax revenues over the current tax expenses. Increase in tax revenues is the difference between the sum of tax revenue from a number of interdependent taxes, which is calculated in terms of incentives submitted in the period when a real effect from the action of the incentives takes place, and the sum of tax revenues in the absence of incentives in a period of the same duration before their introduction. All indicators are considered for the period t, they should be discounted to the same period of time. If the desired value is positive and exceeds the sum of tax expenditures (i.e., the budget revenues exceed the expenditures on incentives provision - the loss of the budget), the provision of this incentive has a fiscal effect, otherwise – no.

Social impact of the tax incentives is to be seen in the increase of the standard of living of the population, the preservation and development of socially significant spheres of activity, the formation of favorable living conditions for vulnerable categories of the population, preserving and creating jobs. The demonstration of this effect for the area is clear, but it precise quantification is difficult. There are two main reasons for this.

First, it is necessary to separate this effect from the overall natural background of increasing living standards and improving social well-being of the population area, which is difficult to do, because in this area several companies may exist (and benefits they receive, of course, can be different) that form this effect. But the main analyzed error causes the possibility of achieving this effect by the means of the social program financed by the budget system.

Secondly, there is no single indicator of the population social well-being of a territory, increase of which over the natural level could be evaluated in relation to the social effect of the action of any additional stimulus in the area. Of course, there are integral factors of the United Nations (UN) like "index of quality of life" and "human development index", but they are supported only in the cross-country dimension. These indicators are not calculated by the statistical authorities of the municipality and the region. Here it is necessary to use a range of well-known indicators of the population life quality of the area interactively.

Thus, the accurate calculation of the social impact is difficult. For some incentives purely focused on production, this effect will be almost absent (for example, exemption from the value added tax on the importing to the Russian territory of process equipment analogues which are not produced in Russia is not accompanied by any noticeable social impact). In this case, the social effect of such incentives will be zero. For an approximate estimation of the socially orientated incentives we can offer two approaches.

The 1st basic approach. If for the social orientation incentives it is possible to set appropriate territorial social indicators (for example, giving tax preferences on disabled persons labor will be well correlated with indicators of disabled persons employment and wages levels of persons with disabilities), then the analyzed effect of social incentives should be assessed in relation to the dynamics of cost estimations of these parameters. This dynamic will adequately reflect the effect of the tax incentives under the terms of constant budget financing of relevant social programs. If a significant change in the budget financing takes place it is necessary to carry out appropriate correction of the increase of indicators. As a result, the social effect can be represented as a result of the excess of social indicators in terms of providing incentives for the period t over the corresponding indicators in its absence. The social effect will take place under the condition that the occurred difference exceeds the amount of tax expenses over the period.

The economic effect of the tax incentives becomes evident in the form of growing financial resources of the taxpayer that are at his disposal due to the absence of the need to transfer the funds to the state budget in the form of taxes. This can significantly improve the financial condition of the enterprise, by giving it a higher paying ability and liquidity to solve the problems of rapid modernization of fixed assets, to increase profits, etc. The effect can be seen in the outperformance of fixed investment, in expansion and upgrading of production and technology in order to increase the volumes of production of competitive products and create new jobs (including upgraded) and in the profits increase.

The economic effect is increasing of the following economic indicators taxpayers who use this incentive over current tax expenditures for this incentive. It is proposed to use the amount of working capital as a result economic indicator. This indicator is supported by the state statistics and called "organizations turnover". The organizations turnover include the cost of shipped goods of own production, works and services performed in-house, as well as revenue from the sale of previously acquired on the side of the goods (excluding VAT, excise duties and similar payments).

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The excess of this indicator is understood as the difference between the sum of enterprises sales, calculated in terms of providing incentives to the period of appearance of the real effect of the action of the incentives, and the sum of organizations sales in the absence of incentives in a period of the same duration before its introduction. All indicators are calculated for the period t, thus they should be discounted to a single period of time. If the desired value is positive and exceeds the sum of tax expenditures, the provision of this incentive has an economic effect, otherwise – no.

Budgetary effect of tax incentives is evident not only in the future increase in budget revenues generated through the expansion of the tax base as a result of the incentive, but also in a saving of the budget funds spent previously on solving social and economic problems that due to the exemption companies have to solve themselves. Thus as a result of the incentives there are additional budget funds that can be spent on the most territories of the country. These additional budget money is a result of the increase in tax revenue, i.e. budget revenues and budget savings during the realization of some socio-economic tasks, i.e. expenditures.

Part of the budgetary effect consists of an increase of tax receipts, i.e. budget revenue is a fiscal effect. If the budget savings are considered from the standpoint of alternative costs, i.e. consider budget subsidies granted by the budget of businesses in the absence of incentives to address certain socio-economic problems, then this economy can be regarded as the approximation of the sum of social and economic effects. As a result, it can be said that the budget effect includes three previously presented effects of the individual terms, and the budgetary effect is a kind of integral index, which must be positive. We offer the following approach to the definition of budgetary effect.

Budgetary effect of tax incentives may be represented as the sum of the fiscal, social and economic effects, and if any of these effects is negative, it will decrease the budgetary effect. However, the most important characteristics of budgetary effect should be a comparison of the sum of all growth indicators (income tax, social indicators, organizations turnover) obtained during the period t, when the real effect of the action of this incentives takes place with the amount of tax expenditures for the same period t. In our opinion, we should not calculate the arithmetic average of these effects, they need to be just summarized.

So, if the sum of these effects exceeds tax expenditures, the budgetary effect is present, if less - no. Incentive will be effective if the budgetary effect exceeds the effect of tax expenditures

The allocation of the environmental effects is the controversial question. On the one hand, the process of active development of environmental taxation in all countries indicates that it is necessary to allocate, as well as, the searching of adequate tax incentives for reproduction of environmentally oriented behavior of taxpayers. On the other hand, complex quantitative estimate of this effect can be done only in perspective but not in the nearest future.

But it should be noted that the allocation of environmental effects is necessary, it requires by realities. Contents of environmental impact should be reflected in reduced damage to the environment and human health. In our opinion, the evaluation of this effect should be made on two parameters. There are amounts of avoided environmental damage and improvement of health of population.

6   Conclusions

In conclusion it should be noted that each of the indicators of the tax incentives efficiency (fiscal, social, economic) can serve as a criterion by which one can estimate the efficiency (or inefficiency) of any incentives. The presence of even one type of the effect, i.e. exceeding of the increase of any type of indicators over tax expenditures (i.e. a positive effect) allows us to assume that this exemption is effective. But only the budget efficiency can be the integral index, as it accumulates the three other efficiencies. When one of the effects from the incentives can be seen clearly, this incentive has to be considered effective. In this case we have a positive effect, for example, the fiscal or social. It is likely that the budgetary effect would be positive also. Much more complicated is the case with incentives having an impact on several areas of activity. In this case, each of the effects (fiscal, social, economic) may not be as great and may seem vague. And the individual growth of all kinds of indicators will not exceed the tax expenditures, but in the aggregate the value of the total increase of these parameters may exceed the tax expenditures. Therefore, this exemption should also be considered effective. Thus, the indicator of fiscal efficiency has to make sense as the final criterion indicator, basing on the positive value of which the efficiency of the relevant incentives is stated.

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Question Marks of Special Pension Schemes

Jan Mertl[*]

Abstract. The paper aims to monitor the situation of the universal pension scheme in relation to the labour market, demographic changes, quality of life and the existence of special pension schemes in relation with health-social situation of employees. It focuses on the relations of the universal pension scheme and potential special pension schemes, aspects of their evaluation and social-political significance. As an example, we can present the current situation of Czech mining industry. It also demonstrates the possible role of QALY and DALY indicators in relation to the research problem. It is based on the principle that the universal pension scheme is the basic pension scheme available for every employee/citizen and the special pension schemes are perceived as potential upgrade.

Keywords: universal pension scheme, special pension scheme, quality of life, QALY

JEL classification: I310, H800, H00

1 Introduction

In connection with the demographic development, changes on the labour market and the development in the field of medicine and health-social systems, it is more and more important to deal with the issues of quality of life in the course of professional career and its part within the pension schemes.

The paper aims to discuss and reassess the situation of the universal pension scheme in relation to the labour market, demographic changes, quality of life and potential existence of special pension schemes for some social groups and industries, mainly disadvantaged due to the nature of workload in relation to the health-social situation.

In this context, it is necessary to analyse the relations of the universal pension scheme and potential special pension schemes, aspects of their evaluation and the social-political significance. The situation of Czech mining industry can serve as an empirical example.

The analysis is based on the theoretical principle that the universal pension scheme is the basic alternative of the pension scheme available for every employee, or even the citizen of the particular state. In some countries, especially in the past the existence of the pension scheme was perceived as the employee benefit itself; this principle resulting in the existence of branch pension schemes as a tool to provide for relevant social groups will be considered secondary in this text. Prospective special pension schemes will primarily be interpreted as an enforced update to the universal pension scheme with clear preference to provide for the population, if possible.

The research methods include socio-economic analysis of determinants influencing special pension schemes, application of theoretical models on the social reality (branch analysis, social models and pension schemes) and discussion on public policy tools when dealing with social situation in industries and with impacts on the national economy.

2 Theoretical aspects of the evaluation of special pension schemes

The issue of professional pensions (special pension schemes) contains a number of economic and social aspects. It is obvious that in this respect each special precaution bears its pension scheme expenses; at the same time, however, it shows its social aspects and macro-economic connections for which these precautions are taken into account. As in other fields of social policy, relevant costs are compensated with relevant benefits and the question is in which „branch" of the pension scheme these costs and their amount will be reflected. If we were to separate the relevant areas with the emphasis on premature pensions, this can basically be done as follows.

Economic aspect – referring to the afore-mentioned costs and their relation within national economy. From the purely micro-economic perspective, it refers to increased costs of the respective industry where the professional premature pensions are generated; in this sense they are indirectly included in the wage costs and should be viewed as such. This idea results in maintaining the structure of relevant schemes by agreement between the employee and the employer, in principle without any external intervention or assistance and generally speaking even without the obligation to generate such pension schemes. This concept is basic, theoretically pure and it is advisable and practical to apply it for the prospective structure of special pension schemes. From the macro-economic perspective, there is another problem of long-term sustainability of these estimated pension schemes at the level of relevant branches or enterprises; there is a number of well-know cases where such generated schemes were subsequently considered too costly, decreasing the competitiveness of the respective branch. The key factor of potential problems, however, mostly refers not to the costliness of respective pension schemes but mainly to the economic cycle or rather to economic crises; whether they are of structural nature – see e.g. motorcar industry in

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the USA, (Kotlikoff & Smith, 1983), or of financial one. Macro-economic factors are thus a periodical problems and it seems efficient to take them into account.

Social aspect – employees, who cannot perform their jobs because of the requirements of that particular branch and their health-social situation, can be basically „provided for" either by another job (which might require requalification or periods of unemployment), or related public-service (special) pension, or disability pension. If these systems cannot be utilizable for a person, it is possible to turn to mechanisms of social welfare. In any case, it involves potential „clients" of the social system at its relevant levels and it is important to treat them as such within the pension concept. It implies that the massiveness and availability of prospective special pension schemes also result in its protective social function; if they are absent, it is necessary to use other social-political mechanisms with related costs or social consequences.

Teleological aspect (Engliš, 1930) – it is practical to take into consideration and to analyse the specific goal of respective special pension schemes. Generally, two targets may be detected:

- Enhanced living standard of the employees of the respective branch and enhanced attractivity for those interested in working there
- Preventive solution of social situation and social risks in the described purpose of relevant funds accumulations or other special pension schemes

The relevant teleological specification makes us realize that the first afore-mentioned objective is almost exclusively a field for potential modification of these relations at the level of employee/employer; with possible correction in case of macro-economic imbalance. The second objective represents a social aspect, thus a potential incentive for public interest and adequate position in the concept of social policy. This specification also reveals that the second aspect is crucial for a branch with a relatively lower standard of wages and higher intensity of labour (e.g. health service, building industry). Theoretically, it would be possible to distinguish these objectives as to whether that particular scheme only relieves the health-social situation of the employee by allowing him to early retire or by adjusting working conditions and whether in general it enhances the level of his pension scheme as such.

From the perspective of social models we can observe that the liberal model does not focus on pension schemes at all, for everone should provide for themselves, independently of the state as well as the employer. The conservative model supports the creation of employee pension schemes including special ones if there is agreement at the branch level. The social-democratic model then takes into account health-social consequences of the work as a separate entity and is willing to discuss granting respective claims based on the acknowledgement of claims of respective social groups, including the pressure on generating applicable schemes at the level of the whole branch, region or nationwide. Differences among these models also indicate problems during the public choice and practical implementation of proposals.

3 Relations to the structure of the universal pension scheme and pillar

The key aspect for the prospective structure of special pension schemes is the retirement age. It can be noted that the higher and less flexible this age shall be, the more distinct incentives for the structure of special pension schemes will exist within the national economy. On the othe hand, the growing individual flexibility of universal pension schemes is connected with little „relying" on special pension schemes, for this flexibility basically resolves necessary provision for respective social groups in many cases, even at the cost of its lower financial level. A sufficiently massive universal pension scheme thus markedly reduces the need for the production of special pension schemes; among others it is also connected with the independence of the employer and the value of the respective branch.

From this perspective, it is evident that the development in recent years has brought about more pressure to allow higher flexibility: prolonging the retirement age (Domonkos, 2014) and present waiting for an „extensive" pension reform in terms of its higher flexibility, e.g. as for NDC system the result is that some social groups are exposed to pressure into allowing the implementation of early pension schemes. It is a relatively new feature because after 1990 one of the key benefits of the ongoing transformation of the pension scheme referred to the harmonization of the retirement age and cancellation of benefits for some social groups, the so-called cancellation of job categories. Whether these advantages were motivated by the real intensity of labour or the social preference of some social groups and job categories, their existence was perceived as fundamentally non-system within the economy transformation, which is why the reform efforts aimed to gradually eliminate them in order to introduce a uniform pension scheme for all insurants (Krebs, 2010). The subsequent increase of the retirement age, in progress since 2011 („never-ending" retirement age), however, caused that the situation of certain social groups began to be viewed as problematic as regards this increase, which is why the system generated impulses to additional modifications in this respect.

In case of requirements for a special pension amendment, it is possible to establish pension schemes accumulating additional sources to cover higher demands of the person involved. Such schemes accumulate sources independently of the parametric set-up of the universal pension scheme. The second option is to utilize

sources which are already contained in the pension scheme and to redistribute their payment – to a certain extent such adjustment then interferes in the universal pension scheme by modifying its demands for the selected social group based on certain criteria, thus making it preferential over standard claims.

It greatly depends on the structure and selected option of the general pension scheme. With the current option applied in the Czech Republic, i.e. I Pillar based on the mix of equivalence and solidarity, the potential interference in the expenditure part as regards the structure of special pension schemes is basically a pressure on the redistribution of funds among standard participants in this pillar with respective employees of the particular branch. It is allowed within the existing structure of the Czech pension scheme which can (with a relatively large volume of funds in I Pillar and exclusive allocation of the selected social insurance premium from the income in this pillar) adjust its expenditure part so that it has not relation to individual claims of the respective system participants; it "only" affects its global balance (which has a number of other, mostly macro-economic determinants). In other words, the current Czech general pension scheme is not very transparent in relation to the claims of individual insurants versus their contributions to the system, which is why these claims may be adjusted if the system balance equilibrium is ensured or its relative deflection is tolerated in relation to the volume of the whole system. On the one hand, it is quite a significant advantage since theoretically it is possible to relatively "easily" implement socially or otherwise enforced precautions, on the other hand it is quite an essential disadvantage since this manipulation with the pension scheme, especially if not separated from the state budget, is slightly non-transparent and allows to raise different claims on the system without a directly visible calculation of their impacts.

After possible reform of Czech pension system according to work recently done at research centre of UFA (Vostatek, 2013), there should be two generally used pillars, one pure solidaristic and one based on social insurance approach (NDC or FDC). In this scheme, the universal approach covers those two pillars and social insurance approach could be modified only by visible subsidising from the government budget. The room for special pension schemes is thus primarily moved to other voluntary (employer based) pillars and no "silent" redistribution is possible, which is more transparent, but also more difficult to negotiate and defend in social policy practice.

4   QALY, DALY and their relation to the pension scheme

QALY, DALY, also HYE (Healthy Year Equivalent) and WAI (Work Ability Index) are indicators aiming for the quantification of the quality of life in relation to individual´s health condition. This could be theoretically used in the concept of the pension scheme. If the quality of life remains good (unchanged or only slightly lower), individual´s work capability is expected and the person thus maintains the ability of economic activity; he does not have to be considered a recipient of the pension or another social scheme benefits.

In connection with the evaluation of medical methods and changes in health conditions, the concept of Quality Adjusted Life Years (QALY) was developed, measuring the quality of life. The mechanism of the calculation of QALY indicator is mentioned e.g. by Hurley (2000):

$$QALY = \sum w_h * t_h, \tag{1}$$

where h represents the number of individual health conditions, w_h is the criterion of quality connected with each of these health conditions and t_h is the time spent on each of them.

For WHO level in connection with the measurent of the healthy-life period, DALY (disability adjusted life years) indicator is used for a specific illness, expressing the loss of years due to premature death and the number of active years limited with invalidity or bad health conditions. It is demonstrated by the following formula:

$$DALY = YLL + YLD = N * L + I * DW * L \tag{2}$$

with N ….   number of demises,
   L ….   medium lifespan at the moment of death,
   I ….   incidence of illness,
   DW ….   degree of disablement (0-1),
   L ….   duration of the illness (till the moment of recovery or demise).
   YLL (Years Life Lost) represents the number of years lost with bad health,
   YLD (Years Lost with Disability) represents in this calculation the number of years with health disablement (Babisch, 2010) (Hollinghurst, 1999). Other empirical research is beyond the scope of this conference paper.

Theoretically, it is possible to develop these special pension schemes which would recognize the right of the respective person to use this scheme with sufficient decrease in QALY, or rather DALY in relation to the situation in the industry. Here again, two concepts could be used: either individual where the claim from the relevant scheme would be recognized in case of the indicator change with the specific employee, or average where the calculation of the typical decrease of these indicators with a specific profession would result in adequate reduction of the retirement age, possibly it would allow joining the respective special pension scheme according to set rules. If this scheme also took into account the cost of treatment in relation to the quality of life, it is possible to quantify the benefits of potential preventive and treatment programmes for the employees of the particular branch.

5   Example of Czech mining industry

Working in underground mines is a typical example of strenuous work industry which historically offers the incentive to allow premature pension as part of the special pension scheme. Prolonging the general retirement age within the basic pension scheme for this social group „puts pressure" on solving their social situation by means of special measures within the pension scheme. There are actual possibilities resulting from the theoretical analysis as to how to deal with the relevant social situation. The basic step is to determine the so-called permissible duration of the exposure after which according to health-social criteria (though the aforementioned QALY and DALY indicators are not utilized directly) the health condition of the employee is deteriorating, thus generating the incentive to restrict the possibility to perform the profession in question. As regards the mineworkers, the situation is much more complicated since exceeding this period results in health problems – at the average – quite provably and as a result of the practice of profession. After exceeding this period there are following options:

- To enable/facilitate the respective employee to overcome the situation during the critical period with the unemployment benefit and related requalification
- To use some of the characteristics of the general pension scheme if possible (premature retirement)
- To develop special pension schemes utilizable by the relevant social group (pre-retirement system, special amendment to retirement)

At present (2014), at the level of the Ministry of Labour and Social Affairs of the Czech Republic we could notice the draft amendment to legislative amendment on the Czech pension scheme by course of special pension amendment for mineworkers. This amendment applies to a specified circle of insurants working in mining industry, containing an amendment on reducing the retirement age for these insurants by five years and a special way to determine the level of percentual assessment of the old-age pension. As regards the structure of the Czech pension scheme, these measures are interlinked – if the retirement age is reduced, it is effective to modify the percentual assessment of the old-age pension as well, even in relation to former claims of mineworkers as they have been gradually amended by applicable government regulations since 1995.

The respective draft contains provisions which illustrate the aforementioned problem specifically by § 37b of Amendment to Act No. 155/1995 on Pension Insurance, based on number of shifts done at the mining industry.

The retirement age of these insurants will be reduced by 5 years with the current amendment to the percentual pension assessment. It implies that if the insurance premium rate remains unchanged, the retirement age of these insurants will be substantially reduced – they will thus have financial advantage based on the respective maximum exposure which was determined by health-social criteria. These criteria are average since they apply to all insurants of the respective branch and the claim is therefore universal in the respective social group, whereas the differentiation by the type of the executed work and the related health-social intensity is still applicable. Based on the report of the Ministry of Health dated August 2013 (MZ ČR, 2013), mineworkers suffer most from vocational diseases. 13% of all professional vocational diseases in the Czech Republic apply to mineworkers. The most frequent symptoms include pneumoconiosis or peripheral nerve disorders from vibrations; these disorders usually have permanent negative impacts on the quality of life. Also, the risk of job-related injuries is higher in the mining profession that in most common jobs.

As indicated in related explanatory reports and the analysis of the branch situation, similar drafts are the outcome of the health-social situation of respective employess as well as of the structural situation in the branch. Applicable drafts accelerated in connection with the situation in Ostrava-Karvina region developing after 2010 in connection with the structural situation on the coal market and the overall situation in the mining industry – Paskov Mine. There were also discussions about the cost of the social situation of relevant social groups. Parameters of the Czech social-economic system indicate that the average macro-economic cost of a person, who will be allowed to utilise this special pension scheme and to retire, are much lower than the cost of the unemployed even in case of their requalification. For that reason, according to the theoretical definition even the cost aspect of the relevant issues on the respective „levels" of the social system has been taken into account.

The problem of the selected solution undoubtedly lies in the afore-mentioned link to the expenditure aspect of I pillar of the pension scheme where this solution at first seems an easy and practical relief, resolving the economic problem, however, then we realize the income aspect has not been dealt with, for the claim in question is not attended by the measures on the side of the pension scheme income – e.g. by increasing the insurance premium for the respective social group, or by introducing a special branch pension scheme with the income and expenditure part. Financial cost related to the draft amendment will depend on the number of mineworkers meeting the set conditions which will develop according to the extent of the mining slump. These additional costs will be split according as the mineworkers meet the set conditions and as the scope of mining is decreased. If the number of mineworkers were decreased by ca 25%, the cost would amount to CZK 26 billion by 2070.

Nevertheless, it is also true that from the social-political perspective under current conditions in the national economy and with no schemes of accumulation type, other solutions of the aforementioned problems are more complicated to be promoted and implemented. The system of the so-called pre-retirements is voluntary and the participation in it is (in terms of employees) attended by momentaneous reduction of their disposable income

compared with the previous situation. Increase in the insurance premium or dependence of the employee on individually saved means in III pillar shows similar characteristics. This situation demonstrates that if we intend to develop special pension schemes, it is necessary to focus on it in the concept of the pension scheme and to monitor whether these pension schemes are really created and whether they fulfil the intended purpose; in practice, it is far more difficult than it seems in terms of the theoretical value of the rationality of the pension scheme concept.

6   British Mineworker's pension scheme

International comparison of the special pension schemes is very complicated because it is almost impossible to distinguish their structure by using available data due to real enhanced intensity of the branch work and other reasons, i.e. the historical ones, the extent of the universal pension scheme and its population coverage, characteristics of the branches in the particular country and so on. Therefore, we are going to present only a selected sub-example of the system for mineworkers.

British Mineworker's pension scheme is currently operated in compliance with 1994 Coal Act, however, it was created as early as 1952. Contributions to this scheme had been gradually increased from the maximum of 7.5 pence since 1952 up to 5.25 % from the income in 1998. In 1994, this scheme was closed and new participants were joining Industry Wide Mineworkers' Pension Scheme; the level of employees´ contributions remained on 5.25 % of the income. This scheme also provides other benefits, such as long-term sickness benefits, partner allowances etc.

Pension from this scheme is 1/60 per each year of the contribution service. The earnings taken into consideration represent the average of the best three years from the last 13 taxed years. If the earnings taken into consideration amount to e.g. £ 20,000 and the participant had been a service contributor for 15 years, his supplementary pension shall be

(1/60) x £20,000 x 15 years = £5,000 per year

It is highly probable that a similar scheme mainly serves as a supplementary employee pension; health-social aspects in relation to the mining industry are secondary here. In the comparison with the Czech draft for mineworkers or the earlier system of job categories, similar schemes are noticeably more segmented and more complex since they provide additional schemes for benefits and contributions payment.

7   Discussion

Social-political incentives for special pension amendments in certain social groups are extensive and they grow if human life is being prolonged in relation to the situation on the labour market. In this context, it is quite obvious that current pension systems are pressured into enabling such solutions and we can anticipate that as the social reality is going to show real human fates in the situation of a prolonged professional career, these incentives might be growing.

Relevant methods of the solution of these incentives are summarized in the following table.

Table 1: Methods dealing with the issue of retirement in relation to the intensity of labour

General levels of pension scheme	Examples of specific social-political solutions
General parameters of universal pension scheme, retirement age	Prolonging the retirement age, premium rates, general parametric set-up of the pension system, invalidity criteria
Professional career character, quality of life	Requalification, application of health-social criteria to review the claims
Development of special voluntary pension schemes accumulating additional sources	Pre-retirements, supplementary pension scheme
Development of special claim pension schemes redistributing the sources	Modification of insurants´ claims within the obligatory pension scheme
Solutions within the social system	Unemployment benefit, social help

Source: own proceedings

Primary determinant of potential special pension schemes is the prolonged period of life and the related parametric modification of the retirement system – retirement age and its potential individual flexibility, as well as relevant claimed compensations. In this respect, modifications have a direct impact as to whether special pension schemes will be necessary and for which social groups they might be intended. In general, if the pressure on the special pension schemes is too big, the best method is a high-quality and sufficiently massive universal pension system; here the citizens may implement their pension scheme throughout their whole professional career.

Another factor is the situation on the labour market and the quality of life of the employees. We can observe both more complex QALY and DALY indicators, which are applied in the theory and practice of the health policy

worldwide to assess health-social aspects of life and its quality, and simpler methods consisting in the number of years/hours worked or the indicators of invalidity in the particular branch which can also be used especially for employment purposes.

The issue of individual flexibility of the employees – requalification is quite essential too. On the one hand, considering the present length of one´s professional career, it might be a necessary aspect for a number of professions and it basically represents the solution of the first choice within the universal pension system as to how to ensure continual income allocation without special requirements. On the other hand, it is quite problematic to force social groups, which have been performing strenuous jobs for a long time, to undergo requalification because after a certain period of time their working ability is damaged as a result of this very profession and some of them, as it is often put in, might not even live to see the end of their professional career.

In case the combination of the above-mentioned factors generates social tension in the sense of the requirements for parametric improvement of the retirement system for a certain social group, there are also additional schemes easing this tension.

8   Conclusions

Sources-accumulating schemes are elegant to the intent that they let the employees and employers find the solution and by accumulating the sources they provide the respective employees with higher pension standard, being fully reflected in the costs of the branches as well as in economic balances of respective employers. This also determines their economic rationality, for it is micro-economically fully sustainable for the prices of relevant products to include full costs of labour force in the respective branches, including their life cycle. Their implementation, however, calls for sufficient value of the branch, its structural stability and willingness to create such pension schemes. An example of such measure in the Czech social system are the so-called pre-retirements, voluntarily accumulating contributions of employees and employers who have chosen this system. Eventually, these voluntarily run schemes are not associated with the given criteria of lower quality of life or the limited period of the profession practice: they might be implemented mainly or purely on the public-service pension principle. In case of optionality inside one branch, we may deal with a partial problem related to the implementation only at the level of some (especially bigger) employers and to the current tough position of small firms that may face difficulties when creating relevat schemes in practice; this might be solved through an agreement at the level of the respective branch or region.

Schemes redistributing sources are based on different demands of some social groups within the obligatory pension system. These different demands are characteristically justified by the intensity of labour in the respective branches compared with ordinary branches (average); therein also lies their sticking point, for it is difficult to recognize these claims only for some groups of employees, while others are not entitled to; it might be helpful to use objectified indicators of the quality of life and the intensity of labour which sufficiently and convincingly justify these claims. An example of such a scheme in the past were the so-called job categories and recently the draft amendments to retirement claims of mineworkers; moreover, they intend to sort out the situation in the branch. As part of relevant analyses, however, it is necessary to take into account the stability of the obligatory pension scheme as such in relation to the proposed measure. Criteria justifying these schemes, which are basically of obligatory nature, have to be sufficiently massive and as regards the state pension system sufficiently convincing for public choice.

If the above-mentioned schemes fail or are not utilized, it will reflect on the situation on the labour market, or possibly on relevant levels of the social system, in particular on employment policy and social welfare. Even this is cost-related, which is why it should be effective to analyse to what extent the special pension systems are worth supporting from public budgets. It is equally effective to take into account the macro-economic situation and demographic development, for if it is true that the universal pension scheme depends on it, it is also necessary to take into account the stability of supplementary schemes, which given their smaller volume may easily „succumb" e.g. to the structural impacts of the economic crisis.

The impact on stakeholders is highly dependent on which policies will be applied. The most important group of stakeholders are the employers and employees. The costs are related to the scheme chosen, regarding the stakeholders position also the transactional costs are very important, as it is very hard to achieve a long-time applicable solution in this area.

Acknowledgements

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Measuring Efficiency of Higher Education by Using DEA Models

Pavla Mikušová[*]

Abstract. Lots of studies are devoted to the measuring efficiency of universities, but only a few studies measure the efficiency in an international context. In this paper we focus on measuring the performance of the Czech higher education in comparison with other European countries. We used DEA methodology and data from Eurostat database for 23 countries and determined the following variables: total public expenditure on tertiary education as % of GDP, the annual expenditure on public and private educational institutions per student with tertiary education (PPS based on full-time equivalents), the employment rates of people with tertiary education and the population with tertiary education attainment. All data refer to the year 2011. The Czech Republic with its efficiency score is ranked among the last in the list as an inefficient unit.

Keywords: higher education, efficiency, data envelopment analysis

JEL Classification: C14, C67, I21

1   Introduction

The Czech Republic as the member state of European Union has to deal with increased pressures on public balances, stemming from demographic trends and globalization. Mandl et al. (2008) state that it is more important that public resources are used in the most efficient and effective way. The European education system is traditionally financed by public means; therefore we decided to measure the efficiency of the Czech higher education in comparison with other European countries by using non-parametric method Data Envelopment Analysis (hereafter "DEA").

This paper is set up as follows. The literature review and motivation why we focus on the measuring the efficiency of higher education in an international context are presented in Section 2. Section 3 introduces DEA methodology and describes the data and model specification. The results of measuring the efficiency of the selected European countries by using DEA are discussed in Section 4.

There are a lot of studies, which measure the efficiency of higher education institutions in a country. But this analysis is seldom done in an international framework.

In recent years, several studies have undertaken analysis of efficiency of higher education institution using DEA. McMillan and Datta (1998) measured the efficiency of 45 Canadian universities. Avkiran (2001) and later also Abbott and Doucouliagos (2003) measured the efficiency of 36 public universities in Australia. Afonso and Santos (2005) used DEA for measuring the efficiency of 52 Portuguese universities. There is also a study, which measured the efficiency of 72 public German universities by Kempkes and Pohl (2007). Cuenca (2011) measured the performance of 78 state universitites and colleges in the Philippines.

Afonso and Aubyn (2005) emphasize that there are only a few international comparisons of expenditure performance. For example, Fakin and Crombrugghe (1997) and Afonso, Schuknecht and Tanzi (2004) measured the performance of public expenditure in the OECD and Clements (2002) focused on education spending in Europe.

In our analysis we focus on measuring the performance of higher education in the selected European countries. This helps us to describe the performance of the Czech higher education in an international context.

2   Methods and data

2.1   DEA methodology

Very popular method for measuring the efficiency is Data Envelopment Analysis. DEA is a non-parametric method, which is based on well-known formula: output/input. DEA measures the efficiency of homogenous production units (in the context of DEA it is used the term decision making units, DMUs). One of the advantages of using this non-parametric method is the fact, that it is not necessary to use inputs and outputs in monetary form; therefore we are able to use data in percentage (Banker, Charnes, Cooper, 1984).

DEA belongs to the category of model, which can be input- and output-oriented. The choice of the model orientation depends on what we want to focus on. When we want to maximize the output with the given level of input, we use the output-oriented model. On the other hand, when we want to minimize the input with the given level of output, we use the input-oriented model (Pascoe at al., 2003). In our model we used the output-oriented model, because the principle of cost minimization is not applied for higher education according to the market

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conditions (Tibenszkyné, 2007). We also have to choose the returns to scale – constant or variable (CCR model or BCC model; CCR model was described by Charnes, Cooper and Rhodes (1978). This model assumes constant returns to scale; BCC model was described by Banker, Charnes and Cooper (1984) and assumes variable returns to scale). In our case we applied the BCC model with variable returns to scale, because the BCC model fits situations where outputs do not increase proportionally for increase in inputs.

The formula for output-oriented BCC primal model is:

$$minimize \qquad g = \sum_j^m v_j x_{jq} + v \qquad\qquad (1)$$

$$subject\ to \qquad \sum_i^r u_i y_{ik} \le \sum_j^m v_j x_{jk} + v\ ,\ k = 1, 2, \dots, n$$

$$\sum_i^r u_i y_{iq} = 1$$

$$u_i \ge \varepsilon\ ,\ i = 1, 2, \dots, r$$

$$v_j \ge \varepsilon\ ,\ j = 1, 2, \dots, m$$

$$v \in R$$

where v = dual variable matched with the convexity condition

           g = value of efficiency of DMU_q,

           ε = infinitesimal constant,

           x_{jk} = value of j-th input for DMU_k,

           y_{ik} = value of i-th output for DMU_k,

           v_j = weight of input,

           u_i = weight of output.

The interpretation of the results is following: If the optimal value of function $g*$ is equal to 1, DMU will be efficient. If the value is higher than 1, DMU will be inefficient.

This linear programming model has the large amount of conditions and restrictions, which has the negative impact on the solution of the problem. It is more practical to construct the dual model of linear programming for our primal model. This dual model uses the same data but with less restrictions (for the calculation procedure using the dual model see Jablonský and Dlouhý, 2004).

2.2   Data and model specification

We used data from Eurostat database for our analysis and constructed two output-oriented BCC models. In the first model we used total public expenditure on tertiary education as % of GDP as an input. The outputs are represented by the employment rates of people with tertiary education as % of group 15-64 years and the population with tertiary education attainment as % of group 15-64 years. The second model has the same outputs, but we changed the input – the annual expenditure on public and private educational institutions per student with tertiary education (PPS based on full-time equivalents; where PPS means Purchasing Power Standard). We decided to use this input, because total public expenditure on tertiary education as % of GDP can be influenced by the economic situation in a country. The amount of public expenditure is mostly stable over time, but GDP can be affected by the economic crisis; therefore the low value of GDP at a stable level of expenditure increases the value of total public expenditure on tertiary education as % of GDP. Then this indicator can be misleading. Therefore we constructed the second model with different input (see Table 1).

All values refer to the year 2011. There were available data from 2012 and 2013 for the employment rates of people with tertiary education as % of group 15-64 years and the population with tertiary education attainment as % of group 15-64 years, but total public expenditure on tertiary education as % of GDP and the annual expenditure on public and private educational institutions per student with tertiary education (PPS based on full-time equivalents) were not available for 2012 and 2013; therefore we used data from 2011.

Table 1: Input and outputs of constructed models

	Model 1	**Model 2**
Input	- total public expenditure on tertiary education as % of GDP	- the annual expenditure on public and private educational institutions per student with tertiary education (PPS based on full-time equivalents)
Outputs	- employment rates of people with tertiary education as % of group 15-64 years - the population with tertiary education attainment as % of group 15-64 years	- employment rates of people with tertiary education as % of group 15-64 years - the population with tertiary education attainment as % of group 15-64 years

Source: Author.

There are 23 European countries in Model 1 and 21 in Model 2. Hungary and Ireland are missing in the Model 2, because there were no data available for the annual expenditure on public and private educational institutions per student with tertiary education (PPS based on full-time equivalents). These countries were selected on the basis of available data.

Descriptive statistics (minimum, maximum, mean, median and standard deviation) of the data sets is presented in Table 2. Data for the analysis were used from Eurostat. The DEA calculation was performed by using DEA-Excel Solver 2014 (Jablonský, 2014).

Table 2: Descriptive statistics of data set of the selected European countries (2011)

Variables	Min.	Max.	Mean	Median	Std. dev.
total public expenditure on tertiary education as % of GDP	0.650	2.440	1.329	1.290	0.441
the annual expenditure on public and private educational institutions per student with tertiary education (PPS based on full-time equivalents)	3 255.3	15 987.3	8 847.8	7 668.8	3 465.2
employment rates of people with tertiary education as % of group 15-64 years	76.700	87.800	82.209	82.000	3.395
the population with tertiary education attainment as % of group 15-64 years	13.000	33.700	23.235	23.600	6.933

Source: Calculated by author based on the data from Eurostat (2015).

3   Results and discussion

The results of our analysis are presented in Table 3. The countries, whose tertiary education can be described as efficient, have the efficiency score equal to 1. The efficiency score higher than 1 indicates inefficiency of higher education.

Table 3: Efficiency score and rank of selected European countries (2011)

Countries	Model 1		Model 2	
	Eff. score	Rank	Eff. score	Rank
Austria	1.029	16	1.028	13
Belgium	1.014	12	1.034	14
Bulgaria	1.000	1	1.000	1
Cyprus	1.000	1	1.000	1
Czech Republic	1.066	20	1.076	16
Denmark	1.016	14	1.016	10
Estonia	1.013	11	1.000	1
Finland	1.000	1	1.000	1
France	1.044	18	1.076	17
Germany	1.000	1	1.000	1
Hungary	1.089	22	na	na
Ireland	1.000	1	na	na
Italy	1.079	21	1.132	21
Latvia	1.003	9	1.021	11
Lithuania	1.000	1	1.000	1
Malta	1.000	1	1.013	9
Netherlands	1.005	10	1.005	8
Poland	1.042	17	1.055	15
Portugal	1.054	19	1.077	18
Romania	1.016	13	1.000	1
Slovakia	1.099	23	1.129	20
Slovenia	1.025	15	1.021	12
Spain	1.000	1	1.084	19
Mean	*1.026*	-	*1.037*	-
Std. dev.	*0.032*	-	*0.043*	-

Note: na = not available

Source: Calculated by author based on the data from Eurostat (2015).

The results showed that the efficiency scores in Model 1 are similar to the efficiency scores in Model 2. The rank of the countries is also similar. The countries with efficiency score equal to 1 in both models are Bulgaria, Cyprus, Finland, Germany and Lithuania. In other words, these countries have efficient higher education.

The significant differences in results of these two models may be seen in the following countries: Estonia, Malta, Romania and Spain. These countries are efficient in one model, but inefficient in the second one (Malta

and Spain are efficient in Model 1, but inefficient in Model 2; Estonia and Romania are efficient in Model 2, but inefficient in Model1). Even though we can say that the changing input did not have significant effect on the results in Model 2.

When we focus on the position of the Czech Republic in the rank, we find out that we are almost at the end of the list with other counties from the Visegrad Four. The efficiency score can tell us how to change the outputs when the level of inputs is given and thus become efficient. The efficiency score of the Czech Republic is 1.066 in Model 1 and 1.076 in Model 2. These results say that we have to increase the outputs by 6.6 % (according to the Model 1) or by 7.6 % (according to the Model 2). It means that the employment rates of people with tertiary education as % of group 15-64 years should be increased from 81.1 % to 86.456 % and the population with tertiary education attainment as % of group 15-64 years should be increased from 15.8 % to 16.843 % (according to the Model 1). Using the results of Model 2 shows that the employment rates of people with tertiary education as % of group 15-64 years should be increased from 81.1 % to 87.246 % and the population with tertiary education attainment as % of group 15-64 years should be increased from 15.8 % to 27.624 %. These results raise the questions as how to increase the employment rate of people with tertiary education and how to increase the population with tertiary education? The aim of this paper is not to find answers to these questions, but quantify the efficiency of higher education. Finding answers to these questions could be the aim for next paper.

The performance of the Visegrad Four in an international context is below-average. According to the Model 1, the Czech Republic has the efficiency score 1.066 (rank 20), Hungary 1.089 (rank 22), Poland 1.042 (rank 17) and Slovakia 1.099 (rank 23). Model 2 showed that these countries are more inefficient than in the Model 1. According to the Model 2, the efficiency score of the Czech Republic is 1.076 (rank 16), data for Hungary are not available, Poland 1.055 (rank 15) and Slovakia 1.129 (rank 20). The rank in the Model 2 is affected by the missing values for Hungary and Ireland.

For illustration, the employment rates of people with tertiary education as % of group 15-64 years and the population with tertiary education attainment as % of group 15-64 years for the Visegrad Four are depicted in Figure 1. Both time series are from 2005 to 2013. The results of DEA analysis showed that the Czech Republic should increase its outputs to be efficient. Both charts depict a growing trend of both outputs for the Czech Republic. Without data for inputs in 2013, we can only assume that measuring the efficiency of higher education in the year 2013 could show better efficiency score for the Czech higher education.

Figure 1: Employment rate of people with tertiary education (%, 15-64 years; left chart) and population with tertiary education (%, 15-64 years; right chart) – the Visegrad Four
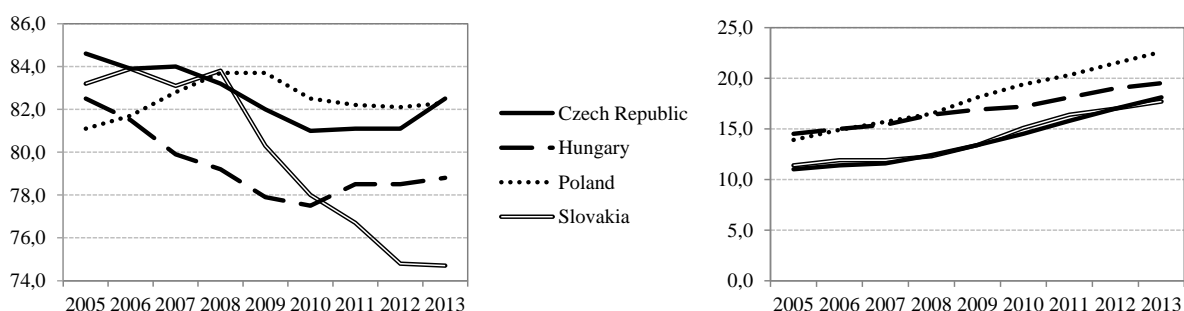
Source: Data from Eurostat (2015).

4   Conclusions

In this paper we focus on measuring the performance of the Czech higher education in comparison with other European countries. There are lots of studies, which are devoted to the measuring efficiency of universities, but only a few studies measure the efficiency in an international context. In our analysis we used data from Eurostat database and constructed two output-oriented BCC models. In the first model we used total public expenditure on tertiary education as % of GDP as an input. The outputs are represented by the employment rates of people with tertiary education as % of group 15-64 years and the population with tertiary education attainment as % of group 15-64 years. The second model has the same outputs, but we changed the input – the annual expenditure on public and private educational institutions per student with tertiary education (PPS based on full-time equivalents). The results showed that the efficiency scores in Model 1 are similar to the efficiency scores in Model 2. We can say that the changing input did not have significant effect on the results in Model 2.

The countries with efficiency score equal to 1 in both models are Bulgaria, Cyprus, Finland, Germany and Lithuania. In other words, these countries have efficient higher education. When we focus on the position of the Czech Republic in the rank, we find out that we are almost at the end of the list with other counties from the Visegrad Four. The efficiency score can tell us how to change the outputs when the level of inputs is given and thus become efficient. The efficiency score of the Czech Republic is 1.066 in Model 1 and 1.076 in Model 2. These

results say that we have to increase the outputs by 6.6 % (according to the Model 1) or by 7.6 % (according to the Model 2).

This analysis also showed if the countries spend their public means on tertiary education effectively or not. On the other hand, we have to consider other factors, which can affect the results (e.g. household wealth, parental education, state support of higher education).

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Effective Corporate Tax Rates in the Czech Republic and the United States of America

Jana Morávková[*]

Abstract. The article compares the effective corporate tax rate in the Czech Republic and the United States of America. The effective corporate tax rate of both countries is computed making use of the macro backward-looking approach in two different ways. In the first, the effective corporate tax rate is determined as a ratio of the corporate tax to the gross domestic product. According to this analysis the effective corporate tax rate is higher in the Czech Republic. In the second approach the effective corporate tax rate is computed as a ratio of the corporate tax to the net income (less deficit). Results determined by using the second approach show unlike the first one that the higher effective corporate tax rate is in United States of Amerika. The tax statistics provided by the Czech financial authority, data from the Amadeus database, and the statistics published by Internal Revenue Service are used for the comparison.

Keywords: effective corporate tax rate, macro backward-looking approach, micro backward-looking approach, micro forward-looking approach.

JEL Classification: H20

1 Introduction

Taxes that will be deducted from future activities are among the most important factors governing the selection of location of a company. The statutory tax rate cannot be directly used for comparison of the taxes imposed in different countries since it does not take into account many essential factors having significant impact on eventual tax liability of a company. Undoubtedly, the corporate tax is not the only tax companies are obliged to pay, the others may be car tax or land value tax. However, the corporate tax usually poses the highest tax burden for companies and because of that this article concerns only with corporate tax.

As mentioned above, the statutory tax rate is not the best measure of tax burden posed on companies. For this reason, economists have introduced a new indicator – the effective corporate tax rate (ECTR). ECTR takes into account not only statutory tax rate but also other significant elements of tax system (e.g. assessment of tax base). Thus it is possible that in the country with the higher statutory tax rate will be ECTR lower than in country with much lower statutory tax rate. (Blechová, 2008)

The aim of this article is to determine the differences between the effective corporate tax rate in the Czech Republic and in United States of America and the causes of these differences. Czech Republic was chosen because I know its tax system well and I want to compare tax burden of my homeland with another countries. United States of America (USA) were chosen because of long tradition of corporate taxation and performed analysis could provide interesting results and possible inspiration for the Czech tax system.

Yet there is no general way to determine the ECTR and various methods for computing the indicator may be found in the literature. (Szarowská, 2011)

2 Methods for computing ECTR

According to Kubátová (2011) it is possible to distinguish between fictional and real indicators. In general, the fictional can estimate possible future impact of a new tax or a new element of a specific tax. Because of that these methods are considered as forward-looking methods. On the other hand, the methods which are based on real data are known as backward-looking methods. At the same time it is necessary to differentiate between macro and micro studies. Macro studies use data of national accounts, while micro studies utilize data from financial statements of companies.

2.1 Fictional indicators

Fictional indicators comprise the tax rate, tax laws, the effective marginal tax rate (EMTR), and the effective average tax rate (EATR). As already mentioned, the statutory tax rates are not objective and thus are not an appropriate indicator of effective taxation. Nevertheless, they can provide at the first insight and assessment of a national tax system. (Kubátová, 2011) In particular, the current height of corporate tax rate in the Czech Republic is 19 percentage. As for the United States, the overall statutory tax rate is much more complicated. It depends on height of taxable income and each state can complement the federal tax rate with a tax rate ranging from 0

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percentage to 12 percentage. The highest federal statutory corporate tax rate is 35 % and is applicable if the taxable income exceeds $ 18,333,333.00 (KPMG, 2014).

Tax laws provide comprehensive description of a national tax system however it is extremely difficult, and thus inefficient, for a company to analyze whole tax systems just to assess suitability of a country. This drawback gets even more pronounced if there are many specific exemptions and frequent changes in law. (Kubátová 2011)

The last two of the fictional indicators, i.e. EATR and EMTR, can be computed with the micro forward-looking scheme. (Nicodéme 2001) The best known method is King and Fullerton's approach from 1984 which analyzed domestic investments. Devereux and Griffith revised this method in 1998. (Blechová, 2008) Both approaches are based on assumptions that all markets are competitive and production function has standard features (Szarowská, 2011).

2.2   Real indicators

The real indicators are based on existent data. They enable to analyze prior tax burden and thanks to actual data all features of the tax system are included. They can be distinguished between macro and micro studies. EATR and the actual effective tax rate are considered as micro indicators. The implicit tax rates (announced by the European Union on an annual basis) and tax percentage are known as macro indicators.

There exist three different ways how to compute tax percentage:
- as the corporate tax income divided by the total tax income;
- as a ratio of the corporate tax income to GPD, and
- as a ratio of the corporate tax income to profit and loss before taxes. (Kubátová, 2011)

2.3   Comparison of both indicator types

Both indicator types possess advantages and disadvantages making them suitable for different purposes. The fictional ones do not include some crucial features of tax system (for example tax loss or tax deductible and nondeductible costs) and because of that they can mislead a potential investor. On the other hand, they can provide relatively accurate estimate of the effective tax rate in the case that tax system does not exhibit specific features. This particular aspect is used by politicians during a process of creation or novelization of tax legislation to assess future impact of new legislation on tax subjects.

The backward-looking methods, i.e. real indicators, include all elements of a national tax system. However, these methods cannot be used for ECTR determination in the case of changes in a tax system. Another disadvantage is that they are not able to abstract from the influence of foreign tax systems.

Many studies have concerned with ECTR but only some of them actually computes the same indicator. All above mentioned methods are correct and choice of particular type of the indicator should comply with the focus of study.

2.4   Macro backward-looking studies

Macro backward looking approach used in their analysis Podhradská and Kubátová (Kubátová, 2011). The authors computed ECTR in different sectors in the Czech Republic using Amadeus database. According to their analysis ECTR range from − 85 percentage points to 115 percentage points in different types of sector. Mendoza, Razin and Tesar used for their analysis data from national accounts and revenue statistics. These authors estimated ECTR for USA, United Kingdom, France, Germany, Italy and Japan from 1965 to 1988. In USA ECTR ranged from 25.6 percentage points (in 1983) to 41.8 percentage points (in 1974). Among authors who used for their studies macro backward looking method belong also Martinez Mongay (2000) who presents in his work corporate income tax revenues (% GDP).

3   Comparison of the effective corporate tax rate in two countries

In this study, USA and the Czech Republic have been selected and two analyses of ECTR were performed. ECTR was computed by means of the macro backward looking approach. This concrete approach have been selected because of the continuity of data and their good availability. At the same time they can provide comparison of tax changes in tax system in time and also it is possible to compare tax burden in more countries in time. In the first analysis the ECTR was computed as a ratio of corporate tax to GDP. OECD statistics were used as a source of data for this analysis.

Figure 1: Effective corporate tax rate in the Czech Republic and United States of America
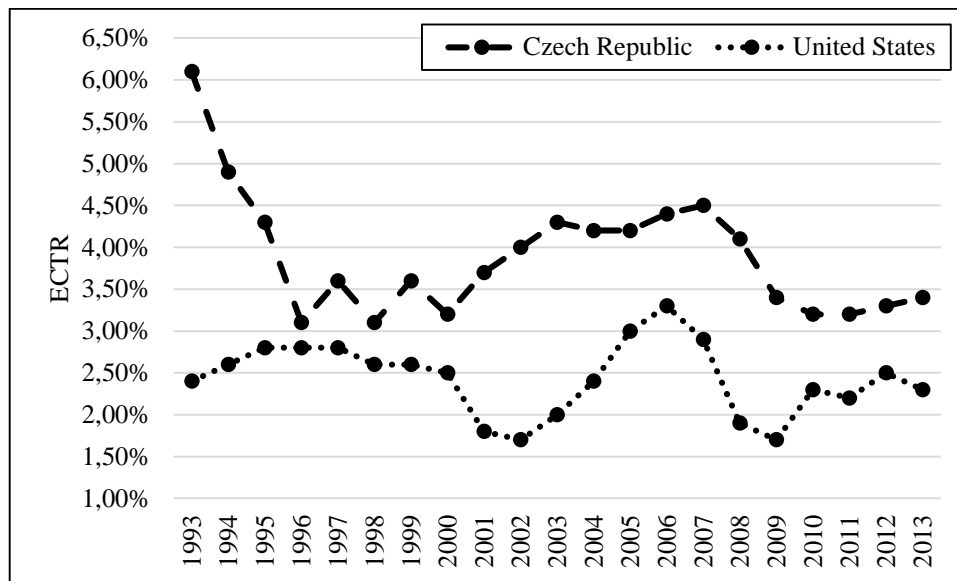
Source of data: OECS statistics

According to Figure 1 ECTR has been, in general, higher in the Czech Republic than in USA in the last twenty years. After the Velvet Revolution ECTR in the Czech Republic rapidly converged to ECTR in USA and both oscillated at nearly similar rate from 1996 to 2000. At the beginning of the new century both indicators diverged again. The descent in USA's ECTR might be attributed to the Dot-com bubble event in 2001. After that ECTR in USA reached nearly the same value as of the Czech Republic. In 2007, the progress of both was influenced by the global economic crisis. Since 2010 the both rates have shown a similar, balanced trend.

Computed ECTR shows the same trend like ECTR computed by Martinez-Mongay (2000) from 1993 to 2000. Nevertheless the ECTR in both studies differs from -0.6 percentage points to 0.6 percentage points.
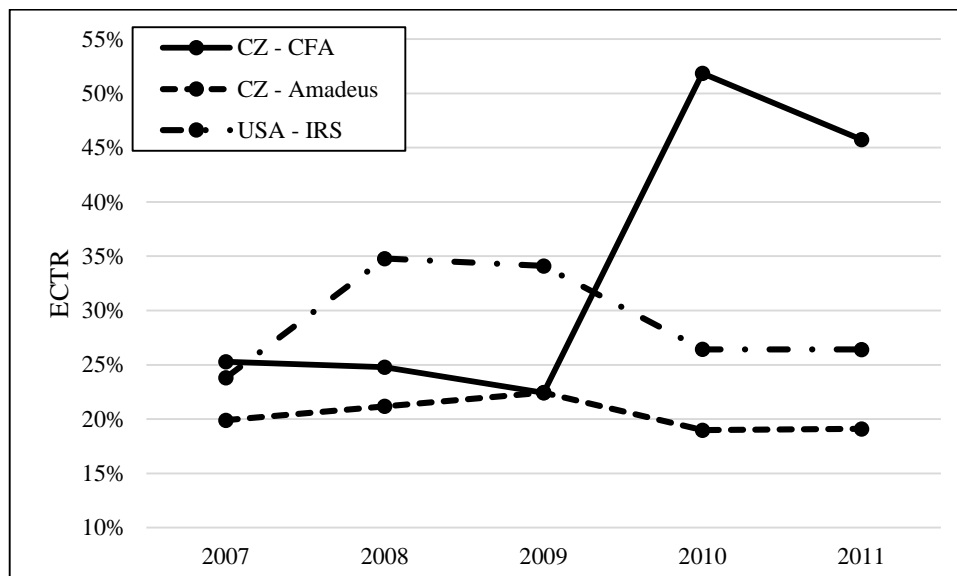
The second analysis processed data provided by Financial Administration of the Czech Republic and by Internal Revenue Service. Because data provided by Financial Administration of the Czech Republic exhibit significant scatter the study was complemented with data from the Amadeus database. ECTR was computed as a ratio of the corporate tax to the net income (less deficit).

Financial Administration of the Czech Republic issues statistics which include the following financial information about Czech tax subjects: profit and loss account before taxation, depreciation, non-deductible expenses, and tax loss. Until 2009 data showed steady progress but in 2010 the ECTR extremely increased. This massive increase of ECTR was caused by enormous decrease of profit and loss before taxes (58 percentage points) while the corporate tax remained almost the same (decrease 2.5 percentage points). This may be due to limited data included in the statistics or due to mistake in provided data, thus the analysis may not be representative enough.

The database Amadeus provides financial data of significant amount of companies in the European Union, however, the database unfortunately does not include information about American companies. Second disadvantage of Amadeus database is that it can provide financial data only about 5000 companies. Thus it was necessary to determine selection criteria for companies. The first criterion was the size of the company. In many studies is used as a model company medium sized company (e.g. Jacobs & Spengel, 1999) thus only medium sized company were included in comparison. The second criterion was independence indicator. In analysis were included only companies with independence indicator A+, A a A- (none of the shareholders owns more than 25 % of shares). ECTR was computed as a ratio of the corporate tax income to profit and loss before taxes.

Internal Revenue Service publishes various statistics concerning taxation of companies. Data provided by Internal Revenue Service were used for US companies. The statistics includes among other information net income (less deficit) which is considered as pretax profit. This indicator corresponds to profit and loss before taxes, found also in Amadeus and provided by the Financial Administration of the Czech Republic. ECTR was computed as a ratio of the corporate tax income to net income.

Figure 2: Effective corporate tax rate in the Czech Republic and United States of America

Source: Internal Revenue Service, Amadeus and Financial Administration of the Czech Republic

ECTR computed making use of data from Amadeus showed similar values as those computed with data provided by Financial Administration of the Czech Republic until 2009. In 2010 and 2011 ECTR differed significantly. ECTR results based on Amadeus were then taken as the reference.

Figure 2 shows that ECTR based on Amadeus data was lower in the Czech Republic than the one in the United States. According to this indicator, companies located in the Czech Republic are subjected to lower tax than the ones located in USA. At the same time this ECTR is very close to the statutory tax rate imposed on companies in the Czech Republic. Decrease of ECTR in 2010 could be the result of the lower statutory tax rate and the exceptional depreciation (this was one of the tax changes which should support companies during financial crisis).

Studies published by Zentrum für Europäische Wirtschaftsforchung GmbH (e.g. Devereux, Elschner, Endres, Spengel, 2011) and by Elschner and Vanborren (2009) support this conclusion (higher ECTR in USA). In their studies computed ECTR is much higher in USA than in Czech Republic.

4   Conclusions

This simple study illustrates that although the both analyses computed the effective corporate tax the conclusion rendered by the indicators differs significantly. Recall that according to data displayed in Figure 1 the higher taxation is in the Czech Republic. This is caused by the higher denominator in equation, since GDP per capita is much higher in USA than GDP per capita in Czech Republic. Because of this fact the whole tax percentage (i.e., ECTR) decreases.

On the other hand, Figure 2 shows that the lower taxation is expected in the Czech Republic. This particular analysis is for potential investors (e. g., companies) much more suitable, since denominator shows effectivity of companies in contrary to analysis shown in Figure 1 where the denominator rather shows efficiency of whole economy of one country.

It thus emphasizes the fact that a potential investor or scientist has to carefully choose a method of computing the effective corporate tax rate such that it is consistent with the focus of the study.

Acknowledgements

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Accountability Arrangements and Social Innovations: Slovak case

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Abstract. In our research we focus on two selected Slovak accountability mechanisms – the Supreme Audit Office and the Ombudsman. The goal is to assess the potential contribution of these accountability arrangements to the anchoring of social innovation in the public sector. The theory expects that accountability mechanisms, like SAO and Ombudsman activities may create feedback loop supporting public innovations. On the base of the comprehensive set of data reviewed, interviews and the general knowledge, we can state that such feedback loop almost does not function in the Slovak reality and we also provide certain explanations why.

Keywords: innovations, social innovations, Slovakia, Ombudsman, Supreme Audit Office.

JEL Classification: H19

1   Introduction

In relation to the public services, the innovation can be understood as the development of public services towards better meeting of the needs based on the modification of the status of entities / actors in the system of public services provision (Hartley, 2005; Mulgan & Albury, 2003; Osborne & Brown, 2005). These entities are able and willing to learn, to improve their work and cooperate with each other (Von Hippel, 2007). The innovation of public services must meet the needs of the public or needs of society or a particular community whose members are involved in the process of creation and implementation of innovation.

Innovation of public services is possible in the environment of a new concept of government that is defined as the sum of interactions with cooperation of actors from public and private sector in solving social problems (Osborne & Brown, 2005). The emphasis is on the citizens and on building the civil society (Pollit & Bouckaert, 2011, Špalková and Špaček 2014). This means that for innovation in the public sector to be successful, there must be a consistency between the nature and the environment where innovation takes place. The innovation process requires legitimacy (Wilson, 1989), political sustainability (Moore & Hartley, 2008), strengthening democratic values (Bason, 2010) and respect for the needs of citizens (Korteland & Bekkers, 2008). Innovation in the public sector is a social innovation that should bring in the provision of public services not only economic value but also legal and democratic values (Bušina, 2011).

Bekkers et al (2013) provide the overall framework for our concrete tasks of this research. The authors not only describe the concept of social innovation and relate this to the public sector context, but they also identify numerous potential drivers and barriers for public sector innovation. These drivers and barriers have been ordered according to three main dimensions: the innovation environment, the innovation process, and the adoption of innovation.

In our research we focus on two selected Slovak accountability mechanisms – the Supreme Audit Office (SAO) and the Ombudsman. The goal is to assess the potential contribution of these accountability arrangements to the anchoring of social innovation in the public sector. The general hypothesis is that accountability mechanisms such as ombudsmen and audit offices, if organized in an appropriate way and if respected well, can generate feedback loops via which organizational learning can occur. These learning processes may, in turn, increase the likelihood that innovations are anchored. Relevant questions to be responded are:

- Which accountability and feedback mechanisms are in place and how are these mechanisms organized: Do Slovak SAO and Ombudsman function in such a way that organizational learning can occur?
- Does this lead to the institutionalization of certain innovations? If not or in very limited scale, what are the purposes?

2   Research methodology

The main method used in this article is the qualitative analysis. To be able to respond to our research questions we decided for following five steps based research design. The first four steps focused on collection of data - defining the sample of SAO and Ombudsman reports to be analysed, content analysis of selected SAO and Ombudsman reports, selection of cases for in depth research and interviews. The final step – the core part of this paper - is the

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evaluation of the capacity of SAO and Ombudsman to motivate for public sector innovations and indication of main barriers to it.

Concerning the SAO all audit protocols are available on the SAO web page. We decided to check all reports published during the 2007 – 2011 period (and 2014 to obtain information if the SAO practice improves). The titles of all reports for this period (about 120 - 150 reports yearly) were screened and reports with titles indicating that performance audit was delivered selected. All selected reports were in depth analysed by contents analysis method. This analysis showed to us that many so called performance audits are in reality just compliance audits and very few real performance audits with effective recommendations are produced by the Slovak SAO. On the base of the contents analysis we were able to select only three performance audits for the purposes of detailed investigations - SAO combined performance and compliance audit report Bánovce nad Bebravou (performance proposals in the area of waste management - report published in 2009), SAO combined performance and compliance audit report City transport enterprise Žilina (performance proposals for public transport organization - report published in 2011), SAO performance audit on separation of waste published in 2011. For this report we investigated the situation in following five municipalities: Raslavice, Huncovce, Družstevná pri Hornáde, Heľpa, Spišský Štiavnik.

For each of these reports we realised interview with responsible person on the side of audited body. On the side of the SAO we were able to realise only one interview with the director of section responsible for performance auditing - the Slovak law does not allow auditors to speak without special permit about realised audits. Total 10 interviews have been realised.

Also on Ombudsman web page it is possible to find and download all reports. Two types of reports are published – annual reports and specialised reports. Because the number of reports is limited, we applied contents analysis method on all of them. On this base we selected one issue (mentioned in more reports) – possibility of electronic voting from abroad. For this issue we realised two interviews – one with Ombudsman and one with the head of department for elections at the Ministry of Interior of the Slovak Republic.

Realised interviews are the core base for the analytical part of our paper – together with generally available data their contents is used to evaluate if the "learning process" leading to innovations can happen and what are main stimulating and limiting factors.

3 Does the Slovak SAO function in such a way that organizational learning can occur?

The Slovak SAO received several quality awards and the representatives of the SAO are very proud concerning the quality of its audit activities – interviewed director feels that the functioning of SAO is excellent. However, the reality is very different, as our research and also other sources indicate. Already the interview at the SAO revealed several major problems. The first core issue is the fact that before 2011 there was not any mechanism in place to archive performance recommendations (without archiving it is rather difficult to follow implementation) and although after 2011 the performance recommendations are archived, there is still no system to follow if any implementation happened. So reports may include certain, in some cases even interesting important proposals, but nobody from SAO follows results. Another negative symptom is the fact that the interviewed director is very much of opinion that SAO role is the "watchdog" role.

Our contents analysis clearly documents that the qualification of SAO auditors to deliver performance audit is rather different: we may state that SAO investigates the right cases (because of number of controls the public sector performance is in depth investigated by the SAO), but not always with the right criteria. First, many officially mixed compliance and performance audits are just compliance audits. When checking performance audits (performance parts of audits) we were able to find few excellent reports, but also several reports with major deficiencies. We can quote from two reports to highlight lack of qualification of auditors:

"The city purchased cars for lowest price. This means that economy, efficiency and effectiveness are secured."

"For each audited university we randomly selected area for economy evaluation. In UKF Nitra we found that there was no exact paper evidence of presence of staff in their offices."

The positive issue, supporting the chance for learning loop, is the fact that the system for communication of SAO findings exists and is prescribed by the law. Draft reports must be discussed with audited bodies on joint meeting. Audited bodies shall sign the final protocol (with the right to provide statements). Management (elected) bodies of audited organisations shall discuss SAO reports on regular meetings. SAO reports have full access to the Parliament. SAO also has one special department for communication with media and public.

To conclude, we might argue that, despite to the limited quality of the SAO performance auditing as the whole, there is some potential for establishment of learning loops stimulation innovations – all interviewed organizations indicated that SAO proposals in our three selected cases are real and helpful. Unfortunately the number of performance audits with effective innovation proposals is rather limited (from more than hundred of analyzed performance reports may be ten have this character).

4 Does the Slovak Ombudsman function in such a way that organizational learning can occur?

According to the valid legislation, indicated above, the core role of Ombudsman is acting upon a complaint of a natural person or legal entity or on his own initiative in cases when fundamental rights and freedoms were infringed contrary to the legal order or principles of the democratic state and the rule of law in relation to the activities, decision-making or inactivity of a public administration body. This legislative environment means that the main role of Ombudsman has ex-post character and the chance to cover all problems is limited (capacities of Ombudsman for own initiative reports are limited).

However, the Ombudsman also states on the main web page of the office that the role of the office is also to improve public sector functioning – so some space for innovative proposals exists:

"I wish the state would function for the people and in terms of democratic principles of good governance. I consider it very important and accordingly I would also like to markedly contribute to improved operation of the public administration bodies. I will devote my energy and time above all to make our country really good place for life and to make people feel better here". JUDr. Jana Dubovcová, Public Defender of Rights

The analysis of Ombudsman reports indicates that a part of regular and specific Ombudsman reports are also recommendations. Most of these recommendations have basic defensive or organisational character, but some of them may serve as motivation to public sector innovations. However, we have to mention that Ombudsman does not have sufficient pro-active communication strategy, especially concerning innovative proposals. All proposals are reported by two basic channels - annual regular reports submitted to Parliament and extraordinary specific reports on own initiative - with the right to move this document forward to be discussed in Parliament.

Findings and proposals may but must not be discussed with bodies involved – all depends on Ombudsman decision (Ombudsman also stressed that even in cases when she wants to discuss some issues, it is rather difficult to find real partner – especially the Ministry of Labor and Social Work is not open for any communication). One employee of the Ombudsman Office is responsible for the contact with media, but the effectiveness of such efforts varies case by case.

All findings above indicate that there is relative potential for establishment of learning loop on the base of Ombudsman recommendations. Ombudsman is ready to serve in this direction, as our interview shows (our interviews with Ombudsman seem to serve as the tool to strengthen this mechanisms), but a lot depends on willingness of responsible public bodies.

5 What is the real impact of the Slovak SAO and Ombudsman on public sector innovations?

Our analysis indicated that SAO and Ombudsman activities may (to the limited extend) serve as the source for public sector innovations in Slovakia. However, the responses from eight interviewed organisations do not provide very optimistic picture concerning the level of implementation of SAO and Ombudsman recommendations.

Concerning SAO, only in one case (Helpa) the mayor stated that all recommendations were welcomed and fully implemented (however, our "cross-check" indicates that his statements were not fully fair, just "over positive" – for example the municipality does not have needed data to asses the level of separation and such data are not the part of program budget). In other investigated cases respondents mentioned partial or zero implementation – the main excuse was financial constraints.

A question is also, if SAO recommendations were the main (or at least important) purpose for few proposed and really realised innovations. If we look on our cases, the interviews document this very clearly. The positive changes in the public transport system in Žilina are results of EU funds financed project conditions and not the SAO report (no impact). The improved separation of waste on municipal level is mainly the result of new stricter EU legislation, setting legal requirements for recycling (SAO reports might play some role, but they are not the dominant factor for changes). The improved system of heating in Bánovce (one of proposals of this audit was to use wooden waste for heating) also cannot be directly connected with SAO recommendations (SAO reports might play some role, but they are not the dominant factor for changes).

The interviews indicate also other problems - municipalities do not screen SAO reports as the source of new ideas and innovations, the see SAO as watchdog, controlling details of their actions and not the partner helping them to improve local democracy and local public services. All this information shows that the rather limited innovative feedback loop from SAO activities is almost fully neglected by audited bodies.

Concerning Ombudsman our research indicates that innovative proposals by Ombudsman are not realised at all.

To summarise, we may argue that the impact of SAO and Ombudsman on public innovations via effective feedback learning loops is rather limited. The following part explains selected main barriers in few more details.

6 Selected barriers limiting the chance for effective feedback loop to support innovations (with focus on local level)

The previous part argues that SAO and Ombudsman impact on public innovations are rather limited because of the character and capacities of these bodies. Except for these "internal" factors, analysed above, our research and also existing data reveal also other purposes for rather limited quality of feedback loop. We want to stress following important aspects - limited absorption (implementation) capacity on the side of addressed organizations, difficult Slovak environment, characterised by the lack of accountability and responsibility and over-politicisation of public life and role of media.

The problem of absorption capacity includes several dimensions, but the best visible issue is territorial fragmentation. Local governments not only feel that SAO and Ombudsman are just controllers and they have doubts about the capacity of SAO to control and advice, but in most cases they do now owe sufficient financial and human capacities for improvement and implementation of interesting advice. This situation is the result of too large fragmentation on the level of self-governments. Slovakia has 5.5 mil. inhabitants, but almost 3000 municipalities, most of them bellow 1000 inhabitants. Such small units have problems to handle basic daily tasks of municipal life and their internal innovative capacity and absorption capacity for handling external innovation inputs is close to zero. The absorption capacity (for positive performance suggestions) by larger public sector bodies is also limited, as our cases show (Žilina has almost 100 000 inhabitants), and the main purpose is described in the following text.

The second, regions specific problem – lack of accountability and responsibility is now well described by Veselý, 2013, but also some other sources. According to the existing theory (see for example Stiglitz, 1989) elected politicians may serve to public but also to their own private interests. In Slovak conditions the second choice is rather frequent – and rent-seeking officials normally do not deliver innovations to improve administrative and public services (not always – in case that innovations are costly and related firms may benefit, the situation can be different). The study by Pavel (2009) clearly shows that because of low level of accountability, Slovak public bodies frequently do not correct mistakes, found by SAO controls – if clear problems are not reflected, it is difficult to imagine that performance proposals would be.

The Slovak public sector is clearly over-politicised. SAO and Ombudsman can serve as interesting examples. SAO is rather popular on the level of the current, but also previous governments (current president of SAO term ended three years ago and new one still not elected by Parliament, no political party cares about this). We can propose one purpose for this - for many years SAO did not initiate investigations of any major top level scandal. On the other hand, the reputation of SAO, as evaluated by external experts, it is not very high. A lot is already visible from our contents analysis and from interviews. In 2012 the SAO has been reviewed by the Transparency International (large project in more CEE countries – Košťál et al, 2012). It scored relatively high in global figure, but the lowest score were for following indicators:

"To what extent does the audit institution provide effective audits of public expenditure?"
"To what extent is the SAO effective in improving the financial management of government?"

The scores for auditors by interviewed representatives of audited bodies is also quite low – all of them see SAO as watchdog, auditors not able to work on the base of trust and understanding. The average mark for SAO reputation in term of credibility and expertise by this group is 3 (with 7 as maximum).
Concerning Ombudsman, its position is rather different. The Ombudsman during the interview that:

"The political support can bring more openness of Parliament to the suggested changes".

Because the Ombudsman criticised several actions of the current government, she is "persona non grata" today for governing coalition with clear majority in the Parliament. The fact that Ombudsman did not receive space for her requested interventions in the programme of recent Parliamentary sessions is clear documentation of the current antagonistic relations between coalition and Ombudsman office (see for example Pravda, 30. 1. 2014: http://spravy.pravda.sk/domace/clanok/306921/).
The Ombudsman also stated:

"The Public Defender of Rights is expected to be the eyes and ears of Parliament. (However)… The Public Defender of Rights is perceived by the institutions more like the control institution, and the primary reaction is to defend".

The role of media reflects the situation in today's´ society. Media are ready to spread information about negative issues, scandals ("boulevard" media approach), but not so much positive performance – such info does not create sufficient attention of people. Slovakia does not have any really investigative and independent daily or weekly (most journals belong to two owners). This situation is mentioned by Ombudsman:

"The practical experience indicates that if some specific and unique issue is detected – the solution of such an issue is much quicker compared to an issue which requests systematic change. It is much more difficult".

7   Conclusions

The theory expects that accountability mechanisms, like SAO and Ombudsman activities may create feedback loop supporting the process of creation of public innovations. This report checks the concrete situation of the Slovak Republic. On the base of the comprehensive set of data reviewed, interviews and the general knowledge, we can state that such feedback loop almost does not function in the Slovak reality. There are more purposes for such situation, especially over-politicization, limited accountability, limited absorption capacity on implementation level, but also internal limits visible especially on SAO level.

Many changes on all levels are necessary to make this feedback loop effective – especially improvement of performance audit capacity at SAO level and switch from politicisation of the public administration in the country to real policy making. The absorption/implementation capacity by public bodies responsible for innovations can be long-term problem, because of large territorial fragmentation – and too small municipalities simply may not have needed innovation capacity.

Acknowledgements

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Competitive Effect in Public Procurement

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Abstract. The paper concerns with analysis of public contracts for constructions awarded in 2013. We aim to investigate the effect of openness in public tender competition (competitive environment) on the final price of a public contract. Analysis of the data set reflecting public contracts for constructions confirms that the more will be adopted an open award procedure, the greater is the potential for submitting a larger number of bids and the greater are savings in the final price that may be potentially achieved. This finding should be an incentive towards amendment of the Act on Public Contracts in order to promote openness and transparency of procurement procedures.

Keywords: public procurement, competitive effect, types of tender procedures, final price of a public contract.

JEL Classification: D23, H57

1   Introduction

While providing goods and services, the public sector may face the question of how to secure the necessary goods and services. Addressing this question takes the form of an institutional dilemma, each of which has its advantages and limitations (see Prager, 1994; Beblavý and Sičáková-Beblavá, 2006; Nemec, Mikušová Meričková and Grega, 2014). Provided the public sector opts for outsourcing, it must respect certain principles to make outsourcing effective (see Domberger and Rimmer, 1994; Levin, Tadelis, 2005; Nemec, Mikušová Meričková and Vozárová, 2014) and conforming to the legal code (Jurčík, 2007). The issue of efficiency in public procurement may be examined from the perspective of different indicators (see Strand, Ramada, Canton et al., 2011). In this paper, we focus on the factor of public tenders' openness with respect to the final price of a public contract. The research subject represent public contracts on constructions in the Czech Republic in 2013. It concerns an analysis of the first year of a period following a major amendment to the Act on Public Contracts executed by the Act no. 55/2012 Coll. This amendment is labelled as a transparent and anti-corruption amendment. Its detailed explanation contains the publication by Jurčík (2014). In the presented paper, we aim to investigate the effect of openness in public tender competition (competitive environment) on the final price of a public contract. Such analysis has got also a practical significance. That is, it points towards an issue that potentially hides savings in public procurement. Taking into account the fact that according to data by the Ministry of Regional Development (see Annual Report on the State of Public Contracts in the Czech Republic in 2013) the value of public procurement stands at around CZK 500 billion, then it makes sense to look for the factors that lead towards savings in public procurement. One of these factors represent openness and transparency in public tenders.

2   Reflexion of the issue in contemporary theory

As the starting point for our analysis we take two interrelated theoretical concepts, known as the so-called effect of (non)transparency in public procurement (Burguet and Che, 2004) and the competitive effect (Domberger and Rimmer, 1994). The concept of (non)transparency argues that when it is not possible to trace the Beneficial Owner in public databases (in the case of the Czech Republic these are the Commercial Registry and the Administrative Registry of Economic Subjects), such public contracts are more expensive compared to transparent competitors. This means that securing a lower final price of a public contract is more likely in the case of open types of awarding procedures. The competitive effect relates to so-called competition hypothesis which argues that the more given public procurement process resembles the competitive market, the greater is competition and the higher is probability that the tendered price will approach the effective price. As the key factor (respectively indicator) in examining the impact of openness in awarding procedures on the final price we shall consider the number of bids. We assume that the more open is the public contest (the more competitors participate in the given tender), the

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lower is the final price compared to the expected price. With these issues deal some empirical studies, examining the issue of openness in the public procurement market and the effect of competition. From existing studies we refer in particular to the study by European Commission (Strand, Ramada, Canton et al., 2011). Analysis of the effect of openness in public contest on the final price pursues e.g. Iimi (2006). In the Czech Republic, the competitive effect in public procurement analyse in particular Nikolovová et al. (2012), Kameník et al. (2011), Pavel (2010), Maaytová and Klazar (2014). Nikolovová et. al (2012) and Kameník et al. (2011) analyse a comprehensive set of public contracts awarded prior to 2013, i.e. before of the amendment to the Act on Public Contracts executed by the Act no. 55/2012 Coll. Pavel (2010) deals with empirical analysis of several hundred large-scale public contracts on transport infrastructure. Maaytová and Klazar (2014) study the competitive effect in Czech hospitals. The non-transparency effect (in terms of the Beneficial Owner) is pursued on the example of a sample of public contracts on constructions in the Czech Republic by Ochrana and Stehlík (2015). Jurčík (2007) examines the legal aspect of the issue. In context of the above mentioned foundations we ask the following research questions: What role assumes openness in public competition on the final price of public procurement? Is it possible to prove that even following the amendment to the Act on Public Contracts (Act no. 55/2012 Coll.) there applies the competitive effect? Does the number of tender bids have an effect on the final price? Our unique results presented in this article differ from the other research papers mainly by the investigation of the competitive effect after The Act on Public Contracts (Act no. 55/2012 Coll.) took effect.

3   Data analysis

The research subject is represented by public contracts for constructions awarded in 2013 (over the period 1 January 2013 – 31 December 2013). Data on these public contracts were obtained from the website of the Bulletin of Public Contracts (see www.vestnikverejnychzakazek.cz). Over this period there were awarded in total 6,273 public contracts. For purposes of our analysis, public contracts were identified using the following characteristics: contracting authority, supplier (winning bid), type of award procedure, number of bids, estimated price of the public contract, final price of the public contract, assessment criteria.

However, during the data collection and their interpretation there turned out a relatively high rate of error (incompleteness) in observed characteristics. It has turned out that about one-fifth of the contracts contained incomplete data. These public contracts (mostly due to missing data) were excluded from further analysis. The resulting data set, subsequently subjected to further investigation, contained data on 5,065 public contracts.

In terms of the share of individual contracting authorities on the number of public contracts, there were mostly represented regional and local authorities (about half of public contracts) and the category "other" (almost one-fifth of public contracts). Each of the following types of institutions (a) national or federal offices/agencies, b) public institutions, regional and local office/agency) were represented by about one-tenth share on the total number of public contracts. Ministries and other national authorities were represented by about 6% numerical share, but on the other hand these institutions undertake large-scale public contracts for the transport infrastructure, as shows Pavel (2010).

In terms of the types of awarding procedures, within the examined set of public contracts there were in 67% cases adopted open procedures. However, it needs to be noted that the Bulletin of Public Contracts includes within open procedures also nearly half of public contracts that correspond with the simplified below-the-threshold procedure. Provided we exclude from the "open procedure" category all tenders awarded using the simplified below-the-threshold procedure, it turns out that using an open procedure there were awarded only 37% of public contracts. From this perspective the Czech Republic lags behind the EU average, since according to the study by the European Commission (Strand, Ramada, Canton et al., 2011) within EU countries there are about 73% of public contracts awarded using an open procedure. Open procedures (*potentially*) create or open up a competitive environment within public procurement. That is to say, they allow for an unlimited number of public contract candidates to participate in the tender. In this regard an open procedure represents an "analogy" to the market since it creates basis for the competitive effect in public procurement.

The *real* indicator of tender environment's competitiveness is the number of bids. Analysis of the data set revealed that the number of bids has ranged from one bid to 49 bids. Of a certain surprise is the fact that in about 15% of the open procedure cases there was submitted only one tender bid. Investigation into the causes of this finding was not a subject of our analysis. In contrast, the highest number of bids (49) was submitted in one open procedure case that was related to a building's demolition. Interesting on this open procedure on a building's demolition is the fact that the lowest tender bid price was CZK 1.2 million while the highest bid was priced at CZK 10 million. Also this case of an open procedure suggests that offered prices within this type of award procedure may significantly differ.

The average number of bids within our examined data set amounted to 6.51 offers; the median is 5 bids. We note that in terms of the indicator capturing the average number of bids the Czech Republic lags behind the EU, where public contracts on constructions attract on average 7.4 bids; the median is the same as in the case of the Czech Republic, i.e. 5 bids (see Strand, Ramada, Canton et al., 2011). In terms of adopted types of awarding

procedures, the highest average number of bids has demonstrated an open procedure (7.96 bids). On the second place with an average number of 7.15 bids has ranked the accelerated restricted award procedure. On the third place is the simplified below-the-threshold procedure (this procedure is recorded by the Bulletin of Public Contracts within open procedures) which has attracted on average 6.97 bids. As therefore evident, for this type of award procedure – where the contracting authority addresses at least 5 candidates – applies a higher number of candidates than is addressed. Not surprisingly, the lowest average number of submitted bids attracts the negotiated procedure without publication (on average 1.53 bids).

For analysis of the effect of tender openness on the final price we investigate the relationship of the final price of a public contract and the estimated price of a public contract. In addition to the variable Number of bids *PN* there will in turn be a second fundamental variable for further calculations, the price ratio DC, which may be defined as

$$DC = \frac{KC}{PC}; \text{where} \tag{1}$$

DC price ratio,
KC final price of a public contract,
PC estimated price of a public contract.

The average price ratio of the analysed sample of public contracts stands at 0.7698. This means that a reduction in the price of a public contract occurs more frequently than its price increase. Nikolovová et al. (2010) in their study also note the predominant share in the number of public contracts with a lower final price compared to the expected price of public contracts, specifically in 71% of the cases. Analysis of prices changes by the type of an award procedure shows the following ratio (see Table 1).

Table 1: Average price ratio by types of award procedures

Type of award procedure	Average price ratio (*DC*)
Accelerated restricted	0.6344
Open	0.7080
of which open	0.6940
of which simplified bellow-the-threshold	0.7257
Negotiated with call for tender participation	0.7826
Restricted	0.8267
Award of contract without prior publication of tender announcement in the Official Journal of the European Union	0.8437
Negotiated without publication of tender announcement / call for tender participation	0.9763
Accelerated negotiated	1.0183
Total	0.7698

Source: Data Bulletin of Public Contracts. Own analysis.

Analysis of the data set shows that the price ratio varies among individual types of award procedures. We would probably expect that the highest savings (price ratio between the final and estimated price) will be associated with an open award procedure. It is not so. As evident, the highest average ratio (savings) has reported the accelerated restricted award procedure (procedure with reduced deadlines). For the given finding there offers the following explanation. First, this type of an award procedure has ranked in terms of the average number of bids (7.15) second just behind the open procedure, while the difference between the average number of offers recorded for the open award procedure and accelerated restricted award procedures is only 0.81 bids, so from this perspective we also deal with a competitive environment. On the other hand it needs to be noted that within the whole data set of public contracts, using this type of award procedures were awarded only 0.0028% from the total number of public contracts. This is a very low number where one or two contracts with a large difference between the estimated and final price significantly affect the average price ratio of this type of award procedure.

For a more accurate analysis of the ratio between prices and the number of bids we adopt the Pearson correlation coefficient and regression analysis. In the context of the theoretical background there should apply that the more bids were submitted, the lower should be the final price. Empirical calculations on the data set confirm this hypothesis. To determine the dependence of two variables (in our case *DC* and *PN*), we use the Pearson correlation coefficient *r* in the form that allows to calculate it directly from data of the data set.

The result *r* = -0.5643 points towards a relatively strong negative correlation. We interpret the given result in a way that the higher the number of bids, the greater are savings compared to the expected price. However, this does not necessarily mean that a higher number of bids is the cause of savings. We only note that values of both variables (*DC* and *PN*) vary depending on each other, whether the cause is given directly due to a change in the

number of bids or the change is due to another factor. That is to say, the issue of savings (and quasi-savings) is much more complicated as shown by Půček and Ochrana (2014) and Matějová et al. (2014). For example, provided the estimated price of a public contract is overstated due to a poor estimate and the final price is consequently lower, in such a case we deal with quasi-savings.

For a more accurate examination of dependence of the price ratio on the number of tender bids we use regression analysis where the price ratio (DC) is the dependent variable and the number of bids (PN) is the independent variable. As expected, linear regression analysis has detected a decreasing regression line $y = 0.9237 - 0.0236 x$. Assuming this is a straightened line that shows the trend of the observed values, we may interpret this equation so that with each additionally submitted tender bid the final price reduces by 2.36%. The coefficient of determination R2 for this regression line is 0.3184, meaning that by this regression line there may be explained only approximately one third of the observed values. This is probably due to the fact that there is a large number of observed values which are considerably dispersed and therefore as such cannot be straightened out just by one line. Residue analysis of linear regression (Figure 1) shows that residues are not uniformly stratified along the x-axis; with a higher number of bids, the residue values oscillate above the x-axis.

Figure 1: Residue analysis of linear regression
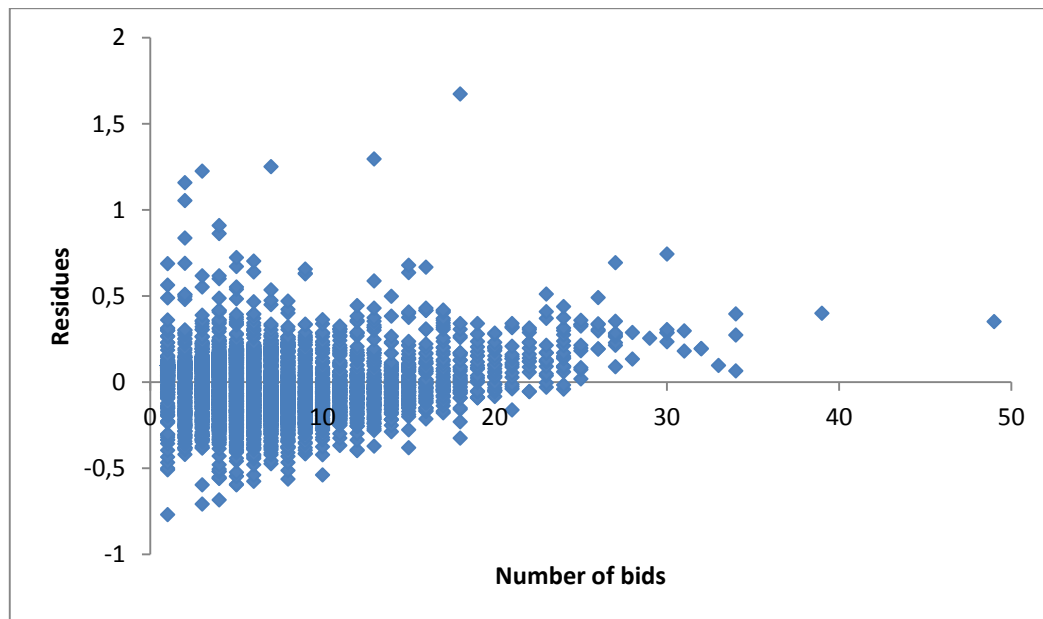
Source: Data Bulletin of Public Contracts. Own analysis.

The residue analysis points towards a slightly curved projection of observed values and their non-uniform distribution. Therefore it seems as more appropriate to adopt the logarithmic regression function. Logarithmic regression analysis of the given data set detected the following trend in the relationship of the price differential and the number of bids: $y = 1.0039 - 0.15 \ln(x)$. The coefficient of determination $R^2 = 0.3738$. Logarithmic regression analysis captures better the trend of the relationship between the price differential and the number of tender bids. Nevertheless, the conclusion for both linear and logarithmic regression analyses of the examined data set remains the same. There is an inverse relationship between the price differential and the number of bids.

4   Conclusions

Analysis of the data set reflecting public contracts for constructions confirms that the more will be adopted an open award procedure, the greater is the potential for submitting a larger number of bids and the greater are savings in the final price that may be potentially achieved. Analysis of the data set has revealed that the number of bids had ranged within the interval from one bid to 49 bids. The average number of bids was 6.51; the median is 5 bids. The highest number of bids (8) attracted an open procedure For purposes of analysis of the effect of openness on the final price of a public contract there was adopted an indicator of the price ratio DC = KC/PC (KC is the final price of a public contract; PC is the estimated price of a public contract). Average price ratio DC of the analysed sample of public contracts is 0.7698. This means that a reduction in the price of a public contract occurs more frequently than its price increase. The Pearson correlation coefficient r = -0.5643 indicates a relatively strong negative correlation between the price differential and the number of bids. Linear regression analysis has revealed that with each additionally submitted public tender bid the final price reduces by 2.36%. Analysis of the data set carried out using the form of logarithmic regression analysis shows that higher savings are brought by an increase in the number of tender bids for those contracts where the number of bids is low. This may be explained by the

phenomenon of a "saturation of the public procurement market", when an additional bid to an already large set of bids does not bring such a large effect in terms of the final price's reduction as in the case of a lower number of bids. This finding is appropriate to subject to a further research within separate examination. Analysis has confirmed the hypothesis that with each additionally submitted tender bid there reduces the final price. This finding should be an incentive towards amendment of the Act on Public Contracts in order to promote openness and transparency of procurement procedures. It turned out that those contracting authorities which increasingly use an open procedure on average also received a higher number of bids. Taking into account the fact that the public procurement market amounts in the Czech Republic to about CZK 500 billion, by using the established reduction in the final price by 2.36% with each additional bid we may in turn achieve through openness in the public tender rather significant savings in public procurement. It is therefore relevant to look for factors that impact the competitive effect of public procurement and in context of the theoretical findings to amend regulations that guide award of public contracts.

Acknowledgements

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Annex: Summary output

Regression Statistics	
Multiple R	0.564298
R Square	0.318432
Adjusted R Square	0.318297
Standard Error	0.173792
Observations	5065

ANOVA

	df	SS	MS	F	Significance F
Regression	1	71.44547	71.44547	2365.456	0
Residual	5063	152.9212	0.030204		
Total	5064	224.3667			

Influence of 2007 and 2008 Tax and Benefits Reforms on the Distribution of Marginal Effective Tax Rates

Jan Pavel[*]

Abstract. In 2008 came into force the tax reform, which has introduced just one 15 % marginal tax rate for taxation of personal income. One reason for implementation of this reform was effort to make the tax and benefit system more incentive to work. In this paper we analyze the impact of this reform on the distribution of marginal effective tax rates for employed persons (METR (EP)). The indicator is calculated only for the head of the household, which is the standard approach used. We have used microsimulation model based on data from the survey EU-SILC.

Keywords: Czech Republic, Make-Work-Pay Indicators, Microsimulation.

JEL Classification: H21, J08

1   Introduction

In 2008 came into force the tax reform, which has introduced just one 15 % marginal tax rate for taxation of personal income. One year before there was implemented other reform, which was focused on the social benefits. The systems of state social support as well as assistance in material need have been significantly changed. Both of these measures are significantly influenced the effects of the interaction of tax and benefit system on the motivation of people to increase their work effort.

The main aim of this paper is using a microsimulation model created within the project for the Ministry of Labour and Social Affairs to analyze the impacts of these two reforms on the distribution of selected make-work pay indicator. Due to the limited scope of this work we have focused only on one indicator: the marginal effective tax rate for employed persons.

The article is divided into three parts. The first describes the methodology of solutions, the parameters of used microsimulation model and summarizes the changes in tax and benefit systems made in 2007 and 2008. Second section presents the results of the analyses. Finally, the conclusion discusses implications of obtained results for tax and benefit policy.

2   Research method

Supply side of the labour market, especially in the case of low-income households that receive social benefits, is strongly influenced by the alignment of the tax and benefit system. It is underlined in number of publications (e.g. Haveman (1996), OECD-EC (2003) and Carone - Salomäki (2002)). The behavior of households is affected by the overall impact of individual tax and benefit instruments on their net income, and therefore it is necessary to consider these two systems together. The increase in the gross household income does not often increase only direct tax burden, but reduce the amount of social transfers as well.

For the analysis of (de)motivational impact of the interaction of tax and benefit system can be used several basic indicators. Their definitions and calculation based on studies of OECD-EC (2003) and Immervoll (2002). Due to the limited scope of this paper we will focus here only on one indicator: marginal effective tax rate (METR (EP)), which shows the extent to which the tax and benefit system motivates households to increase their work effort. The indicator value indicates how much increase the taxes and social security contribution and decrease social benefits if gross earned income will increase by one %. The indicator is defined as one minus the ratio of the change in net income to change in gross income, EC (2003):

$$METR\ (EP) = 1 - (\Delta NEI/\Delta GEI), \qquad\qquad (1)$$

where   METR (EP) = marginal effective tax rate for employed persons,

                  ΔNEI = change in net income,

                  ΔGEI = change in gross income.

The change in net income is defined as a function of change in gross income (from work), the marginal tax rate including social and health insurance paid by the employee and the rate of reducing the value of social benefits. The rate of reduction of social benefits reaches 100% in the event that these benefits are reduced by the same amount by which increased earned income after tax. This situation is typical for systems where social benefits are constructed as the difference between after-tax income and subsistence minimum (e.g. system in the Czech Republic until 2006, see more in Galuščák – Pavel (2012)).

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The model, which has been used to analyze the impact of changes in tax and benefit system in 2007 and 2008, is based on the simulation of tax obligations and benefit entitlements at the level of individual households. The data used for the calculations are microdata from the survey "Living Conditions". This survey is carried out by the Czech Statistical Office since 2005. The number of households investigated in 2008 is 11 294.

Microsimulation was carried out in the form of calculation of tax and other payment liabilities (social security contribution) on the one hand and social benefits on the other hand for each of the monitored households. The calculation was firstly based on the reported amounts of gross income and secondly for such situations, which is relevant for used indicator. In our case (indicator METR (EP)) was simulated the impact of an increase in the gross income of the head of a household of one percent.

When applying the microsimulation it was necessary to adopt a number of simplifying assumptions:

- when calculating the tax on personal income we have taken into account only the standard deductible amount / tax credits,
- social benefits are modeled only those which amount is affected by household income (child allowance, social allowance, housing allowance and benefits in material need). Others, such as pensions, sickness benefits etc. were taken from the reported values.
- in 2007, in the case of households, where possible, we have used the joint taxation of married couples with children,
- social benefits in material need are seen as claimed.

Microsimulation model can be used for analysis of changes in the distribution of income and monitored indicators due to changes in tax and benefit system, but also to analyze the impact of these reforms on public sector revenues and expenditures. The quality of the model can be tested using ex-post analysis of the data generated by the above-mentioned factors and actual amounts paid. In this comparison (macro-validation), it is necessary to take into account the difference between the accrual data microsimulation model and cash flow reporting presented always by the public sector.

Comparison of the data generated by the model with the administrative data (for 2007) shows Table 1. The accuracy of the model is relatively high, ranging between 90% and 150%. In comparison with previously existing models these numbers are very good (Sutherland (2005)). The biggest differences can be identified in the cases of housing allowance and benefits in material need. Model "overestimates" demands on public budgets in the range of about 40-50%. There are several reasons for these not good results. The main problem is that the housing allowance as well as material need benefits is influenced by the housing costs. Their amount is indeed observed in the sample survey, but probably the households are not able to demonstrate them to the competent authorities. Another role can play the problem of "Non-Take-Up", i.e. non-utilization of social benefits because of unfamiliarity with system or shame.

Table 1: Macrovalidation of the model, year 2007, data SILC2008

Social security contribution	Personal income tax	Child allowance	Social allowance	Housing allowance	Benefits in material need
Model (mil. of CZK)					
497,048	139,341	9,433	4,195	2,146	4,651
Administrative data (mil. of CZK)					
573,416	142,181	10,236	4,607	1,565	3,117
Simulation accuracy (%)					
87	98	92	91	137	149

Source: own calculation

In this article we analyzed the impact of reforms (resp. changes in setting of the tax and benefits systems) from period 2007-2008. The following table summarizes the content of these reforms.

Table 2: Reforms implemented in 2007 and 2008

Year	Implemented measures
2007	• The change in the construction of subsistence level; introduction of the institute of existence minimum. • The new form of housing allowance; now connected with the eligible expenditure on housing. • Extensive reform of benefits in material need; the introduction of the allowance for living and supplement for housing. • The new maximum amount of unemployment benefits is 0.58 times the average wage in the national.
2008	• The introduction of single marginal tax rate on personal income tax, the abolition of tax deductibility of social security contribution, broadening the tax base (now included the social security contribution paid by employers), increase of amounts of tax credits. • The introduction of maximum contributory base for social security contribution. • Limitation of the number of households receiving social state support benefits.

Source: own analysis

3   Results

The distribution of indicators METR (EP) was very much modified because of results of reforms in 2007 and 2008. Next tables contain the comparison of the situation in three years: 2004, 2007 and 2008. Vast majority of households are now concentrated in the interval of 31-40%. Moreover, the portion of households affected by demotivational (more than 50%) value of the indicator METR (EP) has been significantly decreased. Nevertheless, this percentage is significantly higher for households with children, especially in single-parent families (between 17-20%). Generally speaking, the reforms in 2007 and 2008 have improved the distribution of indicators METR (EP). Positive influence had as well as "autonomous development", especially the reduction of unemployment rate, robust wage growth, but also the stagnation of the amount of minimum subsistence level. The most significant impact on this positive improvement had the reform of benefit system in material need. There has been implemented system used in the Slovak Republic, which takes into account when calculating benefits only a portion of relevant income (e.g. 70 % of income from employment and business, 80 % of unemployment benefit).

Table 3: The distribution of households in terms of values METR (EP); all households with at least one adult works, the data in%

Year	METR (EP) %										
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91 and more	More than 50
2004	0.0	1.8	58.3	21.5	9.5	6.2	0.6	0.0	0.0	2.2	9.0
2007	0.0	1.1	53.1	28.9	13.0	0.9	0.2	1.6	0.6	0.6	3.9
2008	0.0	3.3	0.7	88.0	2.4	2.0	0.7	1.1	0.4	1.3	5.6

Source: own calculations

Table 4: The distribution of households in terms of values METR (EP); single person households, the data in%

Year	METR (EP) %										
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91 and more	More than 50
2004	0.0	0.2	64.3	22.9	10.2	0.0	0.0	0.0	0.0	2.4	2.4
2007	0.0	1.0	52.4	30.1	14.3	0.1	0.0	2.2	0.0	0.0	2.3
2008	0.0	4.0	0.3	90.2	1.0	1.9	0.1	1.7	0.2	0.7	4.4

Source: own calculations

Table 5: The distribution of households in terms of values METR (EP); two parents families without children where at least one adult works, the data in%

Year	METR (EP) %										
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91 and more	More than 50
2004	0.0	0.8	63.8	27.7	7.5	0.0	0.0	0.0	0.0	0.3	0.3
2007	0.0	0.9	53.4	29.2	16.0	0.2	0.0	0.4	0.0	0.0	0.5
2008	0.0	3.2	0.4	90.2	1.9	1.8	0.6	0.3	0.3	1.3	4.3

Source: own calculations

Table 6: The distribution of households in terms of values METR (EP); two parents families with children where at least one adult works, the data in%

Year	METR (EP) %										
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91 and more	More than 50
2004	0.0	2.6	51.8	18.7	12.4	11.9	0.1	0.0	0.0	2.5	14.6
2007	0.0	0.8	52.1	30.3	12.3	0.8	0.1	1.5	0.9	1.2	4.5
2008	0.0	2.3	0.9	88.0	3.3	1.9	0.5	1.2	0.4	1.5	5.4

Source: own calculations

Table 7: The distribution of households in terms of values METR (EP); families with just one parent with children, the data in%

Year	METR (EP) %										
	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91 and more	More than 50
2004	0.0	5.6	43.4	11.8	4.7	18.6	7.3	0.0	0.0	8.5	34.4
2007	0.4	2.2	39.7	23.3	14.0	6.9	2.7	5.9	2.9	1.9	20.4
2008	0.0	3.6	1.8	73.7	3.1	6.6	4.6	2.9	0.5	3.1	17.7

Source: own calculations

4   Conclusions

Analysis of changes in the values and distribution of indicator METR (EP), which occurred as a result of the implementation of the reforms of the tax and benefit system in 2007 and 2008, showed improvement in the incentive system settings. However, this was not so significant positive shift, which can explain the dramatic improvement in the labor market situation in 2007 and 2008. The implemented reforms were also not able to prevent forceful deterioration in the labor market in 2009, because of economic crisis. This result supports the hypothesis that the dominant role plays development on the demand side of the labor market and not tax and benefit systems.

However, the presented reforms removed several distortions which have been long criticized, such as construction of benefits in material need. Nevertheless, there are still several problem areas that need attention. This includes for example construction of child allowance, which sometimes causes more than 100% rate of METR (EP). Generally, there is still no greater coordination among relevant ministries, which is reflected in the lack of aligning of the minimum subsistence level and basic tax credits. This subsequently leads to simultaneous payment of taxes and social benefits, which generates a high rate of METR (EP).

Long-term problem is also the clarity of some laws in the social sphere, where in particular the definition of relevant income for calculation of social benefits is highly fragmented and in many cases unnecessarily complex. Attention should also be paid to the evaluation of the new system of assistance in material need.

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Public Spending on the Czech Hard Power and its Control

Bohuslav Pernica[*]

Abstract. Each state can use both soft and hard power. Using of hard power is considered as use of (armed) force in both national and homeland security by the military and security forces. Being suspected of a state within a state, hard power bodies are subjected to political control carried out by political power. One of techniques used for scrutiny of hard power bodies is budgetary control executed by the central government and the national parliament. This article deals with issue of political control of public money spending on defense and security in the Czech Republic. The case study shows some substantial deficiencies in this area of budgetary control. The most serious defects are: a defective classification of expenditures allocated to defense and security done by the Ministry of Finance and an excessive fragmentation of budgetary control in the chamber bodies.
Keywords: hard power, political and budgetary control, public spending, force
JEL Classification: F52, H12, H56, H60

1   Introduction

The issue of expenditures allocated to national bodies employing national hard power represents a part of the theory of civil-military relations. Although the military is the foremost element of a set of national bodies exerting hard power it is not the only one. Besides a ministry of defense, there are other ministries able to generate hard power—ability to using of (armed) forces—as a part of national or homeland security. Armed forces, police and intelligence services are considered as *imperium in imperio*, a state within a state; hence they might be suspected of plotting against a democratic government. In order to prevent from coup d'état led by the military, police or intelligence service, the national hard power bodies are subject to budgetary control.

Due to fact that issues of budgetary control of hard power bodies do not rather attract attention of academic research in the Czech Republic, this article has three objectives: (1) to inform about structure of hard power bodies in the Czech Republic, (2) to show how the Czech hard power is controlled by chamber bodies, and (3) to analyze an impact of such control on the government´s ability to control public spending on hard power bodies, indeed.

2   The state and its hard power bodies

The concept of hard and soft power was created by Joseph Nye for explanation of foreign policy. Nye coined the term of hard power as a counterpart to the term soft power. In particular, both hard and soft power represents options which a state has for using its power in its foreign policy. Hard power is "the ability to get others to act in ways that are contrary to their initial preferences and strategies". (Nye, 2011, 11) On the contrary, soft power is the ability to get "others to want the outcomes that you want". (Nye, 2004, 5) Although this concept was adopted by researchers dealing with international conflict, international relations, and foreign policy, the soft-power-hard-power concept is fully applicable in public policy analysis.

In particular, ministries can be classified as state power bodies with a potential of using either soft or hard power. Supposing the ability to get "others to want the outcomes that you want" means that each of us is obligated to behave in accord with law, each ministry and its subordinated offices and agencies enforcing state of law have status of soft power bodies. However, some of them have (armed) forces at their disposal which could be used if someone would refuse to obey the law or become a menace to state, its sovereignty, political system, and authorities. Such ministries ought to be considered as hard power bodies.

Nonetheless, some elements of national power have to exist always because they are an essential source of power resulting in the "ability to get others to act in ways that are contrary to their initial preferences and strategies". Such a quality of hard power is characteristic for armed forces (the military), security forces, and intelligence services using their capabilities as an essential support of state vital interests. For instance, they are authorized to: deter and repel any potential aggressor; protect citizens from any impact of crime, in particular, violent one; prosecute crimes; protect authorities from any assault; protect property from damages caused by man; avert tax and tariff evasion; isolate criminals from other people; protect the state from interfering with its business by other governments, organized crime, and extremists; freeze assets in accordance with the EU Anti-Money Laundering Directive, etc.

In compliance with the Czech national law, there are thirteen hard power bodies having capabilities of using force in the above mentioned manners. All of them are subordinated to a member of the government (a minister, prime minister); however, there are only four hard power ministries in charge of hard power bodies:

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- Ministry of Defense responsible for
  - The Czech Armed Forces,
  - The Military Police,
  - The Military Intelligence Service,
  - The Castle Guard and The Presidential Military Office;
- Ministry of the Interior responsible for
  - The Police of the Czech Republic,
  - The Fire Rescue Service of the Czech Republic,
  - The Office for Foreign Relations and Information (an intelligence service);
- Ministry of Finance responsible for
  - The Customs Administration of the Czech Republic,
  - Financial Intelligence Unit;
- Ministry of Justice in charge of The Prison Service of the Czech Republic.
  The other hard power bodies subordinated directly to prime minister are:
- General Inspection of Security Forces (internal investigating body focusing on police people, fire fighters, customs officer, and members of non-military intelligent services as well as on The Prison Service),
- Security Information Service (the national counter-intelligence service)

With the exception of The Castle Guard and The Presidential Military Office, all hard power bodies are responsible to a minister, possibly to the prime minister. The Presidential Military Office is subordinated to the head of the Czech Republic who is the formal commander in chief of the military in the Czech Republic as well. As a head of the state he has the privilege of having his own guard, a military ceremonial body, which is The Castle Guard.

From point of view of international law, hard power bodies under the Ministry of Defense umbrella are considered to be the military. As the military, they can be used as a part of foreign policy. Other hard power bodies present security forces designated for a non-military use in homeland security. Security forces are in some cases considered to be paramilitary, in particular, in a case of war. The military and security forces are usually self-sufficient. Pernica (2011a, 2012) If required they can support each other either by manpower or their capabilities/capacities. For instance, the military, The Prison Service and The Customs Administration of the Czech Republic can reinforce a police force; and the military usually provides to security forces such specific capabilities as air cargo, corps of engineers, Search and Rescue (SAR) service, and suchlike. On the contrary, police can act, e.g., as border guard providing to national security capabilities of light infantry in case of emergency. If organized in accordance with total force concept, the military and security forces complement one another. (Pernica, 2014)

3 Financial accountability of hard power bodies ensured by the government

The hard power bodies are not independent from the state power, rather just the contrary. Strictly subordinated to government, they are obligated to obey the national security strategy. On one hand, their capacity of action is limited by decisions made by politicians in compliance with the strategy and contingency plans; on the other one, their readiness of military and security capabilities is conditioned by manpower, equipment, and training acquired for money designated in the state budget for purposes of defense and security.

In order to ensure the most powerful control over hard power bodies, the hard power bodies are not only closely linked with political power represented by ministries and their political leaders but they are either a part of budgetary units or they are a budgetary unit *per se*. Besides such an institutional organization of hard power, there is a possibility to track the hard power in classification of public spending. E.g. Classification of the Functions of Government (COFOG) can be used. So public spending is classified into six groups by kind-of-governmental-activity in the Czech Republic: (1) Agriculture, forestry and fishing, (2) Industrial and other sectors of economy, (3) Service for population, (4) Social affairs and employment policy, (5) National security and legal protection (6) General public service. At the end of the day, such a "functional" classification is an input into the System of National Accounts (SNA).

Each group of expenditures can be disaggregated further. All expenditures devoted to the national hard power ought to be included into the group 5 comprising expenditures for national security and legal protection. It is to expect that an institutional organization of hard power in the Czech Republic is in a deep harmony with allocation of public expenditures traceable by the kind-of-activity budget classification. In particular, if the same political body—the government—is responsible for creating and executing security policy covered by spending approved by legislative power in shape of a budget act. In addition, the budgetary legislative power—the Chamber of Deputies Parliament of the Czech Republic—is obligated to supervise the executive state power in order to prevent any risk of governmental divergence from national law, possibly from either common pattern or common sense.

That is the intended purpose of division of the state power in a democracy. There is always someone who is counterweighing the other part of the state power; hence, any likelihood of abuse of power or making a system blunder is diminished due to mutual control of collective power bodies. That kind of control is reinforced by communication among ministries during the process of budget act drafting, as well, in order to have a transparent and effective national state.

Table 1: Czech national budgetary units dealing with the hard-power in 2001 and 2012

Group of Expenditures	Budgetary Units										
	Ministry of Defense (307)		Ministry of the Interior (314)		Ministry of Finance (312)		Ministry of Justice (336)		GIBS (376)	Security Information Service (305)	
	Number of Budgetary Sub-Units Entitled to Enforce State Power by Force										
	$5^{a)}$		$3^{b)}$		$2^{c)}$		$1^{d)}$		$1^{e)}$	$1^{f)}$	
	2001	2012	2001	2012	2001	2012	2001	2012	2012	2001	2012
1	-	x	-	-	-	-	-	-	-	-	-
2	x	x	x	x	-	x	-	-	-	-	-
3	x	x	x	x	x	x	x	x	-	-	-
4	x	x	x	x	x	x	x	x	x	-	-
5	**x**	**x**	**x**	**x**	**x**	**-**	**x**	**x**	**x**	**x**	**x**
6	x	x	x	x	x	x	x	x	-	-	-
Share of Groups of Expenditures in Total as %											
5	**78**	**76**	**84**	**76**	**0**	**0**	**95**	**93**	**100**	**100**	**100**
1-4	22	24	14	21	1<	11	5	6	1<	0	0
6	1<	1<	2	3	100	89	1<	1	0	0	0

Notes:
-… no spending on the group of expenditures (indicated as 0 in the other part of the table)
x… some spending occurred (indicated as percentage ranging from 1< to 100 in the other part of the table)
Group of expenditures:
1… Agriculture, forestry and fishing; 2…Industrial and other sectors of economy; 3… Service for population; 4… Social affairs and employment policy; 5… National security and legal protection; 6… General public service
Budgetary sub-units entitled to enforce state power by force:
a) The Czech Armed Forces, The Military Police, The Military Intelligence Service, The Castle Guard, Presidential Military Office ; b) The Police of the Czech Republic, Fire Rescue Service of the Czech Republic, The Office for Foreign Relations and Information (an intelligence service); c) The Customs Administration of the Czech Republic, Financial Intelligence Unit; d)… The Prison Service of the Czech Republic; e) General Inspection of Security Forces (internal investigating body started its activity in 2012); f) the national counter-intelligence service
Source: *Ministry of Finance of the Czech Republic* (ARIS/ÚFIS data).

Nonetheless, as shown in Table 1, there are some deficiencies in controlling of hard power in the Czech Republic. In spite of fact that The Customs Administration of the Czech Republic and Financial Intelligence Unit are authorized to use (armed) force in a police manner; for instance, that The Customs Administration of the Czech Republic is authorized to use guns against suspicious characters endangering the national economy by their criminal activities whenever there is a need to enforce public safety during such an action. Likewise, Financial Intelligence Unit can freeze peculiar financial transactions coming under measures against legitimization of proceeds of crime and financing of terrorism. (2005) Such an empowerment has usually only the police; furthermore, they need a legal permission from a procurator in order to take action. Also police power is counterweight by power of justice in any case of criminal prosecution. Although the letter of the law recognized right of police to hard power bodies in area of responsibility the Ministry of Finance it is absolutely clear, that the Ministry of Finance believes custom officers and employees to be common civil servants. On the other hand, public servants of any tax office have prohibited using guns so far; consequently, it is not supposable count them in hard power. For that account, they must be supported by police assistance on the spot.

4   Parliamentary control of hard power bodies

There is another significant and maybe a more serious deficiency in the control of hard power bodies in the Czech Republic. That is an excessive fragmentation of budgetary control in the chamber bodies (see Table 2). The excessive fragmentation of parliamentary surveillance might become a painful problem. In case of emergency,

there would be an urgent need of changing the running Budget Act in response to an abrupt development in international environment.

Table 2: The Czech chamber bodies dealing with accountability of hard-power sub-units and approving their budgets (the electoral term 2013-2017)

	Budgetary Unit	Budgetary Sub-Unit	Chamber Body in Charge of Budgetary Sub-Unit	Code	Chamber Body Approving the Act on the Budget
none	Ministry of Finance	Financial Intelligence Unit	Budget committee (sub-committee for state assets, liabilities and Financial Intelligence Unit)	312	Budget committee
		The Customs Administration of the Czech Republic	Budgetary committee (sub-committee for taxes, tariffs, and lotteries)		
Security Forces	Ministry of Justice	The Prison Service of the Czech Republic	Committee for homeland security (sub-committee for prison service)	336	Committee for homeland security
	Ministry of the Interior	The Police of the Czech Republic	Committee for homeland security (sub-committee for police and private security agencies)	314	
		Fire Rescue Service of the Czech Republic	Committee for homeland security (sub-committee for Integrated Rescue System)		
		The Office for Foreign Relations and Information	-		
	Prime minister (head of government)	The Security Information Service	Permanent board for supervising of the national counter-intelligence service	305	
		The General Inspection of Security Forces	Permanent board for supervising of internal investigating body of security forces	376	
Armed Forces	Ministry of Defense	The Military Intelligence Service	Permanent board for supervising of Military Intelligence Service	307	Committee for national security
		The Czech Armed Forces The Military Police	Committee for National Security		
	President (head of state)	The Castle Guard and Presidential Military Office	-		

Source: the Chamber of Deputies Parliament of the Czech Republic

As shown in the Table 2, the system of parliamentary control of hard power bodies is rather complicated and complex than compact and comprehensive. There are six budget units supervised by three Chamber bodies and thirteen sub-units—hard power bodies—under supervision of nine Chamber sub/committee or permanent board, nowadays. Generally, the hard power is controlled by three Chamber bodies: Committee for homeland security, Committee for National Security, and Budget committee. But only two of three Chamber bodies are dealing with security. Likewise the government, the members of parliament do not consider The Customs Administration of the Czech Republic and Financial Intelligence Unit for hard power bodies, as well; thus, those two hard power bodies are out of control of any committee dealing with security issues and security policy. That seems really strange because the government has declared in its security strategy (2015) a comprehensive approach to issue of security policy "It is increasingly important to have a comprehensive approach that prevents threats and mitigates their impacts through a combination of military and civil tools, including diplomatic, legal and economic means."

Furthermore, customs officers are considered as a part of hard power due to law adapted by MPs earlier. For instance, from point of view of the Act No. 361/2003, *o služebním poměru příslušníků bezpečnostních sborů*,

customs officers have the same employee status as police people and members of intelligence services. This law warrants them a set of benefits which are prohibited to ordinary officials, such extra pensions and leaves. On the contrary, clerks working for Financial Intelligence Unit do not enjoy any extra employee status. Despite the fact that they might become a target of international criminal and terrorist organizations affected by freezing their assets, such risks have no compensation. By contrast to customs officers and police people, ministerial officials assigned to the Financial Intelligence Unit cannot enjoy any extra pension or extra leave justified by extra stress and risk linked to their job.

An excessive power fragmentation should be considered as an unwanted development of democracy due to dissipation of perspective on parts of state power being suspected of a state within a state. An excessive power fragmentation makes any policy coordination difficult and formal. Separating funds designated to defense and security policy among three independent chamber bodies reduces possibilities of modification of a budget bill by legislative power. Provided that a parliamentary body in charge of both national and homeland security could reallocate money between defense and security purposes in accord with preferences its members, two independent parliamentary bodies focusing either on national or homeland security will not be able qualified to do so. Any fragmentation of parliamentary bodies is eroding the power of Parliament in representative democracy due to fact that the Parliament keeps losing its power to effect governmental policies by extra- and intra-sector reallocation of public money in budgetary process.

Consider apart from The Customs Administration of the Czech Republic and Financial Intelligence Unit case, even in 2001, there was only one Chamber body dealing with issues of defense and security policy. That was the Committee for national and homeland security. In addition, that committee was in charge of any approval of budgets of hard power bodies and authorization of money needed for implementation of (comprehensive) defense and security policy. An indisputable advantage of controlling five budgets linked to eleven hard-power bodies by only one chamber body was an altogether compact hard-power-bodies overview. The defense and security sector was supervised by a chamber body composed of limited number of MPs. The Committee for national and homeland security had 23 members split into only three sub-committees in 2001. Ten year later, already 26 MPs focusing on defense and security were split into two extra chamber committees, each committee divided in three sub-committees. Measuring by expenditures devoted to security and defense purposes as well as by number of people working in the security and defense sector, the sector has have significantly declined haw was indicated by Pernica (2011b) and Kořán et all (2015). Two electoral terms were needed in order to dismantle that a compact organizational model which functionality was designed for state of emergency most likely. In such a situation, simplicity is a plus. From commons sense´s point of view, it is easier to discuss and authorize changes of budgets belonging to eleven hard power bodies during one committee meeting than do so at two meetings running either simultaneously or successively.

Another significant drawback caused by the excessive fragmentation budgetary control is an influx of ambiguity generated by multiplying of actors. Any increase of number of actors taking part in budgetary cycle reduces not only its transparency, but undermines government's effort to do a comprehensive security policy as well, and places hard power bodies into a situation of unfair rivalry for public money. It means, instead of allocation of public money in accordance with actual and expected security risks and threats the allocation might be affected by political preference linked either with interrelationships among coalition partners or a contra positive link between opposition and coalition. All that will get more vivid when committee chairmanship would be taken into account. That phenomenon of allocation of money contrary to needs of comprehensive security policy is well know from American budget cycles which is supported by a bunch of publication, e.g., Lindsay (1990), Jones (1993), and Jones – McCaffery (2008). Any excessive fragmentation of budgetary control facilitates an increased influence of lobbyist and generates phenomena such pork barreling.

5   Conclusions

Any existence of a state is dependent on its hard power bodies. States without police, armed forces, intelligent service, and so on, can hardly be proper states, i.e., states able to defend their sovereignty and integrity, states able to fight crime and to enforce state of law. On the other hand, hard power bodies dispose of force which might be abuse against democracy. On that account, hard power bodies are subject both of political or budgetary control carrying out by supreme political bodies as the government and the parliament. Organization and ways of such a kind of control is a question of political attitude and culture. In order to ensure transparency of such a process and its efficiency in any state of affairs, it desirable to keep this process compact, simple, and easy.

This case study has exposed that there are some significant and serious deficiencies which reduce the government´s ability to control public spending, indeed, devoted to hard power bodies in the Czech Republic. The institutional organization of hard power bodies does not match with financial tracking of that kind of spending. Expenditures allocated to hard power bodies which are authorized of using police power are believed to be spending on general public service. That is confusing. In this manner, those "financial" hard power bodies are controlled by the parliament. Furthermore, that kind of control contributes to an excessive fragmentation of

budgetary control: thirteen hard power bodies are supervised by three Chamber committees and nine permanent boards or sub-committees. That makes the budgetary control complicated, convoluted, and rather too non-transparent. This state of affairs is a consequence of development within the last 15 years when parties and politicians fragmented Chamber bodies in order to gain parliamentary benefits as much as possible without any respect to purpose of Chamber committees in case of emergencies.

Bringing that development face to face with declarations of a continual need of a comprehensive approach to issues of defense and security, there is a vivid conflict between such declarations appealing to public interest and policy of greed developed by parties in the parliament in the last three electoral terms. So far, it seems that that such a conflict is not resolvable by any political means, not exempting managerial techniques in use of managing business organizations.

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The IFRS Adoption by the EU and its Impact on Book-tax Conformity

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Abstract. Although accounting research outlines arguments against rather than in favour of book-tax conformity, the strong interdependence of corporate and tax accounting is a matter of fact in many countries. The adoption of IFRS adds a new dimension to the deliberations, whether to link tax profits to accounting income or not. The debate on usefulness of IFRS for corporate taxation emerged especially in countries with strong link between accounting and taxation. If the tight form of book-tax conformity is applied, a potential shift to IFRS for taxation purposes may substantially extend or contract the base, which is subject to taxation. High book-tax conformity may be thus an obstacle to incorporate IFRS-based results in calculation of taxable profit. The study analyses the regulatory regimes of EU countries, with emphasis on the required/allowed/prohibited usage of IFRS both in statutory accounts of listed companies and in their fax filings.

Keywords: book-tax conformity; IFRS adoption; European Union

JEL Classification: M41, H25

1   Introduction

The research debate, whether financial reporting and corporate taxation systems shall be independent or interconnected, emerged as a reaction to two practical issues. Firstly, the independency of both systems was criticised in connection with the accounting scandals (Enron, Tyco, Xerox, etc.) at US capital markets. According to Desai (2005) and Whitaker (2005), the relative independence of corporate and tax accounting enabled companies to inflate their profits for capital markets and to understate profits reported to tax authorities simultaneously. Secondly, the IFRS adoption by European Union raised concerns about the tax collection, esp. in countries (*e.g.* Germany, Austria) with a strong link between accounting and taxation. By adopting a new system of financial reporting standards, policy makers are challenged, whether the new system should be also implemented for taxation purposes or not. The coexistence of two accounting regimes (IFRS and local GAAP) intensifies the problems when balancing the basic principles of taxation, *e.g.* neutrality, equality, simplicity, and legal certainty (MacDonald, 2002); (Oestreicher and Spengel, 2007).

The strong relationship between accounting and taxable definition on profit shall to restrict opportunistic behaviour of corporates management, when they manage earnings to meet the desirable goals. By establishing effective full book-tax conformity (further "BTC), the management will be forced to trade-off between the "penalties" from capital market and "benefits" from taxation if lows profits are reported. Similarly, capital markets rewards for reporting high profits would be neutralised by higher tax burdens. Full BTC shall overcome the opposite direction of earnings management in accounting (upwards) and taxation (downwards). This requirement by (Desai, 2005) could by partially grounded on arguments on dichotomy of accounting and tax profits revealed *e.g.* by Manzon and Plesko (2001); Mills, Newberry, and Trautman (2002); Dyreng, Hanlon, and Maydew (2008); or Frank *et al.* (2009). However, a greater number of empirical studies produce extensive evidence that increased accounting and tax dependency lowers accounting quality and thus the usefulness of financial statements for users – *e.g.* Ali and Hwang (2000); Hanlon and Shevlin (2005); Hanlon *et al.* (2005); Hanlon *et al.* (2008); Atwood *et al.* (2010); Blaylock *et al.* (2015). Furthermore, Guenther and Danquing Young (2000) and Lang *et al.* (2012), identify that a proposed closer link between accounting and taxation does not work.

Although accounting research outlines arguments against rather than in favour of book-tax conformity, the strong interdependence of corporate and tax accounting is a matter of fact in many countries. The adoption of IFRS adds a new dimension to the deliberations, whether to link tax profits to accounting income or not. The debate on usefulness of IFRS for corporate taxation emerged especially in countries with strong link between accounting and taxation (namely German-speaking countries). If the tight form of BTC is applied, a potential shift to IFRS for taxation purposes may substantially extend or contract the base, which is subject to taxation. The countries have to decide, whether and what extent to permit IFRS for taxation purposes. Countries, where high-quality of financial reporting is historically essential for smooth functioning of capital markets and/or for promoting of investments, build up taxation system relatively independently on accounting. We therefore hypothesise that these states (*e.g.* UK, the Netherlands, and Denmark) are more likely to allow IFRS in calculation of taxable profit, as the change

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in accounting regime shall have hardly registerable effect on tax revenues. On the other side, we assume that countries (*e.g.* Germany, Austria, and Italy), which traditionally use financial accounting to manage tax revenues, are reluctant to admit IFRS-based taxation. The reason behind is that IFRS are developed by the IASB; an independent body, which does not address tax goals of national policy-makers. Under tight BTC regime, accounting principles distinct from local GAAP may thus alter tax streams immediately and in an unpredictable way. The main goal of our paper is to investigate, which countries have adopted the IFRS only for financial reporting purposes and which countries have extended the relevance of IFRS also for corporate taxation. As there are over 110 IFRS-adopting countries, we limit the scope of our study to the EU countries only.

The paper is organised as follows. After the introduction and literature review in Chapter 1, we introduce the regulatory framework for IFRS in the EU and propose the classification of real systems of accounting and taxation systems of EU countries in Chapter 2. Chapter 3 concludes the paper and outlines its contribution to current research.

2   Model development

Pursuant the Article 4 of the Regulation (EC), companies, with securities admitted to trading on a regulated market of any member state, shall prepare their consolidated accounts in conformity with the IFRS. In addition, the Regulation gives the member states options relating to annual accounts and/or private companies. Following Article 5, member states may permit or require (a) the companies referred to in Article 4 to prepare their annual accounts, (b) companies other than those referred to in Article 4 to prepare their consolidated accounts and/or their annual accounts, in conformity with the IFRS. Based on the text of Regulation (EC), the EU countries are set free to mandate or allow the application of IFRS for other purposes than in consolidated statements of listed companies. Different countries apply the provisions of Article 5 at a different scope. Some do not use the option at all (*e.g.* Austria); others require/allow the IFRS for almost all companies both in individual and consolidated statements (*e.g.* Denmark, The Netherlands, Ireland; etc.). Further, we will just focus on Article 4 and the option in Article 5 (a), *i.e.* we will deal with financial reporting of listed companies only.

The main feature of corporate taxation within the EU is that the tax burden is levied in majority cases on a single legal entity (Consolidated taxation is allowed under specified and relatively strict conditions *e.g.* in France.) Despite some recent deliberations about the introduction of consolidated corporate taxation, the current tax systems deals with corporate taxpayers on stand-alone basis. The classification of corporate and tax accounting systems is therefore determined by the link between principles used in annual accounts (separate financial statements) and principles applicable in tax accounting. There are several dimensions shaping the classification structure. Firstly, we shall address the system applied for consolidated financial statements. As we deal with Articles 4 and 5 (a) of the Regulation (EC), IFRS as the exclusive system are mandated for this purpose throughout the EU. The second level deals with the link between consolidated and separate financial statements of listed companies. The Regulation (EC) allows member states to decide whether listed companies preparing consolidated financial statements in conformity with IFRS:

- are required to prepare their individual financial statements in conformity with IFRS; or
- are required to prepare their individual financial statements in conformity with local GAAP; or
- are allowed to opt between IFRS and local GAAP.

The third level of classification of corporate and tax accounting systems refers to the link between separate financial statements and tax fillings, as far as the calculation of taxable profits concerns. Depending on whether accounting income from statutory accounts is relevant for the determination of tax base or not, the systems may be sorted out into two extreme groups:

- systems with zero book-tax conformity (*i.e.* absolute independence of accounting and taxation system);
- systems with full book-tax conformity (*i.e.* absolute dependence of accounting and taxation system).

In reality, some countries following the zero BTC can be identified. On the other side, the full BTC is rear, as real regimes oscillate within the scale from zero to absolute conformity (*i.e.* within high and low number of differences between accounting income and tax profit). This mixed approach is commonly applied by majority of EU states. Consistent with findings of (Watrin *et al.*, 2014), we assume that most EU countries derive taxable profit by adjusting accounting income reported in statutory accounts in accordance with special provisions set forth in the income tax acts. Based on number of adjustments required, we distinguish:

- high number of adjustments (denoted H), which determines low BTC;
- average number of adjustments (denoted M), which determines average BTC;
- low number of adjustments (denoted L), which determines high BTC.

Table 1: Corporate and tax accounting systems of the EU countries after the IFRS adoption (as at December 2013)

Scenario	Separate statements	Tax fillings	EU countries (number of adjustments)		
A1	IFRS required	Independent tax rules	Estonia		
A2	IFRS required	Statutory accounts	Cyprus (L)	Bulgaria (M)	Croatia (H)
			Denmark (L)	Greece (M)	Lithuania (H)
				Italy (M)	Romania (H)
				Malta (M)	
A3	IFRS required	Other methods			Czech R. (H)
B1	Local GAAP required	Independent tax rules	xxx		
B2	Local GAAP required	Statutory accounts	Austria (L)	Sweden (M)	France (H)
			Belgium (L)		Germany (H)
			Hungary (L)		Spain (H)
B3	Local GAAP required	Other methods	xxx		
C1	Local GAAP or IFRS	Independent tax rules	Netherlands		
C2	Local GAAP or IFRS	Statutory accounts	Luxembourg (L)	Finland (M)	Ireland (H)
				Poland (M)	UK (H)
				Slovenia (M)	
C3	Local GAAP or IFRS	Other methods	Latvia (L)		Portugal (H)
					Slovakia (H)

Source: Authors' direct analysis of relevant accounting and tax acts; (EY, 2014); (PwC, 2014a); (PwC, 2014b); (IASB, 2014)

Table 1 captures the classification of mutual relationship of corporate and tax accounting regimes in the European Union after the IFRS adoption. The classification follows the principles outlined above; each country is assign to respective group with reference to (a) the analysis of legal acts regulating financial reporting and taxation in given country; (b) studies of (EY, 2014), (PwC, 2014a), (PwC, 2014b) and review of jurisdiction profiles by (IASB, 2014). Contrary to the model of (Watrin *et al.*, 2014), our BTC grouping is solely grounded on the provisions of income tax acts, which set the required adjustments of accounting income to calculate taxable profit. The former model is more appropriate for empirical research (*e.g.* in studies detecting tax motivated earnings management); our measure is more suitable for the ordering of regulatory regimes. (Watrin *et al.*, 2014)'s measure captures the real differences between accounting and taxable profit (because of permanent and temporary differences); the observations on company level are then aggregated and averaged on country level. However, factual discrepancies reported by firms cannot measure the level of "BTC de jure" precisely, as it could be hardly expected that each company be engaged with all potential adjustments requested by legal acts on taxation. In addition, this measure of "BTC de facto" is of ex-post nature and it varies with changes in business operations, even if both accounting and taxation regimes are stable. Our approach determines the BTC ex-ante, and it is invariant unless an amendment in accounting or tax rules occurs.

We have identified seven real scenarios of mutual relationship between financial reporting and taxation systems relevant for the EU listed companies. Theoretically, nine scenarios may have occurred, as there are three variants for the preparation of separate financial statements of listed companies and three variants of tax regime. Following the option in Article 5 (a) of Regulation (EC), EU member states may decide that listed companies are required, permitted, or prohibited to apply IFRS in their annual accounts. Furthermore, corporate taxation (a) can be based on statutory accounts of firms; (b) may use completely independent rules; (c) may require different set of accounting principles than applied in statutory financial statements. However, two possible scenarios are not followed by any EU country. Only Estonia and the Netherlands prefer a complete independence of accounting and taxation, thus exhibiting no BTC. Estonia is probably the extreme EU state regarding the corporate taxation, as no taxation of companies' profits is mandated by Estonian government; only dividends are taxable on distribution. Other countries follow a more common approach, under which accounting profit is somehow adjusted for tax purposes. Financial standards used in separate financial statements can then decisively determine the tax base. The largest group contains 11 countries, which mandate listed companies to prepare not only consolidated, but also separate financial statements in compliance with IFRS. Majority of them allow calculating tax profit based on

statutory income, which results in application of IFRS for taxation, too – see Scenario A2. The number of adjustments differs within the group; the association between accounting and tax profit may thus vary significantly. *E.g.*, Danish firms may expect that their accounting income will be (almost) equal to their tax profit. On the other hand, a high number of adjustments required *e.g.* by Croatian tax rules may loosen the linkage. Despite allowing IFRS to be tax base, the resulting tax obligation could be effectively independent on the figure reported in IFRS income statement in countries with high number of adjustments. The Czech Republic is the only country not permitting IFRS for taxation, despite listed companies must prepare both consolidated and individual statements according to IFRS. For income tax purposes, Czech listed companies have to firstly transform their statutory accounting income (based on IFRS) to accounting income based on Czech GAAP; consequently Czech GAAP income is adjusted (for relatively high number of instances) to taxable profit.

Class B contains seven states, which have not allowed the usage of IFRS in statutory accounts of listed companies. Separate financial statements have to be prepared in accordance with local GAAP. The starting point for tax fillings is statutory income, which is modified according to tax principles. In these countries, IFRS adoption has not any material impact on traditional relationship of corporate and tax accounting. Finally, Group C is made up by ten countries (including the Netherlands) passing the Article 5 (a) option on companies. Listed companies may decide whether they will maintain their statutory accounts according to local GAAP or whether they switch to IFRS completely for both sets of statements. This company-wide variability in financial reporting has to be addressed also in the tax area. Six states permit the use of IFRS in tax filling, although with relatively significant extent of adjustments. The Netherlands has an independent tax system and three countries do not tied-up tax profit with statutory accounting income automatically. Latvia and Portugal oblige the companies, if reporting under IFRS regime, to calculate additionally the income according to local GAAP, which is then adapted for tax fillings. Finally yet importantly, Slovak policy-makers permits listed companies applying IFRS in statutory accounts to calculate income tax either according to the IFRS or Slovak GAAP rules. For both cases, many adjustments have to be made in tax returns. In addition, specific provisions are applicable in the first fiscal period, for which IFRS-based taxation was selected. A complex set of tax requirements should ensure that tax expense payable would be the same regardless which type of financial reporting and tax regime will be adopted.

3   Conclusions

We thus contribute to current debate, whether accounting and taxation systems shall be constructed dependently or not. The theoretical findings can be relevant also for policy-makers, especially in connection with the IFRS adoption. Despite IFRS are designed primarily for the reporting at capital markets, many countries around the world have decided to mandate or permit the usage of IFRS in separate financial statements. Therefore, IFRS are applied not only for consolidated statements of listed companies, but also in statutory accounts of public and even private companies. As statutory accounts are traditional starting point for the calculation of tax profit in majority countries, policy-makers face a cardinal challenge, whether to allow IFRS-based taxation or not. The degree of book-tax conformity may substantially determine the impact on fiscal revenues from corporate income tax. The deliberations are further complicated by international capital mobility, which facilitate the cross-border profit shifting. The growing number of opportunities to relocate profits to more favourable jurisdiction is available especially to multinational corporations, which report just under the IFRS regime. This may be risk, but also opportunities for small open economies, which struggle to retain control over taxation.

The previous findings highlight the need to examine, whether and how the adoption of IFRS has affected the relationship between taxation and accounting. The process may influence both the regulatory frameworks (*i.e.* legal changes) and the business practices of companies. Empirical research (focusing mainly on the EU countries) has already unveiled that companies abused the changeover to IFRS to avoid taxation at some extent. However, these findings are restricted because of partially incorrect research design (Tang, 2014) or some misspecification in classification of accounting and tax regimes of certain countries (De Simone, 2013), (Watrin *et al.*, 2014). As the misspecifications relates mostly to the regimes of new EU countries, we analysed regulatory frameworks for financial reporting and corporate taxation for the whole EU with emphasis on the new member states from Central and Eastern Europe. Based on the analysis, we classify the mutual relationship of financial reporting and taxation of EU countries into nine theoretical subgroups. However, the real systems were assigned only to seven subgroups. The proposed classification can serve as the basis for further clustering of countries following similar patterns in construction of taxation system in relation to financial reporting. Finally, the classification can be employed in research studies, when the control for different aspect of "de jure book-tax conformity" is needed.

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Economic Health Index for Czech Regional Cities

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Abstract. The objective of this contribution is to make a proposal for a common indicator for the regional cities in the Czech Republic (CR). The common indicator is designed to evaluate the economic health of the regional city. The indicator uses data from the municipal budget of regional city and data which express economic prosperity of regional city. A Multiple Criteria Decision Analysis (MCDA) was used for evaluation of City Economic Health (CEH). The model of MCDA works with real data set from the Ministry of Finance of the CR and the Czech Statistical Office from the year 2013. The data set was constructed for twelve regional cities except of the capital city. The algorithm has been implemented in MATLAB.

Keywords: regional city budget, common indicator, multiple criteria decision analysis, Saaty matrix.

JEL Classification: H72, C38

1 Introduction

Cities and municipalities in the CR have the status of publicly-legal corporation and according to the law about the municipalities they care about making the conditions for the social care development and meeting the needs of their citizens, following the local conditions and customs. The needs are mainly about the living, protection and development of health, transportation and lines, the needs of information, education and scholarship, overall cultural development and protection of the public order. (Act No. 128/2000). For this reason the municipalities use the budget and especially for investment development they also use repayable sources of income (such as credits, loans, and bigger cities also issue municipal bonds). The way of using these funds influences the quality of the provided goods and services for the citizens and the other development of the municipality. The indebtedness of Czech municipalities is linked with a quite liberal approach to financial markets, getting the loans and co-financing projects from the EU as well.

The evaluation of indebtedness of all municipalities is done by the Ministry of Finance of the Czech Republic (MF CR) by using of the system of 18 informative and monitoring indicators (so called SIMU) (MF CR, 2015). For the expressing of how the debtor is able to meet his obligations, is generally used rating of the debtor. Rating of municipalities in the CR the is realized on commercial base by the private rating agencies (e.g. Moody´s, Standard & Poor's, CRIF-Czech Credit Bureau) on the request of the municipality. Rating is, however, understood as an overall evaluation of the municipality not only for the creditors, but also for the citizens and other subjects. Some other different evaluation is expressed also in some specialized journals by using of questionnaires and surveys (e.g. City for business realized by the support of weekly magazine Ekonom), showing how quality services are provided to the citizens and business entities by the municipalities.

The aim of this article is to propose common indicator of the City Economic Health (CEH). The CEH is used to evaluate the economic situation of the twelve regional cities in the CR. The indicator has been suggested this by using the Multiple Criteria Decision Analysis (MCDA) method. For the creation of the CEH indicator, the publicly accessible data from the 12 regional cities were used, except from the capital city Prague. The CR has 14 self-governing regions in total. Prague has a specific status – it's a regional seat for both Středočeský and capital city Prague region. Due to this specific status, Prague isn't included in the analysis.

2 Description of the indicators

Data to the indicators calculation or directly the indicators themselves were obtained from the information portal of the MF CR Territorial Monitor (MFCR, 2014), from the Czech Statistical Office (2015) and from the Ministry of Labor and Social Affairs of the CR (2015). To eliminate the influence of the size (number of inhabitants) of the regional city to the selected indicators, or the extent of city budget capacity of the city, some of the indicators were recalculated per one inhabitant, or were expressed in relative form. All data were obtained for the year 2013.

For the construction of indicator we have used eleven indicators, which are connected to the municipal budget and are based on the revenues and expenditures, indebtedness indicators, indicator of liquidity and other indicators,

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which predicate about the economy and development potential of the municipality. The indicators take into account four areas used for scoring and rating economic subjects – liquidity, profitability, activity and indebtedness. Rating agencies (Moody's, 2009, Standard & Poor's, 2012) use much wider scope of indicators in each given area. For creation of the CEH indicator, eleven indicators were used. See the Table 1. In our opinion, these are indicators that represent each aforementioned area of analysis the best when analyzing local/regional government.

Table 1: Data set of used indicators

Code of the indicator	Calculation	Name of the indicator
C1	Total debt / Number of inhabitants	Debt per inhabitant in CZK*)
C2	(Current revenues-Current expenditures) / Current revenues)*100	Balance of the current budget to the current revenues in %*)
C3	(Debt service / Current revenues)*100	Debt service in %*)
C4	Current assets / Short-term liabilities	Total (current) liquidity
C5	Capital expenditures / Number of inhabitant	Capital expenditures per inhabitant*)
C6	(Capital expenditure / Total expenditure)*100	Proportion of the capital expenditures to overall expenditures in %*)
C7	Number of economically active entrepreneurs / Number of inhabitants	Number of the economically active entrepreneurs per inhabitant*)
C8	-	Unemployment rate in %
C9	-	Average wage in CZK
C10	Tax revenue / Number of inhabitants	Tax revenue per inhabitant in CZK*)
C11	(Outside resources / Total assets)*100	Proportion of the outside resources to the overall assets in %

Note: *) means recalculated indicators
Source: Own proceeding based on MFCR, CSO, MLSA.

One of the simplest indicators is the indicator of tax revenues. Tax revenues represent main source of income for Czech municipalities. Czech municipalities and cities are dependent on the shared taxes, those yield cannot be nearly influenced. The other tax flowing into the municipalities' budget is a property tax, whose yield can be influenced, but it is not so significant tax for municipality's revenues. Some indicator distortion is that it contents also the corporate income tax, which is paid by the municipality itself and it is not considered as a real increase in revenues (it enters both on revenue side and expenditure side of the budget). To eliminate the size of the municipality the indicator of tax revenues is expressed per inhabitant. From the point of view of the CEH it is required the highest value of this indicator.

The other indicators related to the municipalities' budget are: indicator of the capital expenditures of the municipality per one inhabitant and the indicator of the proportion of capital expenditures to overall expenditures. The indicators reflect the size of the financial resources spent on development needs of the municipality, to the enlargement and modernizing of the infrastructure or to the savings of the operational expenses or investment transfers. These needs could be financed from the own resources (current budget surplus, capital revenues, accumulated savings) or from the outside resources. Municipalities realize mostly non-profit projects in comparison with business entities realizing profitable investments that must carefully consider what way the debt will be repaid.

For this purpose we use an indicator of the current budget surplus (current revenues minus current expenditures) – the indicator expresses, what amount of current revenues as a free source has the municipality disposable after paying the current expenditures. We have expressed this indicator as a percentage share to the current revenues because of the elimination of the municipality's budget size.

The indicator - debt per inhabitant - belongs to the indebtedness indicators. This indicator can be used for comparison among separate municipalities. Another indicator is an indicator of the debt service. MF CR expresses it as a proportion of the expenditures on the debt service to the total revenues in the relevant year. We have modified this indicator and expressed it as a percentage of the debt service to the current revenues to eliminate the influence of received capital revenues and transfers. This indicator does not take into the duration of the commitment or the deferred repayment. This fact can be considered as its failure. Some authors (Provazníková, 2009) recommend the value of this indicator should not reach more than 20-25%.

The indicator which as one of monitoring indicators of the indebtedness watched by MF CR (2015) is an indicator of the percentage of outside resources to the overall assets of the municipality. This indicator evaluates the proportion of the municipality's assets financing by the external resources, thus expresses, if there is not over-debt of the municipality's possessions. The value which should not be exceeded is according to the MF CR 25 %.

The second monitoring indicator of the MF CR (2015) is the indicator of total (current) liquidity (calculated as a ratio of the current assets and short-term liabilities of the municipality repayable to one year). Total (current) liquidity reflects the ability of the subject to reimburse current liabilities properly and in time. The value of the indicator should be higher than 1. If the value of this indicator moves within the interval [0;1] and at the same time the percentage of outside resources to the overall assets is higher than 25%, this municipality is addressed by the MF CR and asked to explain this unsatisfactory situation.

The other indicators express municipality's economic potential and prosperity. The number of economically active entrepreneurs per inhabitant demonstrates how strong entrepreneurial climate is. This is in relation with employment (more precisely unemployment rate) and average wage in the municipality. These indicators influence purchasing power of the population in the municipality. Taking into account that the unemployment rate is not registered at the municipal level, it was used the indicator of the district unemployment rate and similarly, for the average salary there was used average salary of the region.

The Table 2 was suggested on the basis of the set of indicators for year 2013 where O1 is Brno, O2 is Ostrava, O3 is Pilsen, O4 is Liberec, O5 is Olomouc, O6 is Ústí nad Labem, O7 is České Budějovice, O8 is Hradec Králové, O9 is Pardubice, O10 is Zlín, O11 is Jihlava and O12 is Karlovy Vary.

Table 2: The real values of individual criteria (indicators) for regional cities in 2013

City	Criterion										
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
O1	14,619	19.2	3.46	2.67	7,743	23.93	0.18	8.24	23,489,	21,362	10.86
O2	22,483	14.8	8.31	2.32	10,943	29.21	0.13	10.87	22,401,	21,230	13.64
O3	13,723	24.4	2.84	2.18	8,477	28.03	0.16	6.10	23,242,	20,929	8.82
O4	20,260	9.6	42.07	1.11	3,893	20.98	0.15	8.15	22,226,	13,142	19.32
O5	19,187	14.1	43.87	1.74	6,860	28.67	0.15	8.70	21,492,	13,929	14.03
O6	14,443	12.8	6.55	3.06	331	2.19	0.12	12.10	22,065,	13,270	13.1
O7	7,872	12.2	7.35	2.39	3,138	17.52	0.16	5.42	21,761,	13,356	6.89
O8	9,045	10	3.24	3.22	6,246	27.56	0.17	6.90	21,838,	14,954	9.46
O9	4,752	14.6	2.57	3.66	2,733	14.83	0.14	5.90	21,496,	13,826	5.12
O10	5,264	17.5	3.91	2.85	4,894	25.43	0.16	6.99	21,111,	13,140	5.78
O11	998	21.4	6.66	5.92	6,611	30.83	0.14	7.19	21,754,	13,108	2.65
O12	8,321	12.8	22.08	3.24	4,698	21.85	0.19	8.80	20,674,	15,264	2.3

Source: Own proceeding based on data from MFCR, CSO, MLSA.

3   Model design on the basis of multiple criteria decision analysis

A ranking objects evaluation is possible on the basis of MCDA. The traditional MCDA process is determined by the set of decision alternatives and the set of criteria according to which the desirability of an alternative is to be evaluated.

The MCDA problem can be solved by means of analytic hierarchy process (AHP). The AHP method points to an effective decision under difficult situation. It is the method of analyzing difficult unstructured situation that separates the hierarchical problem into several different groups of simpler elements (also called levels, clusters, stratums) thus creating so called hierarchy structure. Hierarchy is a particular type of system, which is based on the assumption that the entities, which we have identified, can be grouped into disjointed sets, with the entities of one group influencing the entities of only one other group and being influenced by the entities of only one other group (Gass, Harris, 1996; Triantaphyllou, 2000). The AHP (Saaty, 1980; Saaty, Vargas, 2006) is possible to apply to the easiest type (3-level) of hierarchy structure of MCDA. The ranking evaluation of objects in MCDA process is described in (Křupka, Provazníková, 2014), too. We aim to find their weights of influence: the vector w represents "importance" of criteria and the matrix V expresses "importance" of alternatives for each criterion by the following way:

$$\mathbf{w} = \left[w_1, w_2, ..., w_m \right], \mathbf{V} = \left[v_{11}, v_{12}, ..., v_{1n}; v_{21}, v_{21}, ..., v_{2n}; ...; v_{m1}, v_{m2}, ..., v_{mn} \right]. \qquad (1)$$

Basic problems of the method are (Gass, Harris, 1996; Saaty, 1980; Saaty, Vargas, 2006) subjective evaluation of the pair wise comparison of the criteria and determine an output vector, it means evaluation **E** alternatives. Subjective evaluation of the pair wise comparison of the criteria, assigns a numerical value to individual components. It expresses relative importance of the individual criteria by weights w_j and v_{ij}, where $i = 1,2, ..., m$ and $j = 1, 2, ..., n$. It determines the output vector of alternative with the highest priority on the basis of the multiplication i-row of the matrix **V** and the transposed vector **w**. It means:

$$\mathbf{E} = \left[e_1, e_2, \ldots, e_j\right] = \left[v_{1j}, v_{2j}, \ldots, v_{mj}\right] \cdot \left[w_1, w_2, \ldots, w_m\right]^T . \qquad (2)$$

For creating a rank of order based on the real data, MCDA method was used. The individual indicators weights of importance were assigned on the basis of expert's evaluation. For the creation of the Saaty matrix which is used to calculate weight vector of criteria, a line with 1 and 9 demarcations was used. We marked the position of each criterion on the line. This position represents the level of importance of the criteria from the point of economic stability and prosperity of the city. Each position on the line is based on the Saaty scale of relative importance (Saaty, 1990; Saaty, 2008). A set of alternatives represents twelve cities from Table 2 and elements of the set of criteria are in the Table 1.

Based on Saaty matrix $\mathbf{S}(11 \times 11)$ is defined standardized weight vector of criteria (see Table 3), λ_{max} is 11.7541 consistency index CI is 0.0754 and consistency ratio CR is 0.0498. The value of random consistency index RCI of $\mathbf{S}$ is in (Alonso, Lamata, 2006).

Table 3: Weights of criteria on the basis of Saaty matrix

Weight	Criterion										
	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
w_i	0.0157	0.0157	0.0569	0.1588	0.0276	0.1884	0.0132	0.048	0.0569	0.1884	0.2302

Source: Own proceedings.

Saaty matrices for all criteria $\mathbf{S}_{C1}(12 \times 12)$, $\mathbf{S}_{C2}(12 \times 12)$, …, $\mathbf{S}_{C11}(12 \times 12)$ were constructed in the same way as $\mathbf{S}(11 \times 11)$ on the basis of Table 2 and their CRs are < 0.1. Finally, based on (2) the evaluation of alternatives, it means order of the regional cities, was computed as vector $\mathbf{E}$ by the following way:

$$\mathbf{E} = [0.1084, 0.1078, 0.1156, 0.0293, 0.0534, 0.0343, 0.0576, 0.0719, 0.0844, 0.0766, 0.1675, 0.0930] \qquad (3)$$

The order of regional cities illustrates Table 4.

On the basis of the used method MCDA we have calculated weight of each criterion (indicator) entering to our analysis (see Table 3). The most important criteria for the calculation of the CEH are C11 (the percentage of outside resources to the overall assets and C6 – capital expenditures per inhabitant). On the other hand the criteria with lowest weight were calculated criteria C7 – number of economically active entrepreneurs per inhabitant and with the same weight criterion C1 – debt per inhabitant and C2 – current budget surplus to the current revenues.

Resulting order of the regional cities created in accordance with CEH indicator (with using the MCDA model) is shown in Table 4. The city with the best score is Jihlava, followed by Pilsen. Cities with the worst score are according to the CEH indicator Liberec and Ústí nad Labem.

Liberec showed high values of debt indicators (indicator C11 – proportion of the outside resources to the overall assets, C1 – debt per inhabitant and C3 – indicator of debt service). It also reaches the lowest values of C2 – indicator of balance of the current budget to the current revenue, which gives some evidence about the potential risk to repayment of the debt.

Table 4: The order of regional cities

Code of the city	Calculation of order	Name of city
O11	0.1675	Jihlava
O3	0.1156	Pilsen
O1	0.1084	Brno
O2	0.1078	Ostrava
O12	0.0930	Karlovy Vary
O9	0.0844	Pardubice
O10	0.0766	Zlín
O8	0.0719	Hradec Králové
O7	0.0576	České Budějovice
O5	0.0534	Olomouc
O6	0.0343	Ústí nad Labem
O4	0.0293	Liberec

Source: Own proceedings.

Liberec also has, from all tested cities, the lowest value of current liquidity. These results can be explained by the situation in the year 2010. Liberec solved the problem of cumulating its repayments of the long-term loans by issuing municipal bonds in amount of 2 billion CZK with maturity for 25 years. The aim was to split the expenses of the debt service evenly. Liberec repaid by these municipal bonds its long-term debts to two companies in amount of 1.89 billion CZK. This city is the first city obtaining the agreement from MF CR to issue such bonds after Act

about bonds 190/240 Coll., came into force, and according to the MF CR opinion it is able to meet its obligations connected to the municipal bond issue. However, the problem is that the city must have pawn its estates, which cannot be renovated now (municipality cannot get the grants) and it slows down the economic city's development.

Another city with the low CEH indicator is Ústí nad Labem. In this case this city is mainly influenced negatively by its low economic potential: it reaches the worst value of the unemployment rate (criterion C8), has the lowest number of economically active entrepreneurs per inhabitant (C7) and has markedly lowest value of capital expenditures per inhabitant (C5), only 333 CZK. The cities in the upper part of the rank reach the value over 10.000 CZK. This is also connected with the lowest percentage of the capital expenditures to the overall expenditures. These facts illustrate quite a low investments activity of the city at the present time. It must be keeping in mind, that for the simplification of the analysis we have examined only data for one year (2013). Ústí nad Labem has realized important investment activities in 2010 year, insofar that in the following years it was just repaying its loans and the two indicators of investment activity were low thanks to them.

The third worst score was reached according to the indicator CEH by the city Olomouc. This city has quite a high amount of debts (1.908 million CZK), which worsen the ratios and the overall score of the evaluation. This city showed the second worst values (from the observed sample of the cities) at two monitored indicators by the MF CR (C4 indicator of total liquidity and C11 – indicator of proportion of the outside resources to the overall assets) and the completely worst value of the debt service indicator. All of these indicators have quite high weights in evaluation, which worsen the score significantly. Similar situation is with the indicator C10 (tax revenue per inhabitant) and C9 indicator (average wage), whose values move roughly in the middle of the studied sample.

The best evaluated city is the regional city Jihlava, which has a very low indebtedness and at the debt criteria it reached the best values from the all observed cities (precisely C1, C2 indicator). It has very good values at the monitored indicators C4 and C11 as well. Despite the low indebtedness and the lowest value of tax revenue per inhabitant (C10) the city pays attention to the further development - it has the highest percentage of the capital expenditures to overall expenditures (C6). The city creates the high surplus of the current budget and therefore it is able to make very good conditions for financing investment and development.

The second best evaluated city is Pilsen. Pilsen together with the city Brno and Ostrava obtained the high percentage of the shared taxes (according to the Act of budgetary contribution of the tax No 243/2000 Coll.) than other regional cities, which influences C10 indicator. These cities reach much higher tax revenue per inhabitant than other examined regional cities. Similarly they also reach the higher amount of average wage (C9). Quite high total amount of their debt does not influence values of examined indicators since they disposable with a higher amount of overall budget. Pilsen has relatively low debt per inhabitant (C1) and debt service (C3) and it is able to create a high surplus of the current budget (C2) and also keeps high capital expenditures (C5 and C6).

Roughly the same evaluation of CEH has showed other cities such as Brno and Ostrava. Score of Ostrava is made worse by economic indicators (high unemployment rate - C9 and low number of the economically active entrepreneurs C7).

4   Conclusions

Our reached score of CEH can be considered as satisfactory to all of observed regional cities; none of the cities has reached 'critical' values of the examined indicators. Order of the cities according to the set of introduced indicators, however, only simplifying evaluation of CEH per one year. We are aware of the situation, that the different results would be obtained using a longer period of time of indicator development. This fact is most apparent in capital expenditures that are part of C5 and C6 indicators. Because of their fluctuating nature, it might be prudent to work with an average of a few years capital expenditures. This was apparent in our analysis of Ústí nad Labem, as was mentioned in part 3.

It is confirmed specific status of the large cities with a higher amount of the budget (Brno, Ostrava, Pilsen). Despite of their high level of debts they reached upper positions of created CEH. An importance of the other economic indicators for evaluation is confirmed as well. For our future research it would be interesting to create the CEH indicator for groups of cities with different size.

Our results correspond with ratings of some cities realized by reputable rating agencies Moody's or Standard & Poor's. Jihlava, Brno, Ostrava, Liberec and Olomouc have gained their ratings. All the rating values move among the investment zone (from Aa1 to A2 at agency Moody's, from AA- to A- at agency Standard & Poor's). The best rating was reached by Jihlava (level Aa1) given by agency Moody's with the stable perspective.

Acknowledgements

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Who Applies the Real Estate Tax`s Local Coefficient?

Lucie Sedmihradská[*] – Eduard Bakoš[†]

Abstract. The paper identifies the factors which influence the likelihood to increase the real estate tax rates through the local coefficient. The determinants of local coefficient application are estimated using the Binary Logit and Probit models and the full sample of Czech municipalities in 2014. The key determinants are the rate of local coefficient application in municipalities within five kilometres distance and the share of liabilities to assets. Municipalities with more fragmented municipal councils are more likely to apply local coefficient. The structure of the tax base and population change have impact on its application as well.

Keywords: real estate tax, tax mimicking, local government

JEL Classification: H71, H73

1   Introduction

Municipal tax autonomy in the Czech Republic is quite low and the extent of the usage of the narrowly granted power is very limited. Only about 8.1 % of all municipalities apply the so called local coefficient which increases the real estate tax rates and which is de facto the only meaningful element of the local tax autonomy.

Local politicians fear that voters will punish them in election because of increasing the tax rates. Empirical evidence confirms that this concern is justified (for review see Vermeier and Heyndels, 2006).So the key question in this context is: Which municipalities had the courage to apply the local coefficient?

The purpose of the paper is to identify factors which influence the likelihood to increase the real estate tax rates through the local coefficient. A full sample of Czech municipalities in 2014 is analyzed. Using the binary logit and probit model we estimate the determinants of local coefficient application.

The usage of the tax autonomy granted since 2009 attracted some research attention: Bečica (2014) shows significant differences in the behaviour among different types of municipalities (i.e., cities, towns, townships and villages) and in different regions. Sedmihradská (2013) confirmed tax mimicking among municipalities and impact of local coefficient application on re-election probability in 2010 elections. So far nobody investigated the factors determining the municipal tax policy choice in the CR.

Local tax choice is determined by numerous factors. On one hand these are socio-demographic, economic and fiscal factors and on the other hand political aspects and horizontal fiscal interactions. Significant impact of political factors on fiscal policy is now (thanks to a large body of literature) taken almost for granted: weak or coalition governments increase public spending (and hence taxation or debt) because conflicting political objectives have to be reconciled. Roubini and Sachs (1989, 925 and 926) stress, citing work of Karl Popper, that "electorate can do little to discipline misbehaving parties in a system of multiple-party coalitions". As none of the parties has a clear majority, there is no clear election winner or loser. The parties are not dismissed; they only encounter a temporary fluctuation in popularity. Both politicians and voters "become used to the idea that no political parties can really be made accountable for their decisions which may have been forced on them by necessity to form a coalition".

In line with these expectations are findings: Fragmentation of municipal councils is "associated with higher propensity to have property taxation" in Norwegian municipalities (Fiva and Rattso, 2007, 468). Delgado et. al (2015) come to similar results in case of Spanish municipalities: both nominal property tax rate and per receipt amount of property tax are higher in municipalities with more fragmented municipal councils.

Strategic horizontal fiscal interactions among local governments are very common and result from expenditure spillovers, competition for mobile tax base or yardstick competition (Allers and Elhorst, 2005, 493). As the property tax base is the least mobile one, the reason for fiscal interactions or tax mimicking is most likely to be the yardstick competition (Blöchliger and Campos, 2011, 7). Yardstick competition denotes the phenomena when politicians care what politicians from other jurisdictions are doing in order to get their votes (Besley and Case, 1995). Voters do not have enough information to distinguish between politicians who increase taxes due to growing costs of providing public services and who do rent-seeking, i.e., increase taxes in order to finance their whims at the expense of taxpayers. Therefore voters observe behaviour of politicians in the neighbouring local governments which may give them some clue: If the tax rates are growing everywhere, voters may be convinced about the necessity of it, i.e., re-elect the politician. Therefore politicians mimic the behaviour of others.

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Number of studies was conducted in the last fifteen years in order to determine spatial interactions among state and local governments (Delgado at al.,2015, 353-355, present a recent overview). Most of the studies dealing with property tax and local (municipal) level confirm these interactions estimating a spatial tax reaction function, where the tax rate or tax burden in one local government depends among other factors on the tax rates or tax burden of other local governments (Blöchliger and Campos, 2011, 7).

Bordignon et al. (2003) found a positive spatial correlation in the case of local business property tax rates in 143 adjacent municipalities in the Province of Milan, Italy. Allers and Elhorst (2005) found strong evidence of tax mimicking among 496 Dutch municipalities. Delgado and Mayor (2011) found a positive spatial property tax interaction evaluating data for all 78 municipalities in Spanish region Asturias. Fiva and Rattso (2007) found evidence of a geographic pattern in 301 Norwegian municipal decisions about having property taxation or not. Heyndels and Vuchelen (1998) conclude that local income tax and local property tax rates are copied among neighbouring Belgian municipalities. Silva Costa et al. (2011) found a positive strategic interaction among all 278 municipalities in continental Portugal in case of income tax, property tax and business tax. Sedmihradská (2013) confirmed that Czech municipalities which increased the property tax rates applying the local coefficient are surrounded by a higher share of municipalities with local coefficient than municipalities without it. Unlike the other studies Lyytikäinen (2011) did not find any strategic interaction in property tax rates among neighbouring 411 Finish municipalities.

2   Data and methods

We estimate a model of municipal tax choice, i.e., the choice to apply or not to apply the local coefficient in case of the real estate tax. Municipal councils can approve in a public notice three types of coefficients. The most significant one is the local coefficient. It can be approved since the 2009 and it can take the value 2, 3, 4 or 5, and it is applicable to all property types with exception of the arable soil, hops fields, vineyards, orchards, permanent grass plots and gardens. It is uniform for the whole municipality. Unlike the other two coefficients, application of the local coefficient can significantly change the tax yield. Sedmihradská and Bryson (2010) provide a detailed review of nature and incidence of the Czech property tax.

The dependent variable *LC* indicates if a municipality applied local coefficient in 2014 or not. We do not distinguish the size of applied local coefficient. Thus the dependent variable is a discrete variable which can take values 1 or 0. Therefore we use for the estimation the standard econometrical binary Logit and Probit models which are appropriate in such a case and are based on the maximum likelihood principle.

We use a set of explanatory variables which capture the demographic, geographic, fiscal and political situation of the municipalities. The selection of the variables results from the review of literature presented in the previous section. With exception of fiscal data, which come from Ministry of Finance, all data originate from the Czech Statistical Office. Data set represent the state as of 1 January 2014 with exclusion of the electoral data which are based on 2010 municipal council elections and real estate revenues which refer to 2008.

POP: Number of inhabitants.

POPGR: Relative population increase between 2004 and 2014.

AREA: Area of the municipality, in hectares.

DEVELOP: Share of developed land, in percent.

FORREST: Share of forests, in percent.

5KM: Share of municipalities with local coefficient in 2014 among municipalities within 5 km distance.

DIST: Distance to the nearest municipality which applied local coefficient in any of the 2009 to 2013 years, in meters.

RETAX: Per capita real estate tax revenues in 2008 (i.e. the last year before the application of the local coefficient was possible), in CZK.

LIAB-A: The ratio of liabilities to total assets.

NET: Total liabilities lowered by short term financial property, expressed in per capita terms, in CZK.

HI Herfindahl index capturing fragmentation of municipal council (equation 1). The share of individual parties or groupings is calculated based on the number of the council members as of 2010 election results.

$$H = \sum_{i=1}^{k} S_i^2 \tag{1}$$

where S_i is share of individual party or group *i*- in the municipal council

3   Results and discussion

The estimation results (Table 1) prove the relevance of all types of indicated factors. Actual influence of several of them is however very low as the coefficient is very close to zero: this is the case of the size of the municipality in both population and area terms, the distance to the nearest municipality with local coefficient in the past, real

estate tax revenues or net liabilities. Negligible influence of the size of the municipality is similar to Delgado et al. (2015, 364) in case of the nominal property tax rate.

Table 1: Local coefficient determinants (6,218 municipalities)

	LOGIT	PROBIT
CONST	-4.329***	-2.466***
	(0.202)	(0.100)
POP	0.000***	0.000***
	(0.000)	(0.000)
POPGR	0.371**	0.173**
	(0.182)	(0.071)
AREA	0.000**	0.000**
	(0.000)	(0.000)
DEVELOP	0.043***	0.025***
	(0.007)	(0.004)
FORREST	0.012***	0.006***
	(0.003)	(0.001)
5KM	5.366***	3.009***
	(0.369)	(0.201)
DIST	0.000***	0.000***
	(0.000)	(0.000)
RETAX	0.000***	0.000***
	(0.000)	(0.000)
LIAB-A	2.321***	1.205***
	(0.651)	(0.349)
NET	0.000***	0.000***
	(0.000)	(0.000)
HI	-0.384*	-0.173*
	(0.206)	(0.102)
Mc Fadden R^2	0.219	0.226
Likelihood ratio statistics	769.195***	794.061 ***
	(0.000)	(0.000)
Log likelihood	-1,372.040	-1,359.607
Overall predicted	92.2%	92.2%

Source: own calculations
Note: * denotes 90%, ** 95 % and *** 99% of statistical significance respectively

The key factors influencing the decision to apply local coefficient are based on the analysis of the situation in the neighbouring municipalities and the size of liabilities. The results confirm the existence of fiscal interactions among municipalities: local politicians are less concerned with such an unpopular decision as increasing taxes if politicians nearby are increasing them as well (5KM). Tax mimicking takes place in case of local coefficient.

The size of liabilities (LIAB-A) indicates one of these two features: First, the municipality is investing a lot, needs more resources and therefore borrows (more) and increases the real estate tax. Second, the municipality is in fiscal stress, its liabilities are (too) high and it increases the tax in order to repay some of the liabilities.

Anecdotal evidence suggests that the local coefficient is introduced in municipalities with a special structure of the tax base such as a big enterprise, large forests, many holiday houses etc. Unfortunately we do not have data on the tax base structure in the individual municipalities. The usage of the proxy variables describing the territory structure (DEVELOP and FORREST) confirm at least to some extent the expectations regarding the influence of the tax base structure.

The preferences regarding the place of living changed significantly during the last quarter of century. Many people moved from the cities to the suburbs which are independent municipalities. These municipalities observed significant growth of population which requires growth of public expenditures. Positive relationship between LC and POPGR shows that population growth increases the likelihood to apply the local coefficient.

The application of the local coefficient is approved by the municipal council and its structure matters. Lower HI indicates more fragmented municipal council, i.e. council composed of many parties or groupings with no clear majority. Such fragmented municipal councils are more likely to introduce the local coefficient. This fully complies with the proposition of Roubini and Sachs (1989) and results of Fiva and Rattso (2007) and Delgado et. al (2015).

If a one-party majority applies the local coefficient the voters know exactly who to blame for it but if there are many different parties it is a fault of all of them and the voter is going to make his choice based on other factors the local coefficient application.

The results of the estimations are very similar despite the estimation method used. Both of the models are able to predict correctly if a municipality applies or does not apply the local coefficient in 92.2 % of all municipalities. The accuracy of the prediction differs however significantly in case of the two groups (Table 2). While the prediction is correct in about 99% of municipalities which did not apply the local coefficient, it is correct in 16% and 17.2% respectively in case of municipalities which apply the local coefficient. These results are of course influenced by the uneven division of the group (only 8.1% of municipalities belong to group LC=1).

Table 2: Prediction fit – Logit and Probit model (6,218 municipalities)

LC	Applied	Logit estimate - correct		Probit estimate - correct	
0	5,711	5,648	98.9%	5,654	99.0%
1	507	87	17.2%	81	16.0%
Total	6,218	5,735	92.2%	5,735	92.2%

Source: own calculations

4   Conclusions

The overall capacity of the model to indicate municipalities which apply local coefficient is quite low (17.2%) and allows only very partial answer to the question asked in the title of the paper. Local coefficient is applied in municipalities which are in the neighbourhood of municipalities which apply local coefficient. These municipalities have high share of liabilities to assets too. The structure of the tax base and the increase of the number of population have impact on its application. In line with theoretical proposition of Roubini and Sachs (1986) and Besley and Case (1995) we observe significant impact of fragmented government and tax mimicking on the likelihood to apply the local coefficient. The limited predictive capacity of the estimated model suggests that there are many other or different situations or factors which result in application of local coefficient.

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Liability for Unpaid Tax in Unusual Fuel Prices

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Abstract. The paper covers the issue of evasion of value added tax on the fuel market. The aim is to propose amendments that would allow for the application of liability for unpaid tax (Section 109, Value Added Tax Act) in sales made at unusual prices. Procedures were designed such that put a reasonable burden on entities with significant market power whilst reducing the load in entities with minor market power. Subsequently, it was determined what impact the newly established conditions are to have on the State and other actors in the market. The results show that setting such conditions that allow for the liability for unpaid tax whilst placing no restrictions of free choice when selecting a vendor is possible.

Keywords: fuel, tax evasion, usual price, value added tax.

JEL Classification: H20, H26

1   Introduction

Fraud related to value added tax ("VAT") is a major issue in all the Member States of the European Union. No State can therefore be assumed to be completely immune to systematic attacks on VAT. Judgments of the European Court of Justice, while clarifying the interpretation of national laws and regulations, they cover just legal issues. The fraudster can in fact focus on any commodity. Their business can be outlined as being a relatively rapid and short-lived activity. By the time when the taxation/judicial proceedings are underway, the taxpayer may not have enough liquid assets. Although the company's action has been proved to be fraudulent, this fact is not important and does not have a sufficiently deterrent effect. Rather, a new company has been set up and operates on the same principle.

The best-known models of fraudsters benefitting at the expense of the state budget include carousel fraud. The activity makes use of the rules of intra-Community trading (Lazăr, 2013). The first entity acquiring the subject matter of taxable supply from a different Member State is required to apply the reverse charge mechanism. If the commodity is provided onwards, a statutory obligation arises for the vendor to pay the output VAT. The weak spot however appears on lodging the tax return. Although the document is presented by the fraudster, the entity has no longer sufficient funds to pay the tax, thus the State has lost the entire amount of the tax.

For the above reasons, states seek to fight these unfair businessmen by making use of available means. Efforts to control fraud were disallowed for a long time by the European Commission alone. While still leaving space to individual states, if the proposed measure was derogating from Directive 2006/112/ES, then it was rejected. The reason was simple - the proposed measures were lacking sufficient legal basis. In the long term, the states had to return to the harmonised Union's principles. The newly proposed measure of the Czech Republic failed as well; calling for an exemption to be allowed to introduce the reverse charge for fuel, the application was rejected in 2010 with a recommendation to make use other tax or non-tax instruments first (Knížek, 2013). According to Diviš (2013), the European Commission was concerned about permitting a local exemption to apply the reverse charge to fuel, which could cause transferring the problem with fraud into other states. A fact can also be traced in the grounds that improved monitoring and registration of traders in the goods subject to excise taxes might work as a suitable solution. It is also possible to establish that customers of the disappearing traders shall be jointly and severally liable for unpaid tax if they had known or could have known they had been part of VAT fraud. Such an entity can be identified by the customer based on assessing whether or not this was a new company in the market and the price offered was below the usual price (e.g. Semerád, 2014).

In April 2011, the Czech Republic implemented provisions on liability for unpaid tax (Section 109) in specified cases into its national law. These include the following: "if the consideration for such a transaction lacks economic justification for clearly diverging from the normal price". The measure which targeted at the fuel market is ineffective because the state administration did not apply it even once. The obstacles can be found at previous papers of the authors, e.g. Semerád and David (2014), Semerád (2012). The most significant obstacle can be found in the fact that currently there is no public database to pool prices of wholesalers. For this reason, construing a usual price without objective data is virtually impossible.

2   Methodology and Data

This paper aims at proposing changes that allow determining the usual price in the Czech market, based on an analysis of available source data relating to wholesaler prices of fuel.

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In addition to the basic prices of ČEPRO a.s., no other distributor's prices are publicly available. The tax authority, however, does have information on other prices since it is receiving them from the entities through monthly reports. On the basis of a special recording duty, the tax authority has information on not only the prices implemented and volumes sold, but also, for example, information on the provider of the taxable supply or on the shipping company.

The Supreme Administrative Court (7Afs 67/2010) cancelled this obligation in its judgment, having concluded that it is a tax authority's decision through which the authority has imposed a tax entity a specific obligation that the entity shall execute. This leads to intervening into the entity's subjective rights. As a result, carrying out this obligation is a voluntary activity of the fuel distributor. There is even no possibility that the tax authority can demand a correction of the erroneously sent data to challenge the received data *ex post*. The tax authority has information that the distributors did not have at the time of executing the business. Any retroactivity, which would lead to legal uncertainty, is not desirable.

To be able to make use of the provision on usual prices, the usual prices would have to be published no later than on placing order for fuel, or on the day the taxable supply is effected, if appropriate. Any deviation from this assumption reduces the rate of success in proving the guilt since the recipient of the taxable supply may defend by the fact that it did not know or could not know what the usual price was at the moment of purchasing.

3   Results and Discussion

In a competitive market, certain obligations should apply to all entities, while others should cover only entities with significant market power (Directive 2002/22/EC). Let specify entities with significant market power in the market which are required to inform the tax authority on their prices in an anonymous and periodical manner. This will ensure the protection of in-house, secret information that however still may be published as an accessible and reliable source for other market players. If there is an update in the pricelist, the entity shall report that to the tax authority who in turn modifies the published usual price on the portal of public administration.

If such cooperation occurs, the question is whether or not to keep the special recording duty to apply only to acquisition (import) of fuel from other states. If it continued to involve a voluntary activity, the tax entities could be favoured through a lower level of administrative burden under the BISEP model (OECD, 2012). The model is based on the cooperation between tax authorities and taxpayers. The latter group is split based on their degree of cooperation (co-work / do not co-work). The uncooperative entities are forced to cooperate through a form of legal restriction. On the other hand, based on the client-oriented approach (e.g. Uminský, 2014), no inappropriate burden should be placed upon entities cooperating even beyond the legal framework. Favouring entities that were found to comply through inspection and vice versa is also suggested by Cremer and Gahvari (1994) who examined the effect of tax fraud on optimal taxation.

Table 1. Obligations of respective entities - default status

Item	State	Entity with minor market power	Entities with significant market power
Administrative effect			
Special recording duty ("SRD")	Has to process data from all the market entities that meet conditions	Processing not required based on the judgment of the Supreme Administrative Court	
The availability of certain information from SRD	Private; only based on the request according to Act 106/1999 Coll.	Not made available	
Identification of the usual price	Depending on the compliance with SRD	Legal uncertainty	
Checking the usual price	Not performed to a sufficient extent	Lack of information for its determination	
Section 109 of the VAT Act applicable?	Yes, with unclear success	Impossible to assess	
Financial impact			
What are the costs?	The cost of managing large amounts of data that are not adequately inspected	The cost of processing SRD, which brings the expense in the form of human resources and technology	
SRD influence on the amount of tax fraud	None	None	None

Source: Author

The requirements can be summed up as follows. Distribution prices will be sourced from entities with significant market power. They will be subsequently used by the tax authority to be able to determine the usual price and publish the same at a site allowing remote access. The remaining entities will be required to become familiar with the prices. They are however not prevented in buying at lower than the published price. They will however be exposed to liability for unpaid tax when their vendor fails to comply with tax obligations in relation to the state budget. An analysis was carried out for the purpose of this paper as regards the current and future status for (i) the State and (ii) for other taxpayers. These are further classified as entities with minor market power and operators with significant market power (Table 1 and Table 2).

After making the amendment (Table 2), the State will be receiving smaller amount of data, those coming only from entities with significant market power, which can be easily turned into publicly available information on the public administration portal. These inputs will allow determining the usual price and comparing the same while inspecting taxpayers. Through these measures, liability for unpaid tax can be employed. Not requiring SRD from entities with minor market power will reduce costs of these, e.g. the additional labour cost required to process the recording duty.

Table 2: Obligations of respective entities - prospective status

Item	State	Entity with minor market power	Entity with significant market power
Administrative effect			
Special recording duty ("SRD")	Has to process data from specified market entities; has to be established under the law; the usual price has to be published	No	Yes
The availability of certain information from SRD	Freely available from the public administration portal	Not made available	Made available only to the tax authority
Identification of the usual price	Yes; on the basis of common principle of legal certainty		
Checking the usual price	Yes, is possible		
Section 109 of the VAT Act applicable?	Yes	Impossible to assess	
Financial impact			
What are the costs?	Remain the same or become lower; savings when processing and checking lesser data amounts; the cost of periodically updating the public administration portal	Checking updates at the public administration portal	Based on the level of compliance with SRD; no new cost borne if there was compliance prior the amendment
SRD influence on the amount of tax fraud	The same or reduced	Able to decide on price offers to avoid liability for unpaid tax	

Source: Author

Table 3 shows a comprehensive comparison of the period T_1 (after amendment) with the current status, i.e. T_0 (prior to amendment). A rating scale of '+, 0, - " is used while "+" means that introducing the methodology will improve the status, e.g. legal certainty is raised, administrative burden reduced, availability of inputs for setting a usual price enhanced. "-" stands for drawbacks in the form of e.g. increased administrative burden. If the status remains unchanged, then it is rated by "0". "$^+0$" refers to a "slight improvement", while "0^-" stands for a "slight deterioration". The total rating is based on the overall frequency of rating in that category. The prevailing sign is then expressed on the same rating scale.

Table 3: Comparison of the status in period T_1 with that achieved in period T_0

Item	State	Entity with minor market power	Entity with significant market power
Administrative effect			
Special recording duty ("SRD")	0^+	+	-
The availability of certain information from SRD	+	+	+
Identification of the usual price	+	+	+
Checking the usual price	+	-	-
Section 109 of the VAT Act applicable?	+	Impossible to assess	
Overall	+	+	0
Financial impact			
What are the costs?	0 or +	+	-
SRD influence on the amount of tax fraud	0 or +	Impossible to assess	
Overall	+	+	-
Total rating	+	+	-

Source: Author

4   Conclusions

It results from the tables 1, 2 and 3 that the proposed amendment can be evaluated as follows. The state does not have to process a large amount of data produced as part of SRED. The data will be collected from only a minor amount of entities; this will however involve significant market actors. This makes the processing effort more accurate and less demanding. The duty, however, must be specified for the entities under the law and usual prices must be regularly updated on the public administration portal. This challenging legal step influences the "0^+" rating. The advantage is the ability to identify and check the usual price. Subsequently, Section 109 of the VAT Act can be employed and contribute to increased tax collection and reducing tax fraud. The total rating of the administrative impact is denoted by "+". Equally, assuming the improved status for the State is possible as regards the financial impact because of reduced number of staff members processing SRD.

Benefits for the group of entities with minor market share form the largest amount of positives involved in the amendment. The group will not be required to comply with the requirement of specific recording duty. The greatest effort it will have to spend will be that of monitoring the current usual price. A situation when the data on usual prices are published on the website of the Customs Administration, directly at the place listing fuel distributors, may seem to be the most performing solution. This would meet both obligations simultaneously (trading with a registered distributor and for usual prices). The time-consuming factor would be substantially reduced to a minimum.

On the contrary, the least advantages fall on entities with significant market share. These could be formally added the duty of publishing prices in favour of the tax administration, in the form of SRD. This is evaluated by "-" due to the fact that it produces a (new) legal obligation for such actors while requiring them to check the prices on the website of the Customs Administration. It can therefore be expected that their cost will most probably increase. The total rating of "-" represents an increase in administrative burden and higher financial demands. The selected entity may transfer some extent of such additional costs onto their customers as part of sales prices (as is the case of e.g. tax incidence). Overall, the proposed amendment can be assessed positively because its benefits outweigh the negatives in 2 of the 3 studied groups.

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The Tax Adviser Profession in the Czech Republic

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Abstract. The contribution analyses in figures the emergence and growth of the tax adviser profession. The initial data are from the Chamber of Tax Advisers of the Czech Republic list, which illustrate growths in individual years, the division of advisers according to regions and division into men and women. Further, the qualification structure of tax advisers is analysed in the contribution.

Keywords: tax adviser, Chamber of Tax Advisers of the Czech Republic.

JEL Classification: B22

1   Introduction

Tax advisory in the Czech Republic is regulated by Act 523/1992 Coll., the Act on Tax Advisory and the Chamber of Tax Advisers of the Czech Republic, which became operative on 1 December, 1992. This Act regulates the provision of legal aid and financial and economic advice in the matter of taxes, charges, fees and other similar payments and in matters directly connected with taxes.

The Chamber of Tax Advisers of the Czech Republic supervises especially the qualification examinations for candidates for the performance of tax adviser activity, issues tax adviser certificates and keeps a professional list containing, among others, the name, certificate number, contact address, telephone number and e-mail, specialization and knowledge of languages. The basic condition for registration in the list of tax advisers is successful passing of qualification examinations in subjects of financial law, administrative law, civil law, business law and accountancy. The Chamber protects and promotes the interests of tax advisers and supervises the proper performance of tax advisory services in accordance with binding legal regulations.

A tax adviser is understood to be a natural person registered in the list of tax advisers kept by the Chamber of Tax Advisers of the Czech Republic (which was also established by this act). Almost five thousand persons who have taken tax adviser examinations have entered into this profession over the last 22 years. Numerous tax advisers, however, have abandoned this profession. The subject of our survey, therefore, is the demographic development of this profession from its establishment to the end of 2014.

In its substance, demographic development is projected into all public systems; it thus affects development not only in the social area but also in those of education and healthcare. If we were to monitor practically any demographic process on the territory of the Czech Republic, acceleration of changes – especially after 1989 – would be confirmed, especially as a result of changes in society which the revolutionary years brought about (Hulík, Tesárková, 2009). The evolution of this profession and the gradual ageing thereof corresponds with published surveys (Smrčka, Arltová, 2012). The change of legal conditions for the performance of the profession (i.e., the implementation as of 2004 of mandatory academic education at least to the extent of a bachelor study program) significantly decelerated the growth in numbers of tax advisers and brought about the need for numerous older interested parties to supplement academic education, which is in accordance with the current trend of demand for academic education and the recoverability thereof (Finardi, Fischer, Mazouch, 2012). Similar surveys, focusing on the medical profession, have already been carried out abroad (Williams, Pecenco, Blair-Loy, 2013).

There are 13 professional chambers in the Czech Republic which operate on the principle of mandatory membership, and these chambers are the roofing bodies for 13 free professions, such as barristers, auditors, notaries and certain medical and technical professions. The number of auditors is approximately 1300; the number of barristers is about 8000. Certified accountants are subject to a general state regulation and do not have a separate chamber which would be established on the basis of a separate legal regulation (Neužil, 2008).

2   The tax adviser profession in the past years

The right to perform tax advisory services is acquired by a natural person upon passing examinations. The qualification examination for a tax adviser can be taken by a natural person who is fully eligible to perform legal acts, is irreproachable, has no legal, service or other similar relationship to a state or regional self-government whose field of activity includes auditing and decision-making in tax matters, and who has acquired academic education within the scope of an accredited bachelor study program at the minimum. In the past, the law required only secondary education.

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Examinations are comprised of two written parts and one oral part. The first written part focuses on accountancy, legal person income tax and natural person income tax problems. Components of this part include knowledge from the areas of social and health insurance. The second written part is comprised of value added tax, road tax, property tax, consumer and ecological tax and property acquisition tax problems. The problems are conceived in such a way that the candidate has to have legal and economic knowledge. The candidate proceeds to the oral part upon successful completion of both written parts. In the oral part, emphasis is placed not only on knowledge of the above-mentioned tax laws; the candidate also has to have a good command of the Tax Code, i.e. the procedural norm for tax administration, which is crucial for representing clients before the financial authority.

The examination board before which the candidate takes the examination is comprised of one half of examiners – tax advisers and one half of examiners appointed by the Ministry of Finance. The long-term success rate of candidates in examinations is in the vicinity of 20 % (Skálová, 2014).

Additions to the number of tax advisers in the past years are illustrated in graph no. 1.

Figure 1: Growth in numbers of tax advisers in 1993 - 2014
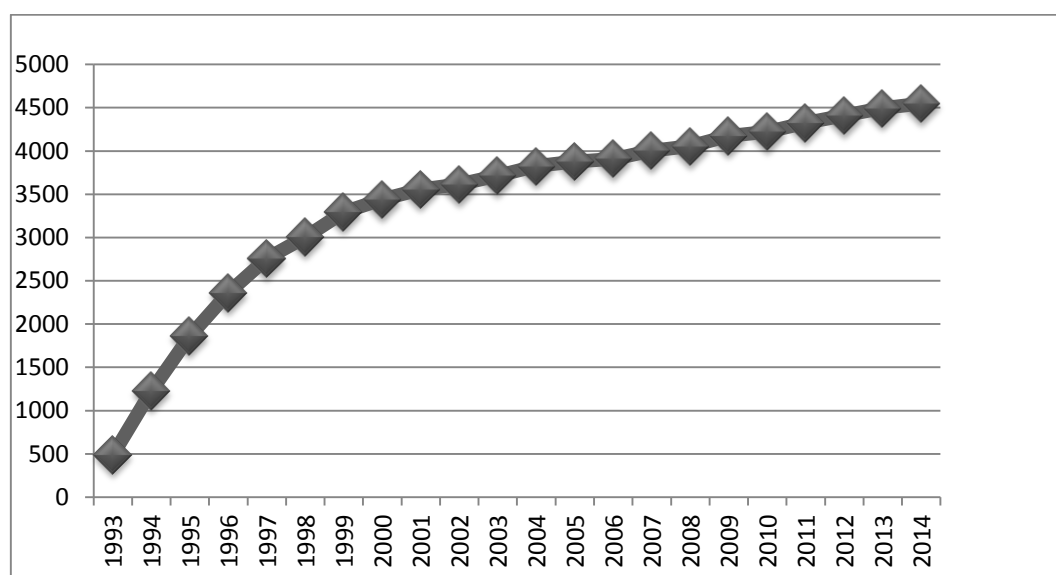
Source: Chamber of Tax Advisers (2015).

The Chamber keeps a list of tax advisers, in which there is an entry of the name and surname of the adviser and, as the case may be, academic title and scientific rank, identification number of the person provided by the administrator of the basic register of persons, their headquarters, domicile or home address, correspondence address, imposed disciplinary measures, suspension of performance of tax advisory services and deletion from the list. The total composition of men (45 %) and women (55 %) for all advisers is illustrated in Figure 2.

Figure 2: Ratio of men and women in the profession as at 31.12.2014
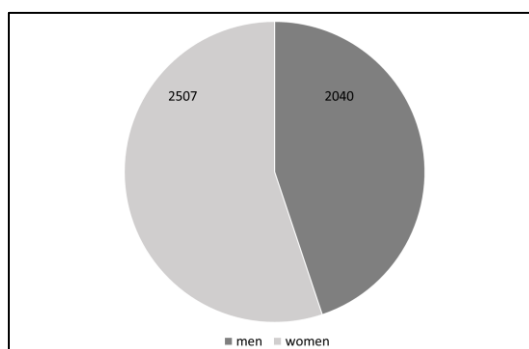
Source: Chamber of Tax Advisers (2015).

## 2.1   Division of tax advisers by region

The division of tax advisers into individual regions of the Czech Republic can be considered important (Table 1 and Figure 3). The chamber does not have any regional organization branches; in every region, however, a tax adviser operates as a guarantor for the organization of training. As a rule, regional training for tax advisers takes place monthly in every region.

Table 1: The number of advisers in individual regions of the Czech Republic

Region	Women	Men
Capital city of Prague	805	605
South-Bohemian	105	97
South Moravian	316	309
Karlovy Vary	34	29
Hradec Králové	79	90
Liberec	109	71
Moravia-Silesia	206	149
Olomouc	115	81
Pardubice	55	56
Plzeň	94	77
Central Bohemian	290	218
Ústí	89	85
Vysočina	64	62
Zlín	143	109

Source: Chamber of Tax Advisers (2015).

Figure 3: Ratio of men and women in individual regions of the Czech Republic at 31.12.2014
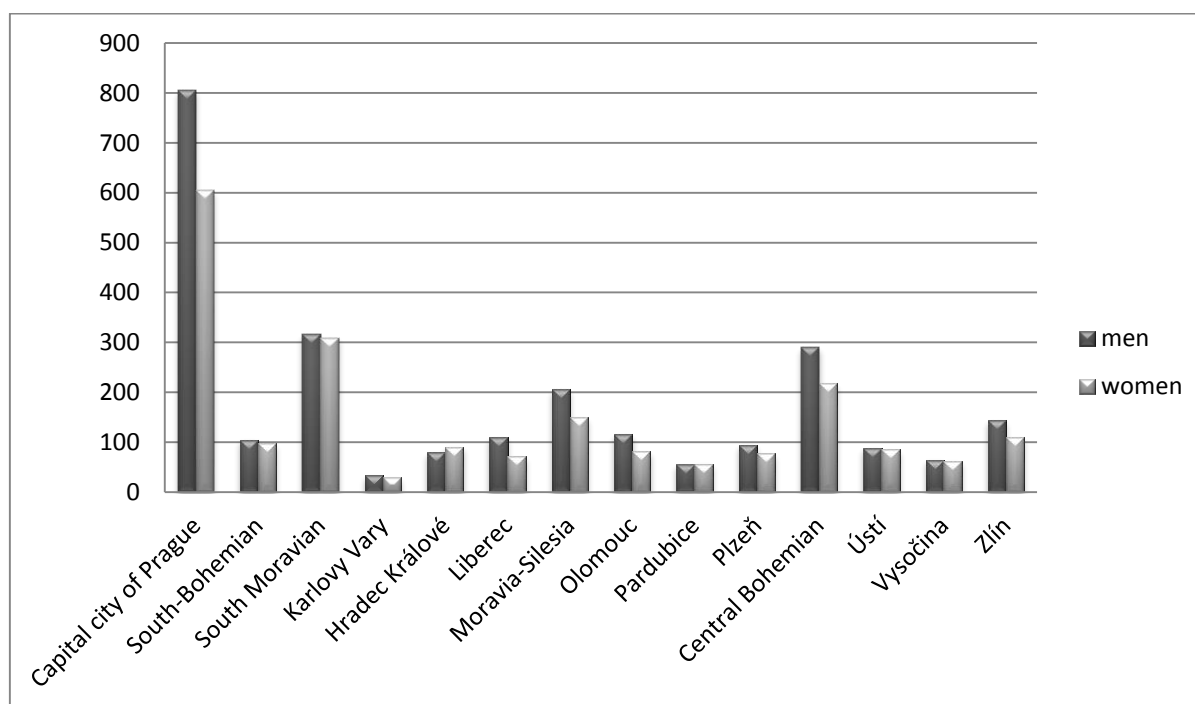
Source: Chamber of Tax Advisers (2015).

2.2 Decrease in numbers of tax advisers

The Chamber will delete a tax adviser from the list if disciplinary measures in the form of deletion from the list are imposed on them, if they request deletion from the list, if they do not perform tax advisory services for more than three years or, as the case may be, if they die or are declared dead. The Chamber can delete a tax adviser from the list if they are bindingly convicted for an intentional criminal act.

Furthermore, the Chamber can suspend a tax adviser from performing tax advisory services if a) proceedings on limitation or revocation of their eligibility to perform legal acts have been commenced, b) criminal prosecution has been commenced against them for an intentional criminal act, c) if they did not fulfil the obligation to close a damage liability agreement. The Chamber suspends a tax adviser's performance of tax advisory services if disciplinary measures in the form of suspension of performance of tax advisory services have been imposed on them. Approx. 30 – 50 persons are deleted from the list annually. The reasons for deletion of tax advisers in 2014 are stated in Table no. 2.

Table 2: Reasons for deletion of tax advisers from the Chamber list (2014)

Reason	Number of persons
Commencement of an employment position in the financial administration	3
Disciplinary measures imposed	4
By own written request	24
Has not performed tax advisory services for more than three years	0
Died	13
Termination of registration of a visiting tax adviser	2
Total number of deleted tax advisers in 2014	**46**

Source: Chamber of Tax Advisors (2015).

3   The education structure of tax advisers

From 1.12.1992 to 1.5.2004, the conditions for entry into the profession of tax advisers also enabled persons with a completed full secondary education to become tax advisers. As of 1.5.2004, the currently effective Act requires academic education in the form of a bachelor's degree at the minimum. The Act did, however, allow for those tax advisers who do not fulfil the condition and had been registered in the Chamber list prior to the effective date of the amendment to the Act to remain in the profession. Vast majority of the tax adviser has higher education (85.6%), the reminder (14.4%) have secondary education. The distribution of education and gender is shown in Figure 4.

Figure 4: Number of men and women according to achieved education
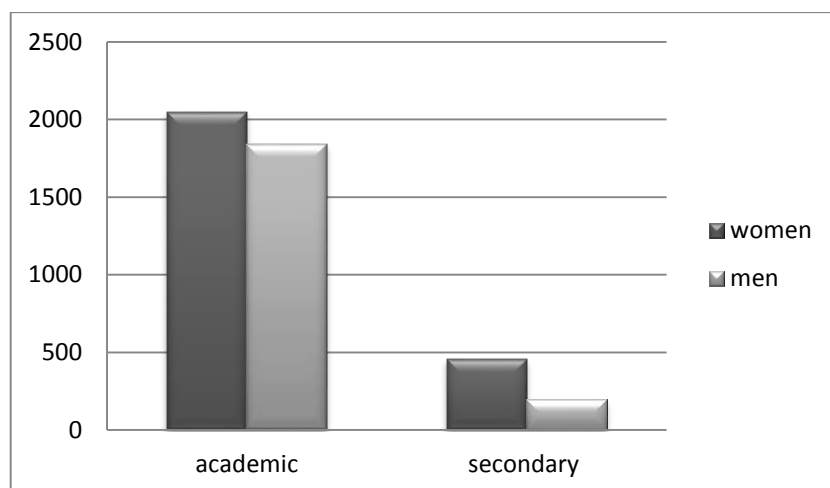
Source: Chamber of Tax Advisors (2015).

4   Conclusions

The data provided above show that the profession of tax adviser has stabilized on the Czech market. The continuous growth of tax advisers reflects an interest in this profession insofar as 100 – 130 persons pass the examinations and are registered in the Chamber's list annually. Decreases in numbers of tax advisers are most frequently caused by death; the annual decrease is by approx. 30 – 50 persons. At present, all new tax advisers have academic education. There are more women in the profession, and they dominate in all regions with the exception of the Hradec Králové region. The regional distribution of tax advisers copies the economic activity of the region. Therefore, the largest number of tax advisers is in Prague, followed by the South Moravian (Brno) and Moravia-Silesia (Ostrava) regions.

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Effect of the Housing Taxation on Household Indebtedness

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Abstract. Most EU countries favour home ownership also via personal income taxation. Particularly deductibility of mortgage interest payments can stimulate households to borrow to acquire housing. Our aim is to explore whether there is a relation between the housing taxation and household indebtedness. We employ the multiple regression and pooled cross-sectional data for the former 15 EU member countries (except Greece). As expected the variable representing the extent of the tax relief on debt financing of the owner-occupied housing has a positive impact. Other factors shown to influence the household debt significantly are wealth, represented by GDP or financial worth, dependency ratio and unemployment rate. Appropriateness of the model increased after the variable reflecting the personal income tax and social security contributions burden was added.

Keywords: Household indebtedness, housing taxation, mortgage interest deductibility

JEL Classification: G21, H24

1   Introduction

A certain extent of debt can have adverse consequences on both micro- and macroeconomic levels, as Izák (2014) sums up. Indebtedness of the household sector raises a concern of economists as well; for example Izák (2012) examines the household indebtedness impact on economic growth. Extensive literature is devoted to explanation of why households borrow or why their debt is so large, see e. g. Cynamon and Fazzari (2008) or Zinman (2014). A special attention is given to the relationship between the household debt and housing. According to ECB (2014) the majority of the European household borrowing is comprised by loans for house purchase. Role of the mortgage lending to households in the bank lending development is described by Jorda, Schularick and Taylor (2014). Governments typically support home ownership via various fiscal instruments including favourable tax treatment. The housing-related tax allowances are one of main tax expenditure items in the EU countries (see European Commission, 2013).

Taxation is considered one factor which could have impact on the household borrowing. Keen, Klemm and Perry (2010), among others, explain how tax treatment of housing can affect home ownership, house prices and the household leverage. A number of authors agrees that the housing taxation creates substantial distortions that may have increased rate of home ownership, house prices and the household leverage. Keen, Klemm and Perry (2010) demonstrate that the more favourable is the housing taxation the higher the mortgage debt to GDP ratio is. That there could be a relationship between the housing taxation and the mortgage debt of households, results of past tax reforms can prove. According to European Commission (2011) the mortgage interest relief reduction leads to lowering mortgages. After all, the European Commission recommends to the EU Member States to reduce the debt bias in their housing taxation and subsequently maps changes in taxation rules in the member countries (European Commission, 2014).

Favourable tax treatment of debt-financed home ownership or the debt bias in the housing taxation, which tends to encourage the leverage, is a product of personal income taxation and property taxation provisions mix. There is a distortion when imputed rent as a home-owner income is not subject to income tax but mortgage interest payment as a home-owner expense can be deducted from a tax base or tax liability. On the other side there is an alternative way to tax the imputed rent, i. e. to levy property (transaction) tax. However to be a perfect substitute the property tax would have to be high enough which is not the fact in many countries (Hemmelgarn and Nicodéme, 2010). At the same time generous tax relief for mortgage interest payments, present in tax systems of many countries, can further mitigate the effect of the property (transaction) tax (Crowe et al., 2011). Moreover home ownership is more attractive as investment when capital gains are not taxed in a neutral manner. And profits from home sales are not usually taxed (Harris, 2010).

Our aim is to explore whether there is a relation between the housing taxation and the household indebtedness. In the next section we focus on the construction of the variable representing the special tax treatment of owner-occupied housing which is supposed to be debt encouraging. The methodology and the other variables are described briefly. Section 3 reports estimates obtained with a multiple regression analysis. Section 4 concludes.

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2   Methodology and data

2.1   Construction of the home-owner tax treatment variable

In our research we followed the work of Wolswijk (2005). He applied a regression analysis in order to measure the effect of fiscal instruments on mortgage debt growth in the EU countries. The fiscal instruments were represented by the after-tax interest rate capital costs variable which captured the deductibility of mortgage interest payments. He constructed relevant tax rates which reflected whether the interests were deductible from the income tax and whether were deductible fully, or with a limit. The capital costs were expressed as a percentage of a house price. We decided to construct our variable representing the tax treatment of housing as a tax wedge which is used as an indicator of the extent of the tax relief on debt financing of the owner-occupied housing (see e. g. Andrews, 2010).

The tax wedge is a difference between the pre-tax interest rate capital costs (CC_0) and the after-tax interest rate capital costs (CC_1). We calculated the capital costs for an unmarried taxpayer in the top income tax bracket who purchased a property for the price (V), financed 80% with a mortgage (M). These taxpayer´s characteristics were used by Keen, Klemm and Perry (2010) for the calculation of effective average tax rates on owner-occupied housing. The top income was defined as double the average wage which is the threshold of the top bracket in the most EU-15 countries. The price was estimated as 5-multiple of the top income. The mortgage interest rate (r) was approximated by the long-term interest rate reported by the OECD Data website. The pre-tax capital costs were calculated as follows:

$$CC_0 = \frac{rM}{V}. \tag{1}$$

The after-tax capital costs were calculated as follows:

$$CC_1 = \frac{(rM) - T}{V}, \tag{2}$$

where T =   savings on the tax liability.

If the tax treatment of the mortgage interest rate is in favour of homeownership a result is the savings on the tax liability reducing the capital costs. The financing cost of owner-occupied home has been calculated already by van den Noord (2003). He took into account the mortgage interest deductibility as well as taxation of imputed rent. Furthermore he explicitly distinguished different tax elements used in income tax codes to favour the owner-occupied housing and dealt with limits on the deductible period or the deductible amount more exactly than Wolswijk (2005) did.

Like Wolswijk (2005) we wanted to include the former 15 EU member states into our analysis but due to a lack of data our country sample does not contain Greece. We covered the period from 2004 to 2013, i. e. we started when Wolswijk ended. We estimated the tax savings, and subsequently the tax wedges, for every country and each year using effective income tax law provisions related to the imputed rent and mortgage interest (or mortgage repayments) just as van den Noord (2003). There were different forms of the tax relief on the mortgage interest. Austria, Belgium, Denmark, Luxembourg and the Netherlands applied a deduction from income or tax base. In addition, Belgium, Luxembourg and the Netherlands taxed the imputed rent (then the interests were deductible first against this income). When the deduction is used the amount, which taxpayers could save due to the tax relief, depends also on a tax rate. A credit lowering a tax liability was applied in Finland, France, Ireland, Italy, Portugal, Spain and Sweden. There was no tax relief in Germany and the United Kingdom in this period. There were various limits on the amounts of the deductions or credits. The amounts were usually derived from the mortgage interest as a certain percentage and they were mostly capped with a ceiling which somewhere depended on taxpayer´s income, marital status or number of children. The imputed rent, if necessary, was set as a fraction of the house price for the Netherlands (according to the European Commission taxation papers) or as a percentage of household income for Belgium and Luxembourg (according to Eurostat, 2013).

The savings on the tax liability should be the sum of annual amounts saved during the period of repaying a mortgage. However since our model taxpayers in all the countries were assumed to repay a mortgage for the same time we could simplify the calculation. The savings on the tax liability was estimated as the amount saved in the first year of the repayment period. Moreover we assumed that the tax treatment of the mortgage interest and imputed rent would be stable over the whole repayment period. On the other hand, the tax treatment of owner-occupied housing significantly changed in Belgium, France, Ireland, Portugal or Spain during the period 2004 – 2013.

Precision of our tax savings estimates was influenced by quality of available data. We had to rely on information provided by secondary sources. We compiled information from the Taxes in Europe database, the OECD Taxing Wages publications and the European Commission taxation papers about tax reforms published in

2011 - 2014. Quality of the data differed across countries: some countries did not provide so much details, sometimes different sources did not provide homogeneous data about the same countries.

Neither van den Nord (2003) nor Wolswijk (2005) included property tax of the home owner into their after-tax capital costs calculations. We also ignored this tax on the assumption that there is no difference in the user costs between own and rented housing since the property tax burden is assumed to be fully borne by the individual using the house (i. e. an owner or a tenant). Finally, Wolswijk (2005) used a modified fiscal instruments variable, which included taxation of expected capital gains from the house sale, in another specification of his regression model but with no satisfactory results. We ignored the capital gain taxation (the capital gain was usually tax-exempt) on assumption that a home owner does not consider selling his house in future.

2.2 Methodology and the other variables

To control for effects of the other influential factors of household debt we employed the multiple regression. We included a number explanatory variables into our analysis - compare Wolswijk (2005) or Turinetti and Zhuang (2011). We estimated the model with pooled cross-sectional data. We employed the OLS method. To tackle the problem of heteroskedasticity we used robust standard errors, variant HC1 (Cottrell, 2003). The multicollinearity was controlled by the Variance Inflation Factors (VIF) method (Adkins, 2012). We used the standard significance levels and the test for normality of residuals based on the Jarque – Bera procedure. The final model, presented in the Table 2 in the next section, passed all the tests except normality.

The dependent variable is the household indebtedness measured by the ratio of total household debt to household disposable income. Due to a lack of data it was not possible to use the ratio of the mortgage to income indicator. Explanatory variables used besides the tax wedge variable are described in the Table 1.

Table 1: Explanatory variables descriptions

GDP (level, difference)	GDP per capita, constant prices, current PPPs
Financial worth	Financial net worth of households per capita, at current PPPs, millions US dollars, percentage of net disposable income
Tax burden	The sum of nominal personal income tax and employee social security contributions rates
Dependency ratio	Ratio of number of seniors to number of people between 15 and 64 years of age
Unemployment rate	All persons, aged 15 and over

Source: authors

Data for the dependent variable as well as most variables described in the Table 1 were from the OECD National Accounts at a Glance, from 2004 forward. The dependency ratios were obtained from the OECD statistics on population. Data on GDP were available from the website of OECD.

3 Results

Table 2 reports the effects of the explanatory variables on the household indebtedness based on our most suitable model. The model was chosen on the basis of common model selection statistics (the Akaike Information Criterion and AIC and Schwarz's Bayesian Information Criterion) as well as on the basis of the plausibility of regression coefficients.

As expected the Tax wedge variable has a positive impact: a larger gap between the pre-tax interest rate capital costs and the after-tax interest rate capital costs, induced by the mortgage interest tax relief, should stimulate households to borrow more.

On assumption that wealthier households are able to borrow money in order to buy houses, or because more affluent households are likely to invest in real property, we used three variables, i. e. GDP, GDP growth and Financial worth. Like Wolswijk (2005) we also tried to include household disposable income as an independent variable but our coefficient was not statistically significant (even Wolswijk considers his evidence ambiguous). The GDP, GDP growth and Financial worth variables present significant coefficients but while the GDP has a positive impact, the GDP growth and the Financial worth have a negative impact. So we are unable to come to a definite conclusion how wealth influences the household debt.

The Tax burden variable was added into the model because it increased its appropriateness significantly. This variable is probably a suitable supplement to the Tax wedge variable. Moreover, the VIF procedure did not indicate the problem of multicollinearity between the two variables although the Tax wedge variable for some countries comprises also the income tax rate.

Table 2: Regression results

Explanatory variables	Coefficients
const.	-290**
	(36)
Tax wedge	0.0064**
	(0.0020)
GDP	0.0030**
	(0.00021)
GDP growth	-3.7**
	(1.6)
Financial worth	-0.39**
	(0.11)
Tax burden	2.1**
	(0.67)
Dependency ratio	9.2**
	(1.4)
Unemployment rate	-2.1*
	(1.2)
Adj. R-squared	0.57
Observations	140

(Standard errors in parentheses. * indicates significance at the 10% level, ** indicates significance at the 5% level.)
Source: Authors´ calculations

The Dependency ratio coefficient is significantly positive. The Unemployment rate coefficient is negative implying that the unemployed people have limited opportunities to borrow. Moreover the unemployment signalizes bad times when households savings increase which leads to a lower consumption and then a lower borrowing (see Turinetti and Zhuang. 2011).

4 Conclusions

Our analysis revealed that the income tax systems contributed to the household indebtedness in the former EU-15 countries in the 2004 – 2013 period. The tax wedge increase of 1 percentage point raised the debt by 0.64 of a percentage point. Our result corresponds with Wolswijk´s result that reduction of the after-tax mortgage interest rates increased the debt. Particularly deductibility of mortgage interest payments in combination with imputed rent exempted from the income tax could stimulate households to borrow to acquire housing. However our estimate of the housing taxation impact is not precise. We ignored taxation of capital gains related to a potential house sale and a property tax. Moreover, tax wedges were modelled for taxpayers with certain characteristics. Finally, caveats related to data availability and quality must be taken into account.

There are the other factors influencing the household debt significantly in our fittest model. The GDP (both level and growth) and financial worth regarding household wealth displayed mixed results in our regression. The unemployment negatively affected the household debt and the ratio of number of seniors to number of people of productive age affected the debt positively. While impact of the unemployment is pretty comprehensible a deeper analysis is necessary to provide better understanding on the effect of population composition on the household indebtedness. To increase appropriateness of the model the variable reflecting the personal income tax and social security contributions burden was included. However that higher taxes rates were related to a greater household debt is questionable. Our results should be considered to be preliminary. Further research must be conducted.

Acknowledgements

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Transfer Pricing Rules in the Context of SMEs

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Abstract. Currently, Small and medium sized enterprises represent about 99% of companies in EU, create 58% gross value added and employed around 89 million people. Therefore SMEs are considered to be crucial for the European economic recovery. However, their internationalization is very low, only 5% of them have foreign subsidiaries or joint ventures. Most of SMEs are active only in their home country to avoid great deal of obstacles in the internal market such as different tax and law systems, compliance cost of taxation, transfer pricing, cross-border loss compensation and others. In this paper we focus on international taxation issues, specifically on transfer pricing as we consider that the approach "one size fit all" is not suitable for SMEs. The aim of paper is to evaluate approaches of each EU Member States in the area of transfer pricing rules in the context of specificity of SMEs and to propose recommendations. Based on the results we can conclude that 18 of EU Member States provide simplification measures in the area of transfer pricing for SMEs, which are related mainly with the documentation, exemption from transfer pricing rules and advance pricing agreements.

Keywords: EU, SMEs, transfer pricing rules

JEL Classification: F23, K33, G38

1   Introduction

Currently, as mention European Commission (2014), Small and medium sized enterprises (hereinafter as SMEs; enterprises qualify as micro, small and medium-sized enterprises (SMEs) if they fulfill the criteria laid down in the Commission Recommendation 2003/361/EC) represent about 99% of companies in EU, create around 58% gross value added (or 28% of EU28 GDP) and create 89 million jobs for people. The most important sectors, where SMEs operate, represent manufacturing", "construction", "professional, scientific and technical activities", "accommodation and food" and "wholesale and retail trade, repair of motor vehicles and motorcycles" as the largest one. Those five sectors represent 78% of all SMEs in EU, generating 71% of value added, accounting around 79% of total EU28 SMEs employment.

There is no doubt that they are crucial for the European economic recovery, although they still have to face to great deals of obstacles. Currently, finding customers is the most pressing problem facing SMEs across the EU28 (that account for 71% of all EU28 SMEs), followed by the costs of the production or labour, competition and regulation. Based on the survey of the European Commission (2014), demand is considered as the most important factor in explaining the performance of SMEs. Nevertheless, due to the fact that internationalization of SMEs is very low (only 5% of them have foreign subsidiaries or joint ventures), most of them are active only in their domestic country and therefore they are not able to fully use the benefits of increased foreign demand. Moreover, internationalization has become increasingly important to the competitiveness of SMEs. As the other survey of the European Commission (2011) showed, export-oriented SMEs generate higher growth of turnover and employment than SMEs operating on the domestic market. In addition, as the survey showed, export oriented SMEs are also more innovative. Therefore, there is pressure to increase internationalization of SMEs in the EU, although there are still many internal and external barriers. National and international administrative rules (such as different tax and law systems), customs rules or technical regulations can be considered as the biggest obstacles. Further, SMEs are facing other issues, such as managing technology transfer and its valuation, protecting intellectual or industrial property rights and also its valuation, which is related to transfer pricing issues, together with compliance cost of taxation and also with cross-border loss compensation.

In dealing with such a complex issues, SMEs are usually less well-equipped than larger enterprises (hereinafter as LEs) with financial and human resources. SMEs are facing specific problems and have specific needs in the practical international taxation issues, and they are not able to bear the same administrative burden as LEs. In this paper we focus on international administrative taxation rules, specifically on transfer pricing, as we consider that the approach "one size fit all" is not suitable for SMEs. This assumption was also a result of the survey of European Commission (2014) highlighting the need for SME size-classes and sectoral differentiation in the design and implementation of new policies and regulations. The aim of the paper is therefore to evaluate approaches of EU

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Member States in the area of transfer pricing rules in the context of specificity of SMEs, and to suggest recommendations in order to reflect sectoral and size-classes differences.

2   Theoretical background

Transfer pricing represent significant issue for both taxpayers and tax administrations because it influences determination of income and expenses and consequently taxable profit of associated enterprises[*] in different tax jurisdictions. However, transfer pricing also represents an instrument which is used as tax planning tool for achieving supplementary goals e.g. optimization of tax, duties and tariffs, or sales and marketing goals, and others. As mentions Buus (2009), in the respect of the optimal calculation formula for transfer prices, it is also possible to affect the generation of profit, and as further adds Swenson (2001) to achieve a shifting of reported income. Bronson, Johnson and Sullivan (2010) mention that transfer pricing have an effect both on the taxable income and on the overall effective tax rate of the consolidated organization, which occurs when business operations are shifted between jurisdictions with different statutory tax rates, as mentioned by Tierney, De Grave, Moore, Vandervelden, Mathieu (2009). In addition, as mention Solilová, Nerudová (2013) properly chosen transfer pricing strategies can enable the distribution of the tax risks and reduce the total tax liability. On the other hand, as state Solilová, Steindl (2013) it is necessary to keep the rules laid down both in the national income tax law and the Double Taxation Treaties (hereinafter as DTT), for the tax authorities may adjust the tax base of the entity, in cases when the taxable profit is not recorded in the source state due to a special relationship between associated entities. Thus, these approaches are available only for large multinational enterprises (hereinafter as MNEs) because SMEs do not have sufficient human and financial capital for expert tax advices and other expert services.

In the EU, transfer pricing compliance means adherence to the arm's length principle (hereinafter as ALP) in accordance to Art 9 of the OECD Model Tax Convention and with recommendations mentioned in the OECD Transfer Pricing Guidelines for Multinational Enterprises and Tax Administrations (hereinafter as TP Guidelines) that provide guidance for the application of the arm's length principle, where the crucial part is the comparability analysis. In this respect, Solilová, Nerudová (2012) mention that arm's length prices determined through comparability analysis with/without consideration of functional and risk profiles of analyzed entities have significant impact on the tax burden and consequently on tax revenues. However, TP Guidelines set treatments of transfer pricing issues in respect to MNEs and make no direct distinction between the type or size of the entity. Thus, all enterprises, regardless of their size, are subjected to the same principles and recommendations. However, TP Guidelines (2010) state that the application of transfer pricing rules may be more complex for SMEs in several places and therefore, too burdensome. Due to this fact, OECD launched another project on the administrative aspects of transfer pricing in 2010 which resulted into the revision of the Section E on Safe Harbours in Chapter IV of the TP Guidelines, and into the recommendation to implement other simplified transfer pricing measurements.

In the end, compliance costs of taxation are hundred times higher for SMEs than LEs as state Chittenden, Michaleas, Poutziouris (2000). As further add Cressy (2000) and Nerudová, Bohušová, Svoboda, Široký (2009), these costs are regressive to the size of enterprise and disproportionately large for SMEs in comparison with LEs, and as also states Sandford (1995) can generate prohibitive effect with the result of declining international competitiveness. Nerudová, Bohušová, Svoboda, Široký (2009) further add that this effect is significantly higher in case of SMEs with foreign branch or subsidiary in comparison with SMEs which are not internationalized.

3   Methodology

To reach the aim of the paper, firstly the analysis of the general transfer pricing rules is researched across EU26 (Malta and Cyprus were excluded from the research due to the lack of data). Secondly, the research is focused on the simplified transfer pricing measurements and safe harbours across EU26. Then, based on the results, the recommendations in order to reflect sectoral and size-classes differences recommendations will be set. As a data source is used the OECD project on the administrative aspects of transfer pricing, Deloitte, PwC and authors' previous researches.

In the respect of simplified transfer pricing measurements and safe harbours, the OECD project (mentioned above) covering 41 countries around the world, but only a few EU Member States, has been extended in order to include the missing EU Member States and update the current status of the issue at the date of 31. December 2014. Our research was focused mainly on *transfer pricing rules* - whether there are available exemptions from transfer pricing rules and transfer pricing adjustment, on the *documentation* – whether there are available exemptions from

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[*] Associated enterprises is an enterprise that satisfies the conditions set forth in Article 9, sub-paragraphs 1a) and 1b) of the OECD Model Tax Convention. Under these conditions, two enterprises are associated if one of the enterprises participates directly or indirectly in the management, control, or capital of the other or if „the same persons participate directly or indirectly in the management, control, or capital" of both enterprises.

documentation requirements and from disclosure requirement, and simplified documentation, on *transfer pricing methods* – whether there are available simplified transfer pricing methods, safe harbour arm's length range/rate and safe harbour interest rate, on *APAs* – whether there are available simplified APA procedures and reduced APA charge, and *on penalty* – whether there are available exemptions from penalty and alleviated penalties.

4   Results and discussion

Firstly, the general transfer pricing rules in EU Member States were researched. As can be seen in Table 1 (in annex), each of EU Member States applies the arm's length principle, comparability analysis, transfer pricing methods for determining the arm's length principle, transfer pricing documentation and dispute prevention as an advance pricing agreements (hereinafter as APAs), exempt of Bulgaria, Estonia and Croatia where APAs are not still available. Further, every EU Member State follows TP Guidelines. The general transfer pricing rules are stated in domestic legislation, usually in Income Tax Act, and further, in administrative decrees published by the tax authority.

Secondly, in the respect of simplified measurements for SMEs, as can be seen in Table 1 (in annex), the largest part of simplified measurements for SMEs is offered in case of documentation (use 14 times, i.e. in 54% of EU Member States). Exemption from documentation requirements presents almost 31% and simplified documentation presents more than 23%. Further, only Ireland, Hungary and United Kingdom exclude SMEs from transfer pricing rules. As regard APAs, only Romania offers reduced APA charges for SMEs and small transactions. In Germany, reduced APA charges for small transactions are also available. Further, in France and Netherlands, the simplified procedures of APA are offered for SMEs. As regard a penalty, only Spain uses for SMEs alleviated penalties regime. Altogether, simplified measurements for SMEs are introduced in 21 cases in 18 EU Member States that account for 69%. However, no simplified transfer pricing method or safe harbour arm's length range/rate is available for SMEs in EU Member States. This type of measurements is usually related with low value adding services and loans. Further, small transactions cover the second largest part of simplified measurements (use 12 times, in 46% of EU Member States). In addition, Bulgaria, Luxembourg and Croatia did not introduce any simplified measurements. Therefore we recommend for these countries to introduce at least some simplified measurements for low value adding services which should reflect EU Joint Transfer Pricing Forum Guidelines on Low Value Adding Intra-Group Services. However, based on the results it is further questioned in case of documentation requirements for SMEs, whether it should be harmonized in all EU or left in its current form. In case of the harmonization, it should mean that the Czech Republic, Austria, Bulgaria, Croatia, Luxembourg, Netherlands, Poland, Romania, Slovenia and Sweden should also introduce documentation simplified measurements for SMEs and follow current trend in the rest of European Union.

Finally, based on the research, it was found out that the EU Member States use the different definition of SMEs for transfer pricing purposes, notwithstanding, that there is a general EU definition for SMEs stated in Art. 2 of Commission Recommendation 2003/361/EC. It makes a situation even more complicated and increases compliance costs of taxation. However, every EU Member States has to take special care regarding the process of defining SMEs so that no LEs being classified as SMEs. Hence, different SMEs definitions for transfer pricing purposes can occur so that no LEs apply simplified measurements. Despite of the fact, based on the OECD (2012), all EU Member States which introduced the simplified measurements for SMEs, state that taxpayers receive increased certainty and a reduced compliance burden.

As regard compliance costs related to transfer pricing, we considered that these costs can be reduced through framework for pre-audit activity, audit activity, and post audit activity. In the first stage (pre audit) should be suitable to develop a specific transfer pricing guidelines for SMEs without deviation from TP Guidelines, adopt a simplified APAs and a simplified transfer pricing documentation for SMEs, and introduce advance transfer pricing rulings for SMEs. Furthermore, it is suitable to organize technical workshops for SMEs and to establish web site with all important information (who to contact for further advice, other SME transfer pricing legislation/decrees, administrative practice or training material and others).

In the second stage (audit process) should be taken into account that SMEs are not able to ensure all required information related to transfer pricing study, specifically comparable and functional analysis due to the lack of human and financial capital. Therefore, it should be suitable to consider the simplification measures, for example in the form of safe harbour - arm's length range and simplified transfer pricing methods using safe harbour arm's length range. Furthermore, SMEs should receive assistance in preparing comparable data and analysis, in choosing the most suitable transfer pricing method in line with results of comparable and functional analysis and also in considering a preparation of a limited/simplified transfer pricing documentation. Furthermore, we do not recommend imposing penalties, especially in cases where SMEs were acting in good faith and are not able to supply the required documentation.

In the last stage (after audit) the dispute resolution should be taken into account. SMEs very often have little knowledge about creating of application and processing the work. Usually, when the transfer pricing adjustment involves transaction with a relatively low monetary value, SMEs do not want to apply Mutual agreement procedure

(hereinafter MAP) available under a DTT, or the EU Arbitration Convention (hereinafter EU AC) with the final result of double taxation. Therefore, we recommend making easy friendly MAP or EU AC to eliminate double taxation for SMEs and furthermore, using of authority of tax administrators to act unilaterally in SMEs cases.

5   Conclusions

The aim of paper was to evaluate approaches of EU Member States in the area of transfer pricing rules in the context of specificity of SMEs, and to propose the recommendation in this area. Based on the results, we can conclude that 18 of EU Member States provide simplification measures in the area of transfer pricing for SMEs, which are related mainly with the documentation, exemption from transfer pricing rules and advance pricing agreements. Only Bulgaria, Luxembourg and Croatia did not introduce any simplified measurements. Therefore, in their cases, we conclude that in those countries it is recommended to introduce at least some simplified measurements for low value adding services which should reflect EU Joint Transfer Pricing Forum Guidelines on Low Value Adding Intra-Group Services.

Furthermore, in case of documentation requirements for SMEs, it is a question whether it should be harmonized in all EU or left in its current form. In case of the harmonization, the Czech Republic, Austria, Bulgaria, Croatia, Luxembourg, Netherlands, Poland, Romania, Slovenia and Sweden should introduce documentation simplified measurements for SMEs and follow current trend in the rest of the European Union.

Further, notwithstanding that there is a general EU definition for SMEs stated in Art. 2 of Commission Recommendation 2003/361/EC, several EU Member States use different definitions of SMEs for transfer pricing purposes. However, every EU Member States has to take special care regarding the process of SMEs definition, to avoid incorrect classification of entity, hence special SMEs definitions for transfer pricing purposes may be unavoidable so that no LEs apply simplified measurements.

In addition, introduced simplified measurements for SMEs can increase certainty of taxpayers and reduce their compliance burden. Moreover, compliance costs related to transfer pricing can be further reduced through different framework for pre-audit activity, audit activity, and post audit activity.

Acknowledgements

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Table 1: Transfer pricing rules in EU Member States

MS	General TP rules*	Type of simplified measurement						Safe harbour			Scope of safe harbour				
		APA	Penalty	TP rules	TP methods	Documentation		Arm's length rate range	Exemption from TP rules	Simplified TP method	Small Transactions (A)	SMEs (B)	Low value adding services (C)	Loans (D)	Others (E)
						Simplified	Exemption								
AT	✓				✓			C		D			✓	✓	
BE	✓					A, B					✓	✓			
BG	✓ **	none													
CZ	✓				✓			C		C			✓		
DK	✓						A, B				✓	✓			
DE	✓	A				A, B, E					✓	✓			✓
EE	✓ **						B					✓			
EL	✓						A, B, C, E				✓	✓	✓		✓
ES	✓	B				B	A, E				✓	✓			✓
FI	✓					A	B				✓	✓			
FR	✓	B					B					✓			
HR	✓ **	none													
IE	✓			✓					B			✓			
IT	✓					B						✓			
LV	✓						A, B				✓	✓			
LT	✓						B					✓			
LU	✓	none													
HU	✓			✓		C	A, B, E		B	C	✓	✓	✓		✓
NL	✓	B			C					C		✓	✓		
PL	✓						A				✓				
PT	✓					B	A				✓	✓			
RO	✓	A, B						D			✓	✓		✓	
SI	✓				✓			D						✓	
SK	✓					B						✓			
SE	✓					A					✓				
UK	✓			✓					B			✓			

Notes: * Arm's length principle and statement of related parties, comparability analysis, transfer pricing methods, documentation, APAs. **No APA available.

Note: Malta and Cyprus were excluded from the research. Source: Deloitte (2015); PwC (2013); OECD (2012); Solilová (2010).

Are Lump Sum Expenses for Self-Employed in the Czech Republic Adequate?

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Abstract. Lump sum expenses are the part of the Czech tax system from the very beginning. However, during last ten years the height of lump sum expenses has significantly increased reaching up to 80 % of income. It raises a question whether such a high lump sum expenses still reflect real expenses and serve as a tool for reducing tax burden of small self-employed instead of being misused to lower tax liability.

This paper is analyzing the adequacy of current lump sum expenses by comparison of declared income of selected business activities with average wages in corresponding industries. Results show that expenses which would ensure the same net income of self-employed as if they would be employed are substantially lower than lump-sum expenses. The estimated expenses are even so low that it would probably not cover real business costs. It implies that revenues declared in tax returns may be underreported.

Keywords: self-employed, lump sum expenses, expensiveness, underreporting of income.

JEL Classification: H25

1 Introduction

Self-employed persons in the Czech Republic are treated differently when it comes to paying taxes if compared to employees. The different treatment is regularly pointed out by various international organizations such as OECD (e.g. OECD 2010, 2011) or European Commission (2014). Some academic studies were also published about this topic, e.g. Dušek, Kalíšková and Münich (2013).

Probably the most significant advantage in terms of tax treatment is a possibility to apply so called lump sum expenses instead of real expenses. By using lump sum expenses, self-employed can reduce their tax base, which is defined as income less expenses, up to 80% of income. Nevertheless the height of tax base is crucial also for the health and social security contributions.

Lump sum expenses were initially introduced to reduce tax burden of self-employed because when applying them, there is no need of bookkeeping or keeping any evidence of expenses. However, during last ten years lump sum expenses have significantly increased. For example in 2004 self-employed having income from entrepreneurial activity under a handicraft trade license could apply lump sum expenses of only 25% of income. Nowadays the same person can apply lump sum expenses of 80% of income. The question is whether such high lump sum expenses still fulfil their initial function or whether they are used rather for the purpose of lowering tax liability of self-employed.

Therefore the goal of this paper is to provide a feasible estimation of the adequacy of the lump sum expenses in the Czech Republic. Rationally behaving person applies lump sum expenses every time his or her real expenses are lower. Therefore it is very complicated to find out the real expensiveness of certain business activities in order to be able to argue that current lump sum expenses are set higher than necessary. There is not enough supporting data to easily determine the real expenses of business activities. However, one can get some indication of the real expenses looking at aggregated macro data, using questionnaires or data about average wages within a sector. To reach the goal of the paper the lump sum expenses are compared with the expenses that would ensure the same net income as an average wage in selected industry. This method comes from the expected utility theory – it is expected that a self-employed person must gain a profit of at least an average wage otherwise he would become an employee instead of running his own business.

2 Lump sum expenses in the Czech Republic

Self-employed can apply lump sum expenses from the very beginning of existence of the Czech tax system from 1992. The possibility of lump sum expenses is incorporated in the Czech Income Tax Act (no. 586/1992, Coll.) where the rules of using them as well as the height of lump-sum expenses are described. The height of lump sum expenses differentiates according to the type of the business activity. The lump sum expenses had changed many times in the history, comparison between years 2004 and 2015 follows:

Table 1: Development of lump sum expenses in the Czech Republic

Business activity	2004	2015	Examples
Income from agricultural production, forestry and water management	50%	80% (no more than 1.6mil. CZK may be deducted)	Agriculture
Income from entrepreneurial activity under a handicraft trade license	25%		Hairdressers, beauty treatments, restaurant services
Income from entrepreneurial activity under a trade license	25%	60% (no more than 1.2mil. CZK may be deducted)	Retail, accountants
Other income from independent activity	25%	40% (no more than 0.8mil. CZK may be deducted)	Lawyers, doctors, tax advisors
Income from the lease of property included in the business property	30%	30% (no more than 0.6mil. CZK may be deducted)	Lease of property

Source: Act No. 586/1992 Coll., Act on Income Taxes.

The issue of application of lump sum expenses by self-employed in the Czech Republic is well described e.g. by Láchová and Tepperová (2013). For the purpose of this analysis we will focus directly on specific business activities leaving behind the general description of lump sum expenses.

3 Data and Analysis

This paper tries to assess whether lump sum expenses as stated by the law are adequate. To investigate this matter we use data from tax returns. The analysis is prepared for three types of business activities depending on the data available.

3.1 Data collection and description

Data used in this analysis was gained mainly from Automated Tax Information System (Automatizovaný Daňový Informační systém - ADIS). This database contains all tax returns which were filed during certain taxable period. Data about average wages comes from Czech Statistical Office and Ministry of Labour and Social Affairs.

Following business activities were selected for this analysis:
- NACE 41 - Construction of buildings (further as Construction of buildings)
- NACE 69.2 - Accounting, bookkeeping and auditing activities; tax consultancy (Accounting and tax consultancy)
- NACE 96.0.2 - Hairdressing and other beauty treatment (Hairdressing and beauty treatment)

The business activities were selected upon fulfilling these criteria: a reasonable number of tax return within the sector and a major share of people in the sector using lump sum expenses. Some basic characteristics of selected business activities follow:

Table 2: Characteristics of business activities selected for the analysis

	Construction of buildings	Hairdressing and beauty treatment	Accounting and tax consultancy
Number of tax returns	24,283	33,325	35,443
- of which active self-employed*	20,570	30,402	27,666
Share of persons using lump sum expenses	77%	65%	74%

* Note: As "active" are considered tax returns where the income from self-employed activity is higher than zero
Source: ADIS (2014), own calculations.

3.2 Analysis

At this point the paper focuses on analysis of the reasonability of lump sum expenses. For the purpose of the analysis a definition of expensiveness must be provided. If self-employed applies lump sum expenses, the expensiveness is equivalent to lump sum expenses. In case the real expenses are declared, the expensiveness is defined as follows:

$$Exp = \frac{E}{I},$$ (1)

where   *Exp*   =   expensiveness,
          E   =   business expenses,
          I   =   income from business activity.

In case one would estimate the expensiveness only looking at the data from tax returns, overall expensiveness would be significantly influenced by application of lump sum expenses:

Table 3: Expensiveness of selected business activities according to data from ADIS

	Construction of buildings	**Hairdressing and beauty treatment**	**Accounting and tax consultancy**
Lump sum expenses	80-60 %	80-60 %	60-40 %
Expensiveness according to ADIS data	84 %	76 %	64 %

Source: ADIS (2014), own calculations.

From Table 3 the impact of lump sum expenses is obvious – the expensiveness is on average higher than lump sum expenses. By expensiveness according to ADIS we mean the ratio of total declared expenses to total declared income ignoring the fact of the way how the expenses were declared (applying lump sum or real expenses).

There are basically three possibilities how to asses if lump sum expenses are sufficient or too high to reflect the real expenses of selected business activities:
1. questionnaire surveys (micro level)
2. comparison with aggregated data (macro level)
3. comparison with average wage

3.3 Questionnaire surveys (micro level)

The easiest way how to find out the real expenses of self-employed would be to directly ask them. However, even random questionnaires don't have to provide true answers. Respondents might be afraid of telling the truth. Therefore it is better to ask them indirectly – e.g. about perception of income sufficiency, living standards or the lowest acceptable salary. These types of questionnaires have been performed by Research Institute for Labour and Social Affairs (further as RILSA, 2013, 2014).

RILSA questionnaires do not focus on self-employed`s expenses but rather on net income. According to its research self-employed are much more satisfied with their income and at the same time do require much higher minimum salary to be willing to work than employees. There are some discrepancies between the results of RILSA research and official data published by Czech statistical office which may imply subjectivism of respondents, methodological differences or underreporting of revenues. Moreover the authors of RILSA study (2013) mention that comparison with the data from tax returns would be pointless considering tax optimisation. This opinion also indicates the problem of underreporting.

3.4 Aggregated data (macro level)

Czech statistical office publishes various financial measures for selected types of business activity including income, costs and profit from which it is possible to determine the expensiveness of business activity. Unfortunately the data is not available in detailed breakdown and are presented aggregated for both natural and legal persons. Moreover most of the data comes usually from tax returns therefore it includes also the impact of lump sum expenses.

3.5 Comparison with average wage

The paper focuses exclusively on a comparison of average wage with data from tax returns. The idea behind this is that when an employee is deciding whether to become a self-employed person he is expecting to gain a profit of at least an average wage in the selected sector of his business activity. This idea comes from expected utility theory – an approach for analysing decision making under uncertainty (Starmer, 2000). If individual is given a choice of alternatives he selects the alternative with the highest expected utility. Regarding the self-employed Shane (2003) says that an individual becomes an entrepreneur if overall utility exceeds those of alternative employment choices. Van Praag and Cramer (2001) point out that it is more likely to engage in self-employment when the expected reward surpasses the wage of employment. In case an individual chooses to become self-employed, employment can be regarded as a missed opportunity and the utility cannot be realized. The forgone benefits of the second best option are called opportunity costs (Buchanan, 1987). Propstmeier, Picot and Schaller (2012) analyse the decision to opt for self-employed of graduates` using the concept of opportunity costs. In their study the opportunity costs

represent the forgone benefits derived from paid employment as a consequence of the self-employment decision, referred to as entrepreneurial opportunity costs (Propstmeier, Picot and Schaller, 2012, p. 3).

This paper considers the employment wage as the only entrepreneurial opportunity cost. In praxis self-employed may ask even higher net income than net wage of employees to compensate advantages of employment contract such as paid holidays, notice period etc. This fact is also supported by the RILSA study (2014) where the lowest monthly wage required by self-employed was higher than overall average wage.

Table 4: Estimation of expensiveness according to average wage

CZK, 2012	Construction of buildings	Hairdressing and beauty treatment	Accounting and tax consultancy
Gross average monthly wage	22,861	14,574	24,795
Net average monthly wage	17,821	12,111	19,154
Average monthly revenues of self-employed	47,399	18,234	31,305
Expensiveness ensuring the same net income	47.8%	13.5%	14.3%

Source: ADIS (2014), Czech statistical office, Ministry of labour and social affairs, own calculations.

Table 4 implies that to ensure the same monthly net income the expensiveness must be much lower than the height of lump sum expenses. On the other hand it is questionable if expenses in absolute term are not too low. If we look e.g. on hairdressing and beauty treatment`s estimated expensiveness which is only 13.5%, it indicates only 2,500 CZK expenses a month. Usually hairdressers need to pay a rent for her hairdressing salon, water, electricity and haircare products. From this point of view 2,500 CZK seems not sufficient to cover all these expenses. It brings us to another idea – income in tax returns may be underreported.

Table 5: Estimation of revenues corresponding to selected expensiveness

CZK, 2012	Hairdressing and beauty treatment			
Gross average monthly wage	14,574			
Net average monthly wage	12,111			
Expenses in % of revenues (expensiveness)	80,%	60,%	40,%	20,%
Revenues corresponding to the expensiveness	78,877	39,438	26,292	19,719
Revenues according to ADIS	18,234			
Difference	-60,643	-21,204	-8,058	-1,485

Source: ADIS (2014), Ministry of labour and social affairs, own calculations.

The effort of above table is not to claim that an average monthly income of hairdressers should be around 80,000 CZK. Nevertheless it tries to point out the inadequacy of lump sum expenses as stated in law and very low level of income declared in tax returns. Even if we would agree that the real expenses of hairdressers could be around 40% of their income, the difference between declared income and income equivalent to gross average monthly wage in the industry would be almost 100,000 CZK per year.

4   Discussion and conclusions

The lump sum expenses are undoubtedly a significant advantage which reduces tax burden of self-employed and at the same time ensure paying low taxes. Concerns of misuse of lump sum expenses had resulted in tightening conditions for application of lumps um expenses starting from 2013. From the beginning of 2015 the maximum amount of expenses when using lump sum expenses is limited for all types of business activities. Moreover, when applying lump sum expenses tax credit for a spouse and for children cannot be used under a certain conditions. Government prefer the limitation of a scope rather than reducing the height of lump sum expenses as it belongs to sensitive political issues.

In the paper we analysed selected types of business activities to be able to assess whether lump sum expenses are sufficient or whether they are higher than needed. The aim of the analysis was not to say what height of lump sum expenses is appropriate but rather to illustrate the difference between lump sum expenses and average wages. Very significant discrepancy was shown mainly within hairdressing and beauty treatment and accounting and tax consultancy sector where the expensiveness ensuring the same net income both for employees and self-employed was around 14 % while lump sum expenses for these business activities is 60% or 80%.

Acknowledgements

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Small and Medium Size Enterprises in the Public Contracts: The Size of Public Contract which Are the Companies Receiving

Tereza Stloukalová[*] – Kristína Srdošová[†]

Abstract. Aim of this work is to study a relationship between the size of the public contract which the Czech businesses are receiving and the size of these companies expressed by average number of its employees. There will be seen, whether the size of the public contract has an effect on the size of the company which won the contract.

This paper aims to examine the relationship value of public procurement and the winning bidder (micro, small and medium-sized enterprise and large enterprise). This post has been supported by the Faculty of Economics, Mendel University in Brno.

Keywords: small and medium size enterprises, type of companies, public procurement, size of public contracts

JEL Classification: H83

1   Introduction

All over the world and in the area of the European Union member states, small and medium sized enterprises are so called the skeleton" of the society and the economic prosperity and they represent one of the most important part of the economy of every state (Barroso, 2008).

Within the functioning of the SMEs, there are many positive effects for the community, e.g. the development of entrepreneurial skills, ability to employ, competence of innovations and their flexibility, which is connected with the capability to fulfill the empty places within the market and regions in which the big corporations are not interested.

Small and medium-size enterprises have significant participation in the process of market forming, creation of GDP, employment in the European Union and also in small countries as are Slovakia and Czech Republic. This field of enterprises presents large potential, which could be raised by using of support on the different levels, by using of knowledge or by implementation of innovations.

In the Slovak Republic, SMEs are on the high level of importance because they created 72% working places in the 2013 and in the Czech Republic it was the value of 68, 5 % in the 2013 (Záboj,Vajčnerová, Peprný, 2011).

Financing and the subsidies for the small and medium – sized enterprises are on the road of higher efficiency and the stronger emphasis of their importance for the economy as whole.

The European Union has a major position within the support for the SME´s in the Slovak and Czech Republic. There are many possibilities and opportunities how the small and medium - sized companies can improve their conditions, administrative and legal environment through the subsidies and support programs from the European Union.

One of the most important steps which the European Union has made was the Small Business Act for Europe from the year 2008. SBA reflects the Commission's political allowance to recognize the most important position of SMEs in the EU economy and for the first time mentions a comprehensive SME policy framework for the EU and its member states. It includes ten principles which should guide the design and help to implement of SMEs policies on the national and the European level (Jurčík, 2011).

Experts dealing with the issue of public procurement both abroad (see e.g. Guccio, Pignataro, Rizzo, 2014, Jackson, Brown, 1994, Loader, 2011) and in the Czech Republic (Jurčík, 2013) note that the role of SMEs in the public contracts should be on the significant level. Some aspects and relation between public contracts and SMEs were solved e.g. in Nakabayashi, Lundberg (2013). Aim of this study is to analyses of a relationship between the size of the public contract which the Czech businesses are receiving and the size of these companies expressed by average number of its employees. There will be seen, whether the size of the public contract has an effect on the size of the company which won the contract. This should shown, if for example Small and Medium Size Enterprises have equal chance to win public contract as bigger enterprises.

2   Methodology

To describe a possible dependency of a relationship between the size of the public contract which the Czech businesses are receiving and the size of these companies expressed by average number of its employees (it's the

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main goal of this article), we have performed the quantitative analysis of secondary data obtained from the Journal of Public Contracts (Věstník veřejných zakázek, 2014) and profile of Ministry of Justice, i.e. of a sample covering tendered public contracts pursuant to the Public Contract Law. The authors divide public contracts on small scale public contracts, bellow thresholds public contracts and above thresholds public contracts. The data have been chosen using systematic selection and cover only the period of 2014. Due to a high error rate of the secondary data (missing values or two different tendered prices (the tendered price is the price offered by the winning bidder in the tender who carried off the contract) within one tender, the authors had to remove the faulty data because of impossibility to correct them. Together 200 records have been selected and validated.

Then, the database Albertina was used, from which the character of winner of public contracts was identified (if it was bigger company of SMEs).

For the purpose of this study we will use this abbreviations:
- SB – small business
- MB – medium sized business
- LB – large business
- SSC – small scale public contract
- ULC – under limited public contract
- ELC – excess limited public contract

For this work regression analysis of secondary data will be used to study if there is some relationship between size of the business and size of the public contract which it won. There are chosen first 100 of Czech public contract from Věstník veřejných zakázek (2014). It concern above-thresholds and bellow-thresholds contracts, 100 small scale public contracts were choose from profile of procurement entities (Ministry of Justice) where there are evidence about tender above 50.000,- CZK. To the definition of public contracts and its division see more in Jurčík (2013) and character of public contracts Kubicek, Vitek (2010). In international context definition and division of public contracts see e. g. in Korthals, Taşan-Kok (2010).

Then we used regression analysis. Regression analysis is a statistical method, which goal is approaching to the so-called causal context. Causality means dependence existence of a one phenomenon on the occurrence of other phenomenon. More over regression analysis describes oscillation of one variable (dependant) as a function of one or more independent variables (explanatory, regressors) in a single regression model function. Regression analysis is capable of quantifying dependencies between economic variables and therefore, it is one of the most used statistical method. Relationship between variables Y (dependant) and X (independent) can be described by general regression model (Budíková, M., Králová, M., Maroš, B., 2010):

$$Y = f(X) + \varepsilon$$

More specifically linear regression model has the following form:

$$Y = \beta_0 + \beta_1 * X_1 + \beta_2 * X_2 + \ldots + \beta_K * X_K + \varepsilon,$$

where β_0 is a level constant, $\beta_1, \beta_2, \ldots, \beta_K$ are the regression parameters and $+ \varepsilon$ is stochastic term. Stochastic residual (error) term ε is variable representing a wide array of factors influencing the dependent variable Y, which are not explained by the explanatory variables X included in the model.Regression analysis will be used to study relationship between size of the business and size of the public contract which it won. In other words dependant variable in the analysis is the size of the company expressed by average number of employees. Independent variable is public contract in thousands of CZK without VAT. We would like to know if the amount of the public contract has an influence on the size company which finally won the contract Our hypothesis is that that the higher the value of the public contract is the bigger is the company (expressed by number of employees) which won the contract.

Table 1: Size of the business expressed by number of employees

Number of employees	Size of the business
1-50 employees	Small business
51-250	Medium-sized enterprises
251 and more	Large business

Source: Authors

3 Results and Discussion

In the beginning an empirical analysis of dependant variable and chosen independent variable is conducted. The first step is to model size of the company as a function of 1 regressor (size of the public contract) using OLS method in Gretl software. Picture bellow shows linear relationship between size of the public contract and size of the enterprise.

Figure 1: Model 2 (logarithm): Relationship between size of the company and public contract which it won

l_The_estimatedvalue_of_public_ versus Size_of_the_company (with least squares fit)

Y = 6.42 + 0.00383X
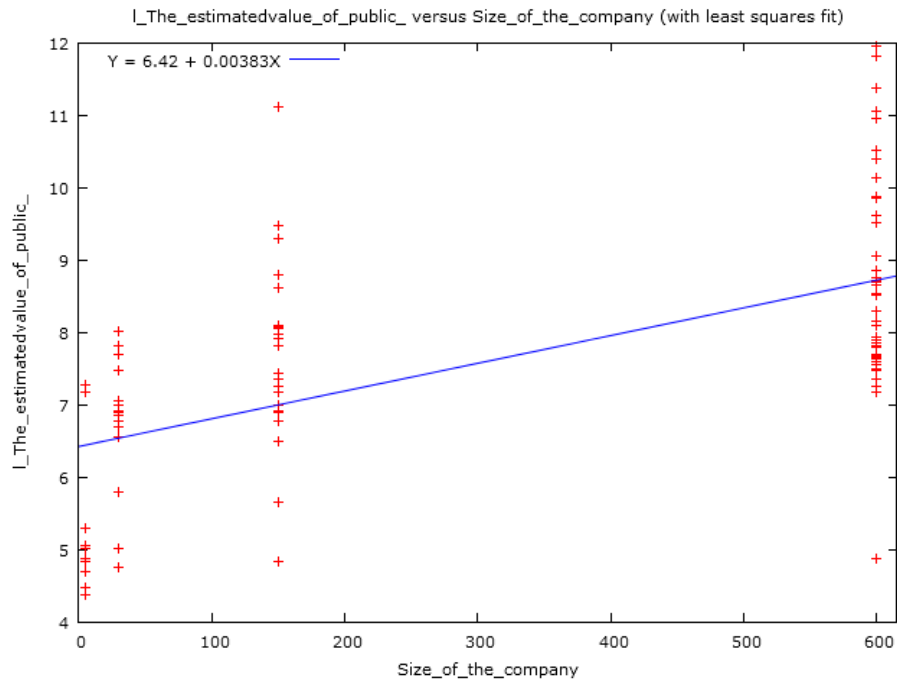
And there will be tested also quadratic relationship of the variables. See models generated by OLS method representing all models (linear and also logarithmic and quadratic).

Table 2: Model 1 (linear): OLS, using observations 1-100; Dependent variable: Size_of_the company

	Coefficient	Std. Error	t-ratio	p-value	
const	271.708	26.9828	10.0697	<0.00001	***
The_estimated_value_of_public_c	0.00339443	0.00104347	3.2530	0.00157	***

Mean dependent var	303.0500	S.D. dependent var	263.9558
Sum squared resid	6,225,373	S.E. of regression	252.0401
R-squared	0.097457	Adjusted R-squared	0.088248
F(1, 98)	10.58214	P-value(F)	0.001567
Log-likelihood	−693.8425	Akaike criterion	1,391.685
Schwarz criterion	1396.895	Hannan-Quinn	1,393.794

Source: authors

Table 3: Model 2 (lin – log): OLS, using observations 1-100, Dependent variable: Size_of_the_company

	Coefficient	Std. Error	t-ratio	p-value	
const	−407.476	98.242	-4.1477	0.00007	***
l_The_estimatedvalue_of_public_	93.6818	12.6467	7.4076	<0.00001	***

Mean dependent var	303.0500	S.D. dependent var	263.9558
Sum squared resid	4,421,737	S.E. of regression	212.4141
R-squared	0.358945	Adjusted R-squared	0.352404
F(1, 98)	54.87300	P-value(F)	4.55e-11
Log-likelihood	−676.7375	Akaike criterion	1,357.475
Schwarz criterion	1,362.685	Hannan-Quinn	1,359.584

Source: authors

Table 4: Model 3 (quadratic) : OLS, using observations 1-100; Dependent variable: Size_of_the_company

	Coefficient	Std. Error	t-ratio	p-value	
const	243.959	28.3807	8.5959	<0.00001	***
The_estimatedvalue_of_public_c	0.0107955	0.00305511	3.5336	0.00063	***
sq_The_estimatedvalue_of_public	−6.06999e-08	2.36334e-08	-2.5684	0.01174	**

Mean dependent var	303.0500	S.D. dependent var	263.9558
Sum squared resid	5,828,964	S.E. of regression	245.1375
R-squared	0.154928	Adjusted R-squared	0.137504
F(2, 97)	8.891560	P-value(F)	0.000285
Log-likelihood	−690.5528	Akaike criterion	1,387.106
Schwarz criterion	1,394.921	Hannan-Quinn	1,390.269

Source: authors

From these models picture can be seen that the best model is model 1 – logarithmic one. It has the lowest value of information criteria (Gujarati, Damodar, 2004) and the highest value of adjusted R2. Also all the variables are significant (p-value is lower than 0.05) and there exists positive impact on the size of the company, which the public contract won.

From Figure 1 and Tables 2, 3 and 4 we can conclude that exist relation between size of public contract and size of the company. Therefore, we can discuss whether it would be appropriate under the law to divide public contracts more jobs in order to support SMEs. Under certain circumstances, the Public Procurement Act prohibits the procurement division. But it allows to determine the length of the contract and procure public contracts regionally departments. We can recommend this type of support for SMEs companies.

3.1 Relationship between variables

From the previous table can be say, than the relationship between size of the public contract which the company received and size of the company expressed in average number of employees is:

Size of the company (expressed by average number of employees) = −407.476 + 93.6818 * log Size of the public contract (in thousands of CZK without VAT)

Meaning that if the size of the public contract increases by 1,000 CZK the average number of employees of the business increased by (93.6818/100) %. In other words the higher the value of the public contract, the bigger is the company which the contract receives.

3.2 Correct specification of the model

The estimators that was created through regression produced a linear - logarithmic relationship between the variables. However, performing a regression does not automatically give a reliable relationship between variables. Seven classical assumptions of well specified model must be fulfilled.

The model must be tested on all classical assumptions. Firstly it will be test on correct specification. Because model is linear (lin – log model) it can be tested by Lagrange Multiplier (LM) test of linearity.

1) Polynomic form: Test statistic: $TR^2 = 1.32318$, with p-value = P(Chi-square(1) > 1.32318) = 0.250023
2) Logarithmic form: Test statistic: $TR^2 = 0.653641$, with p-value = P(Chi-square(1) > 0.653641) = 0.418814

From the both results of LM tests it is obvious that function form of the model is OK and model is linear - logarithmic (both p-values are higher than 0.05, Failure of H0 rejection).

Ramsey's RESET test for detection of omitted variable in the model or incorrect specification of the model:

Test statistic: F = 2.929234, with p-value = P(F(2.96) > 2.92923) = 0.0582 From p-value it is clear that null hypotheses failed to be rejected and model is correctly specified.

More ways to verify correct model specification are adjusted coefficient of determination (R2 adj) and Information criteria. Results of those tests were presented in the Model 1, 2 and 3. 35.24 % of variability was explained by regression model to the total variability.

Model significance was tested also using F–test and ANOVA table.

Table 5: F–test and ANOVA

	Sum of squares	df	Mean square	F
Regression	2.47586e+006	1	2.47586e+006	54.873
Residual	4.42174e+006	98	45119.8	
Total	6.89759e+006	99	69672.7	

Source: authors

P-value of the test from the ANOVA table is 4.55e-011 which is very small number. Null hypothesis is rejected and model is statistically significant. Classical assumption number 1 which says that regression model is linear in parameters, it is correctly specified and it has an additive error term was confirmed.

Classical assumption VI refers about multicollinearity which can be detected by Variance Inflation Factors, VIF(βj). But because in our model only one independent variable stayed, there can be no multicollinearity.

From the Table 5 we can conclude that exist the direct relationship between size of the public contract which the company received and size of the company expressed in average number of employees. This statement was confirmed by statistical analysis. It can therefore recommend open the discussion concerning the administrative measures as law leading to a reduction in the extent of public contracts.

4 Conclusion

Using regression analysis there was studying relationship between size of the company expressed by average number of its employees and size of the public contract which the company received. There was concluded that this relationship exist and is positive (the higher the value of the public contract is the more the average number of employees of the company is). More specifically if the size of the public contract increases by 1,000 CZK the average number of employees of the business increased by (93.6818/100) %. In other words the higher the value of the public contract, the bigger is the company which the contract receives. This relationship was also tested. All tested which were used concluded that classical assumptions Classical assumptions of well specified model were be fulfilled. From above shown table and figures we can state that it is better chance contract for smaller companies where is smaller width of public contracts. Therefore, we recommend pass the law duty to divide public contracts in relation to support of SMEs companies. This division should respect public procurement law and prohibition of unlawful division of public contracts. The recommendation is to award separate public contracts that have no factual relation between them.

Acknowledgements

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Saving Strategies Revalued: Is Bond Pension Fund Really a Safe Pension Vehicle?

Ján Šebo[*], Tomáš Virdzek[†], Ľubica Šebová[‡]

Abstract. As many studies have proven the shift of the risk onto savers in DC pension schemes, we contribute to the analytical material by providing simulations of expected accumulated savings via funded pension funds under the existence of longevity risk. Using bootstrapping method, we simulate various scenarios based on historical equity and bond returns and inflation. By combining increase in longevity and expected wealth at retirement, we confirm that savings decisions using bond pension funds as a low risk pension saving vehicle stipulated by left-wing political actors in many CEE countries are suboptimal and lead to a substantial decrease in replacement ratios not only for higher income cohorts but also for the lowest ones. At the same time, we prove that using bond pension funds do not allow savers avoiding the ultimate risk – uncertainty in expected wealth at time of retirement.

Keywords: DC pension scheme, saving strategy, longevity, regulation.

JEL Classification: C15, E27, G18, G23

1   Introduction

Fully funded pension schemes become a new paradigm for pension systems reformers across the world. Supported by many international organizations, the design of new DC schemes is based on a mantra of shifting risks onto savers (policyholders) under the assumption that longer investment (saving) horizon will smooth the risks (mostly market risk) over time. Accepting these risks, the saver will profit by higher accumulated wealth at time of retirement. Most of these design premises have significant shortfalls when facing the reality.

Pension reforms in many Central and Eastern European countries supported World bank approach and introduced DC fully funded pension pillars. Many of these countries have reverted their reforms after financial crisis in 2008 led especially by issues in PAYG pillars. Financial pressures on PAYG pillars increased political risk in DC pillars and many savers were advised to move back to PAYG pillar or to use bond pension funds as a "safe" pension vehicle to secure retirement income.

Several CEE countries such as Slovakia, Poland, Estonia, Lithuania, Romania, Croatia or Hungary have, however, actually cut contribution rates in DC schemes or in some way disadvantaged the DC plans as a response to the crisis of 2008. And even those DC systems, which operate uninterrupted, invest rather conservatively; holding majority of their assets in instruments with relatively low return potential such as bonds or short-term notes (Salou et al., 2012). Analyzing the portfolio structure of bond pension funds across CEE countries leads to a finding that state and government bonds are the dominant investments of bond pension funds.

These "back-and-forward" political interventions have created a significant level of uncertainty where savers are advised either to return back to the PAYG pillars or to limit the exposure towards equities. The consequences of such advice led mostly by state agencies and politicians to secure debt financing from pension funds could be devastating for future pension pots.

Article presents evidence and spurs the discussion on the issue, whether the savers face more risk of not being able to achieve the saving objective by saving solely in bond pension funds comparing to equity pension funds and whether there can be other strategy based on active savings management on the level of individual saver to secure the saving objective. Understanding the exponential evolvement of individual savings over time (Šebo and Virdzek, 2013) and recognizing long saving horizon, can we say that bond pension fund investing mostly in government bonds are safer saving vehicle than saving into equity pension fund?

The article in chapter 2 presents the life-cycle model of savings using deterministic life-cycle income function for different income cohorts and a basic non-indexed single life annuity model. Chapter 3 presents simulation results and some thoughts for further discussion and research. Finally, chapter 4 concludes the key findings.

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2   Model and data

Building dynamic model of savings requires modeling of key individual as well as policy parameters. Individual parameters are connected to the estimation of life-cycle income during whole career. Even if we understand the random nature of income influenced by permanent and transitory shocks (Guvenen, 2009), for simplicity sake we used deterministic approach. We have created 9 income cohorts based on the level of attained education and experience (human capital). The data for modeling the life-cycle income were taken from a longitudinal study of American Community Survey (ACS, 2014) and fitted to a hyperbolic regression function to get expected monthly wage w for time t and income cohort I and adjusted for inflation index i.

$$w_{I;t} = i_{(t,t+1)} \times (\beta_{I;0} + \beta_{1;I}x_t + \beta_{2;I}x_t^2 + \varepsilon_t) \tag{1}$$

$$\text{for } I = 1, \dots, 9; t = 1, \dots, T$$

where:

$w_{I;t}$ denotes expected monthly wage for an income cohort individual I in month t

$\beta_{1;I}$; $\beta_{2;I}$ denote for regression coefficients

x_t denotes for the age of an individual in months

$i_{(t,t+1)}$ denotes for inflation index in the time interval $[t, t+1)$

In order to define retirement wealth in form of accumulated savings (s_T) we have created a savings model were individual deposits once a month a τ_t-part of his monthly salary w_t adjusted for impact of up-front fees (F_t^U) to a bond (equity) pension fund for a period of t (1,...,T). The budget-constraint equations read as follows:

$$s_{t+1} = s_t\left(r^{B;S}(t, t+1)\right) + \frac{w_{t+1}\tau_{t+1}}{1-F_t^U} \tag{2}$$

where $r^B(t, t+1)$ and $r^S(t, t+1)$ are the net after fees monthly returns of bond (equity) pension fund in the time interval $[t; t+1)$.

This simple savings model allows for tracking savings path alongside the life-cycle income path. The data for historical bond and equity returns for continuous 7-year Treasury Bond Yield and Dow Jones (DJIA) since January 1919 till January 2014 as well as historical inflation using Consumer Price Index - all items were retrieved from the Federal Reserve Economic Data database of Federal Reserve Bank of St. Louis (FRED, 2014).

Let us assume that saver has the possibility to switch between two pension funds offered by the scheme. We introduce two basic saving strategies:
1. Samuelson´s life-cycle investment strategy, presented by Samuelson seminal work (1969) and tested by many authors (Melicherčík and Ševčovič, 2010 or Šebo and Šebová, 2014),
2. CrossEMA saving strategy (Šebo, 2014).

Samuelson´s life-cycle investment strategy is based on a definition of an allocation ratio (λ) among bond and equity pension fund on a monthly basis based on a simple formula:

$$\lambda = (z - r)/[\delta^2 * \gamma] \tag{3}$$

where:

λ – allocation ratio for equity pension fund for time t (logic implication is the allocation ratio for bond pension fund in form of $1 - \lambda$),

z – log-inflation (monthly change in inflation),

r – standard deviation of equity pension fund log-returns for last 5 years,

γ – constant relative risk aversion (CRRA), for this study, the CRRA was set at level 9.

CrossEMA strategy is based on the crosses of 6, resp. 12-month, log-EMAs of equity, resp. bond, pension funds. If 6-month equity pension fund log-EMA is higher than 12-month bond pension fund log-EMA, all savings are transferred into equity pension fund, and vice versa.

Decision making parameters of both strategies described above trigger the switch between bond and equity pension fund. We recognize than the strategies can be smoothed by allowing for lower allocation ratios, however for simplicity sake, let us assume that only ultimate decisions [0;1] can be make and all savings are transferred between two respective pension funds.

The last part of the model is a single annuity path. The rationale behind introducing annuity path into the model is as follows. In order to close the gap in retirement income from the 1st PAYG pillar due to the participation in the 2nd DC fully funded pillar, an individual tries to accumulate the wealth that would allow him to buy a single annuity that delivers a monthly income at a level equal or higher than the expected loss from the 1st PAYG pillar. Taking into account changes in the contribution rates during 2005 till 2015, and expected rise in contribution rates by 0.25% annually from 2017 towards a final 6% in 2024, the average contribution rate for a whole 40-year career would be 6.18%. However, for clearer calculations we have used the contribution rate of 6%. Considering a full career (40 years of contributions) an individual saver would receive 2/3 of the pension from the 1st PAYG pillar designed for 50% replacement rate and the remaining 1/3 is expected from the 2nd DC pillar. Therefore, the 2nd

pillar delivers the savings objective if the single annuity delivers the monthly amount equal or higher than 17% of the last salary.

Introducing this savings objective, the saved sum s_T at the time of retirement T is thus not the ultimate objective. For a given life expectancy at each time t and expected returns from a bond (equity) portfolio r^B (r^S) the ratio of the cumulative sum S_t and the expected monthly income from buying a single annuity is of practical importance to a saver. Modeling such an annuity path would allow saver at each time t to see whether current level of accumulated savings S_t would be, with a certain level of probability, sufficient.

Let us therefore present a simple single annuity model and consider a person of age X years. The probability that this person dies within the next year is denoted by q_x. The probability of a complementary event, i.e., that the person aged X years will survive to age ($X+1$), is defined by $p_x = 1 - q_x$. The one-year probabilities of death q_x are usually known for $x \in \{0,1,2,\dots\}$, given in life tables. Generally, $_k p_x$ denotes the probability that the person of age X will survive at least k consecutive years and is defined by

$$_k p_x = p_x p_{x+1} \cdots p_{x+k-1} = \prod_{h=0}^{k-1} p_{x+h} = \prod_{h=0}^{k-1} (1 - q_{x+h}), \quad k = 1,2,3,\dots \tag{4}$$

Let us define the basic single annuity, which provides for monthly payments of 1 unit as long as the policyholder lives (payments are made at the beginning of each month). The expected net present value of the aforementioned annuity payments is denoted by $\ddot{a}_x^{(12)}$. The formula is as follows (Gerber, 1997):

$$\ddot{a}_x^{(12)} \approx \left(\sum_{k=0}^{\infty} {}_k p_x (1 + i)^{-k} \right) - \frac{11}{24} \tag{5}$$

where:

i represents the technical interest rate per annum.

$\ddot{a}_x^{(12)}$ represents the net present value of an annuity of 1 unit per year payable 12 times per year (1/12 unit per month) until the policyholder's death.

For simplicity sake we have substituted the technical interest rate by inflation rate. However we recognize that using Vasicek or CIR model (Yu and Phillips, 2001 or Ševčovič and Urbánová Csajková, 2005) for the short rate modeling process could make the results more robust. As we show further in the text, we have used a different technique for simulations and thus these models would not influence the results and using inflation rate seems sufficient.

If we know the current level of savings S_t and current level of monthly income $w_{I;t}$, we can calculate the savings/income ratio (d_t) to see the level of accumulated monthly payments at the replacement rate of 1 (see Kiliánová, Melicherčík and Ševčovič, 2006). Using the exponential time horizon curve we can discount the results to determine what level of savings (D_T^R) would be approximately sufficient at time t. Within our calculations we applied probabilities of death drawn from the unisex life tables of the Statistical Office of Slovak Republic for year 2012 (ŠÚSR, 2014) as well as the expected decrease in mortality (increase in life expectancy) from the Working Group on Ageing Populations and Sustainability report (2011) to introduce the longevity risk premium for an annuity path model.

To perform simulations using historical daily data, we have applied a moving block bootstrapping method. The basic idea of the block bootstrap is closely related to the i.i.d. nonparametric bootstrap (Vogel & Shallcross, 1996). Both procedures are based on drawing observations with replacement. In the block bootstrap, instead of relying on single observations, blocks of consecutive observations are drawn. This is done to capture the dependence structure of neighbored observations. This method allowed us to overcome the problem with capturing close relations among inflation, bond returns, and many other macroeconomic parameters influencing other parts of the model (life-cycle income) during the whole savings period. It has been shown that this approach works for a large class of stationary processes (Gilbert & Troitzsch, 2005). The blocks of consecutive observations are drawn with replacement from a set of blocks. By construction, the bootstrap time series has a nonstationary (conditional) distribution.

The moving blocks bootstrap is a simple resampling algorithm, which can replace the parametric time series models, avoiding model selection and only requiring an estimate of the moving block length (l). In our case, the block length (l) is 40 consecutive years, i.e. the full career of an individual. For each unit of a block bootstrap, a vector of variables is defined. Pulling consecutive block of data out from the database of 94 years of monthly (daily) data of variables, each block (k) than consists of variable observations $(X_{k-1+1}), j = 1, \dots, l$. Then the simulation is performed for each block (k). In total we have performed 643 simulations for each strategy for all 9 created income cohorts, thus totally 23,148 simulations.

3   Results and Discussion

For simplicity sake, we present only averages for all income cohorts and only describe the findings for income cohorts. In following histograms, we presents the ratio d_R^S of accumulated savings S_T and required level of savings to buy a single annuity that delivers the income equal or higher than the cut of pension from PAYG pillar S_T^R.
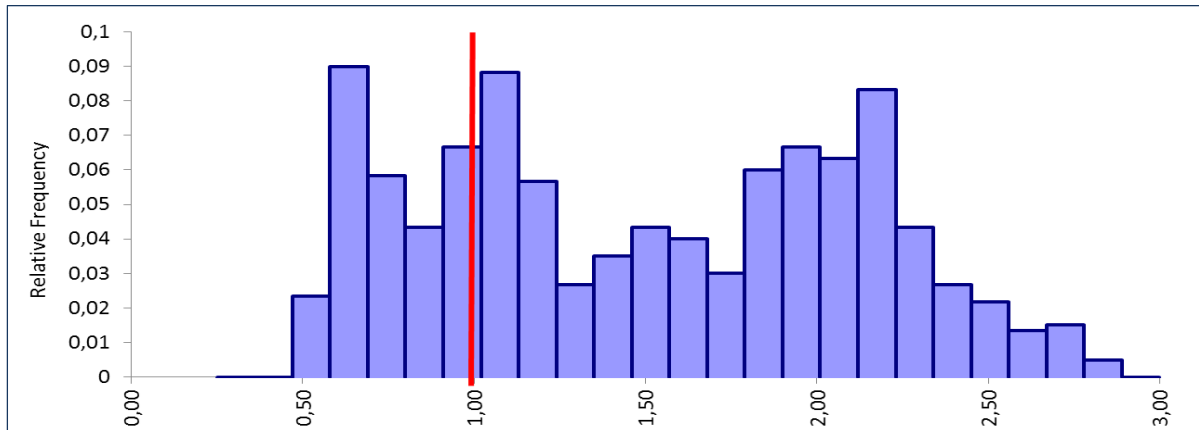
Figure 1: Histogram of accumulated vs. required savings (d_R^S) in bond pension fund
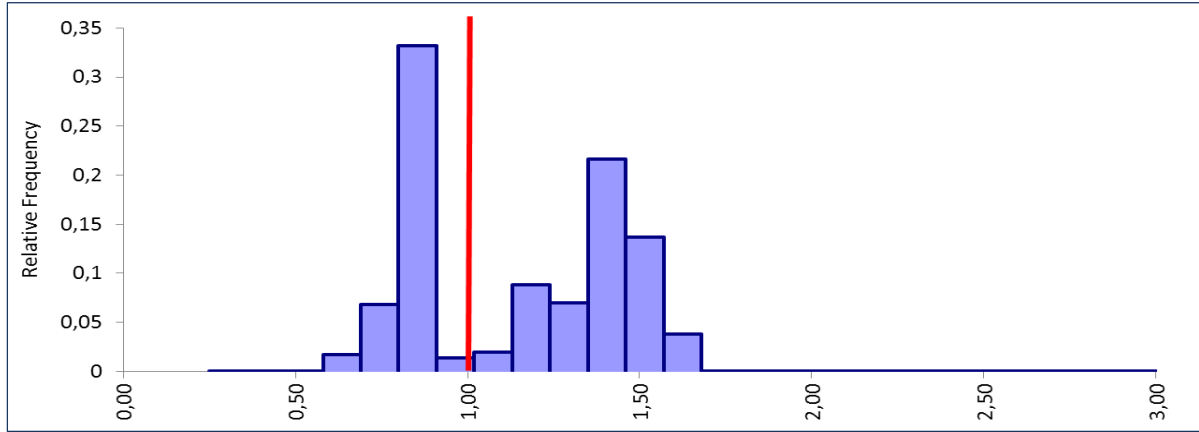
Source: Own simulations using MikroSIM model and @RISK tool, 2015

Using bond pension fund for life-long saving strategy resulted in having the pension pot smaller than required in 45% cases. The distribution of results suggests that the saver will be exposed to the significant level of uncertainty.

Figure 2: Histogram of accumulated vs. required savings (d_R^S) in equity pension fund

Source: Own simulations using MikroSIM model and @RISK tool, 2015

Using equity pension fund for life-cycle saving strategy leads to a significantly higher volatility during the saving period. However, considering the saving objective our research shows than having the pension pot smaller than required is in 23% cases. On the other hand, the probability of accumulating higher portion of savings than required is wider (right side of the histogram). However, the distribution of results suggests that the saver will be exposed to the significant level of uncertainty.
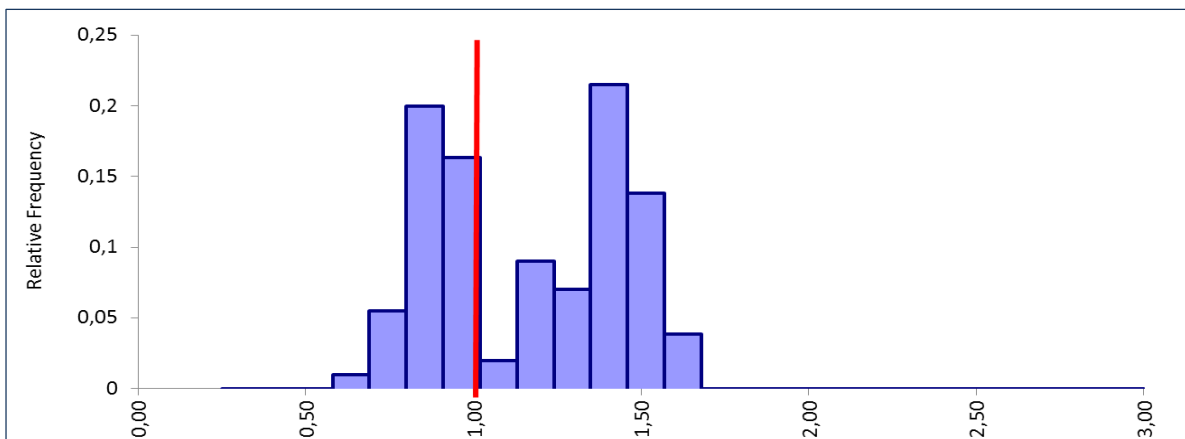
Figure 3: Histogram of accumulated vs. required savings (d_R^S) applying Samuelson Strategy

Source: Own simulations using MikroSIM model and @RISK tool, 2015

Samuelson life-cycle investment strategy led to an increase of overall savings, however the strategy is not able to protect against the down-turns in bonds. Generally, using CRRA at level 9, most of the savings are allocated to the bond pension fund and the results are highly correlated with the bond pension fund saving strategy. Samuelson strategy is, however, able to beat the bond saving strategy in almost 100% of cases. Even when actively managed, the distribution of results suggests that the saver will be exposed to the significant level of uncertainty.

Figure 4: Histogram of accumulated vs. required savings (d_R^S) applying CrossEMA Strategy
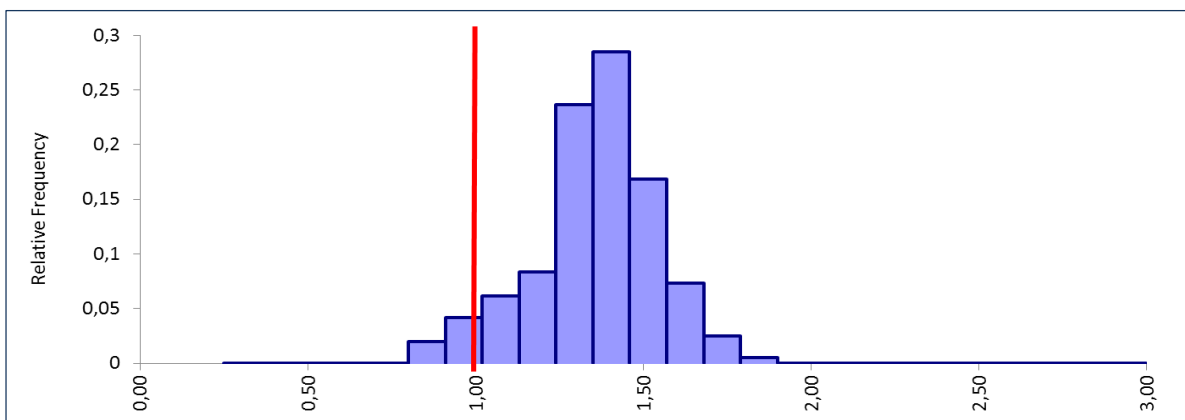
Source: Own simulations using MikroSIM model and @RISK tool, 2015

CrossEMA saving strategy delivers significantly better results when considering the savings objective. The strategy was not able to reach the required level of savings only in 6.5% of cases. Interesting finding is the ability of the strategy to deliver robust results regardless the development of equities as well as bonds over time. The distribution of results suggests that the saver will be able to reduce the level of uncertainty when considering the savings objective.

4   Conclusions

We have presented simple dynamic accumulation model and by using moving block bootstrapping method and performed 23,148 simulations using historical data on bond and equity returns and inflation taking into considerations also influence of other macroeconomic variables. Analyzing available longitudinal data we have developed simple individual life-cycle income model based on various income cohorts taking into account human capital (education level and experience). The accumulation model has been supplemented by objective, which is not based on the maximization of accumulated savings, but rather on required level of savings that takes into consideration the cost of single life annuity based on expected interest rates and longevity.

The analytical results suggest than using bond pension funds as a saving vehicle could lead to an increasing risk of not achieving the targeted level of savings not only for higher income groups, but surprisingly this saving vehicle seems to be suboptimal also for low income cohorts. On contrary, in 90% of simulations the final accumulated-to-required savings ratio of active saving strategy CrossEMA exceeded the level of savings achieved by Samuelson strategy and delivered only marginal risk (6.5%) of missing the saving objective. Thus we can

conclude that savings in bond pension fund cannot deliver sufficient buffer to unexpected increase in longevity even for 40-year saving period. On the other hand, if the savings objective is supplemented by the objective to reduce the level of uncertainty, active saving strategies should be considered.

We conclude that regulations aimed at recommending savers "safe" low risk bond pension funds would lead to an increase risk of ending up with smaller than required pension pot at moment of retirement. However, using bond pension funds as a dominant single saving strategy might lead to a severe utility loss and increase the risk for public scheme in a future. The risk is higher for higher income cohorts and surprisingly also for lowest income cohorts.

Further research should focus in applying active saving strategies aimed at lowering the risk of missing the saving target while at the same time allow for higher longevity risk buffer. This would require taking an extra market risk during earlier saving periods.

Acknowledgements

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Analysis of Impact of Sharing of Pension Rights between Spouses

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Abstract. This paper provides an analysis of the proposal of the Expert Committee on Pension Reform to introduce the sharing of pension rights between spouses. Based on the evaluation of legal regulation of this institution in other countries, it concludes that the design of the sharing of pension rights between spouses proposed by the Committee differs from that we know from abroad. With respect to the objective set by the Committee which is fairer pensions for spouses, the paper suggests to follow a Swiss model of sharing pension rights. It brings analysis of the impact of such a measure for the women and men concerned and answers the question what would be the costs associated with such a solution with respect to the pension system balance sheet.

Keywords: old-age pensions, gender equality, pension rights, pension reform.

JEL Classification: H55, J26, G22

1   Introduction

Since pension rights essentially are acquired in relation to the income during the economically active life, the pension system contributes to the extrapolation of gender inequality in the income and the associated social consequences beyond the end of the economic activity. Despite the significant application of the principle of income solidarity in the pension system in the Czech Republic, pensions paid to women amount only to 82% of the pensions paid to men (ČSSZ, 2013). The Expert Committee on Pension Reform preparing further adjustments to the pension system in order to achieve a fairer income for spouses discusses the option to introduce the institution of sharing of assessment bases for the calculation of pensions between spouses. Such a step requires the clarification of theoretical foundations of the measure, thorough preparation of its design, analysis of the impact on the pensions of the women and men concerned, and quantification of the impact on the pension account balance.

The concept of sharing the assessment bases for the calculation of pensions between spouses can be classified under the broader term of sharing pension rights, which includes the sharing of rights not directly associated with the contributions to the system. (They are non-contributory insurance periods for which the period of insurance is credited to the participant even though he/she does not pay contributions.) The basic principle of sharing pension rights is that each spouse should acquire the same old-age pension rights during the period of marriage. The spouse who has earned more pension rights shall surrender a part of them to the spouse who has earned less pension rights shall gain such a part, which will ensure that the latter will have half the portion of the pension rights earned by both spouses during marriage (Baier,Gortz-Leible, 2011). As part of the basic pension system, this institution is in force in Germany, Canada, and Switzerland. In Germany and Canada, it aims primarily divorced spouses so that the economically weaker member of the household is secured during his/her retirement. In both countries, the institution was introduced in the seventies of the last century and is historically based on the practices applied in the supplementary pension schemes. The pension rights acquired in supplementary pension schemes are in divorce part of assets divided between spouses in several countries: the United Kingdom, the United States of America, Canada, the Netherlands, Denmark, etc. The theoretical basis of this practice is the idea that pension rights are essentially rights of proprietary nature.

In the international context, the sharing of pension rights between spouses is dealt with in the literature concerning the concept of individualisation of social rights (e.g. Meyer, 1998). This concept discussed mainly in the nineties of the 20th century is based on the premise that the basic economic unit is an individual and not a traditional family. Therefore, the so-called derived social rights based on the institution of family should be cancelled and replaced by a more modern arrangement (Czepulis-Rutkowska, Z., 2010). Regarding the pension policy, a logical consequence is the cancellation of "long-term" widow's and widower's pensions, as it has been done in Sweden (Palmer, 2002). In a modern arrangement, the introduction of the institution of sharing of pension rights between spouses according to Kerschen and James could be an alternative way in the effort to mitigate the effects of the income shortfall of the household of a survivor. From this theoretical perspective, Switzerland has proceeded to the preparation of the "10th AHV revision" that cancels marital pensions and long-term widow's and widower's pensions by introducing individual old-age pensions within the basic retirement insurance with effect from 2001. At the same time, it introduces the sharing of pension rights between spouses, which is not only limited to divorced spouses but is applied to all marriages compulsorily.

Heubeck (2003) quantified the impact of the sharing of pension rights between spouses with regard to Germany. He finds that this concept as part of the basic pension system contributes significantly to the amount of pension of the majority of divorced women. However, the demands for the judicial procedures associated with the

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institution are assessed critically (Baier-Gortz-Leible, 2011). As regards Switzerland, the quantification of the impact of the introduction of the institution (UFAS/Office des sociales, 2003) has showed that due to the weighty application of income solidarity in the calculation of pension the impact is not significant on average. Not the administration associated with the institution but an adverse impact on the system comprehensibility to citizens is perceived as problematic. The option to introduce the sharing of pension rights in the Czech Republic was analysed by Šatava (2013). However, he presents the impact of sharing pension rights only with respect to divorced spouses.

The purpose of this paper is to suggest the design of the sharing of pension rights between spouses for the Czech Republic with respect to the objective as set by the Committee which is fairer pensions for spouses. It also aims to evaluate the impacts of implementation of the measure for the women and men concerned. At the same time, the paper aims to answer the question what are the costs associated with such a solution with respect to the pension system balance sheet.

2   Methods

The method used in the formulation of the design of the institution of the sharing of pension rights between spouses was the comparison of the institution of sharing the assessment bases between spouses as proposed by the Committee with foreign models of the institution. The criterion for the evaluation of possible solutions was the objective of that measure as declared by the Committee.

2.1   Microeconomic analysis

The data on the income for the purpose of the microanalysis of the impact of sharing has been drawn from an international survey on the income and living conditions (EU-SILC) carried out in the Czech Republic in 2011 by the Czech Statistical Office entitled "Living Conditions (SILC) 2011" (ČSU, 2011a). The sample survey was based on a two-stage random selection for each region and the data thus constitutes a representative sample of households in the Czech Republic. The data for common households was used for the comparison of income of both partners living in marriage. Married respondents living in full families (i.e. families with two adult members - spouses, regardless of whether there are any children and other household members present in the family). However, at least one spouse with non-zero earned income from employment had to be included in the selected set of analysed households. The analysis excluded households of self-employed persons and households in which at least one spouse receives an old-age pension. The resulting analysed set includes 2,208 households.

When analysing the set, the households were initially divided into income deciles according to the gross annual income of man to which the gross annual income of woman living in the same household were added by analogy. Subsequently, the set was divided into household income deciles according to the gross annual income of women for which the income of their husbands is mentioned. The following marital status was considered: a man/woman living in marriage, a man/woman divorced by the time of being granted pensions, and not remarried, and a man/woman living in second marriages. The income groups were determined separately for men and women based on the decile distribution of selected households from the sample survey. The same households were arranged according to the amount of income of men and for the second time according to the amount of income of women, which allowed to examine the impacts on individual groups of men and women with varying income. Afterwards, the pension for each model individual was calculated assuming that the pension was granted according to the current legal framework and, subsequently, assuming that the proposed form of the sharing of pension rights between spouses is used. The calculations according to the data from the Czech Statistical Office (ČSU, 2011b) assume an average period of marriage of 25.9 years for the marriages lasting to the age of men of 62 years and 12.9 years for the marriages divorced before the age of men of 62 years. The age of entering into the first marriage of 32.2 years of men and 29.6 years of women was assumed. The impacts of the change on households as a whole were subsequently analysed in the same manner.

2.2   Macroeconomic analysis

The analysis is limited to the identification of changes in total expenses on old-age pensions which would have been incurred in connection with the hypothetical introduction of the sharing pension rights between spouses in 2011. The calculation is carried out in two steps; the first is an analysis of the impact of the concerned reform in the year of its introduction. While the other one provides a hypothetical assumption that the institution of sharing pension rights has already been working in the system for a long time and, therefore, the system carries additional costs incurred in connection with the transfer of pension rights of men to women who have a longer life expectancy.

The amount of income which calculations are based on is an average annual income of an individual as determined from the sample survey of data (EU-SILC) 2011, depending on his/her marital status. The income was distributed according to individual categories depending on the marital status and sex - single, married, divorced, and divorced and remarried. The corresponding pension for men and women depending on the progress of their family life was calculated from the income established under the assumptions consistent with the microeconomic analysis. Subsequently, the proportions of persons in the given age (men aged 18 to 61, women aged 20 to 59) in

the classification man/woman and according to the marital status of the corresponding population in the relevant age were determined (ČSU, 2011c). These proportions were applied to the number of pensioners in 2011 (ČSSZ, 2011) and subsequently model expenses on old-age pensions were calculated under the current legal framework and according to the rules considering the sharing of pension rights between spouses. The quantification of costs of the measures in the year of introduction has thus been obtained. Consequently, it was necessary to carry out the calculation allowing for the difference in life expectancy in favour of women of 5.5 years (ČSSZ, 2011d). This has been achieved by multiplying simply the bonuses from sharing as for women in particular types of cohabitation by the numbers of beneficiaries. The sum of all bonuses and penalties of sharing subsequently allowed setting the annual costs of the system of the sharing of pension rights between spouses.

3   Analysis Results

3.1   Design of the institution

The Expert Committee on Pension Reform has approved a proposal to introduce the sharing of assessment bases between spouses on 11 December 2014. The published material (Expert Committee on Pension Reform, 2014) declares as an objective of the measure fairer income for both spouses and states that it would apply even to the persons living in a registered partnership. According to the proposal, sharing pension rights should terminate upon divorce, death or retirement of either spouse. The assessment bases for the calculation of pensions should be shared, but pension rights for the period when one of the spouses falls under the regime
of non-contributory period will not be shared according to the proposal. There are no further details contained in the published material, which cause problems with regard to work on the preparation of measures proceeding in the present at the Ministry of Labour and Social Affairs.

In Germany and Canada, sharing pension rights is limited to divorce. In Germany, spouses can share their pension rights even in the event that there was no divorce, however, they waive thus their right to a widow's/widower's pension and, therefore, this option is not used in practice (Kerschen). On the contrary, Switzerland, has introduced the sharing of pension rights between spouses, which is not only limited to divorced spouses but is applied to all marriages compulsorily. The proposal of the Committee is thus very close to the Swiss variant of the sharing of pension rights between spouses. However, the committee comes with an original solution of the institution which does not allow for the inclusion of non-contributory periods in the shared pension rights. Such approach in any of the countries surveyed is not applied and can be described as problematic. It may in fact lead to unequal treatment of insured persons, when some arrangements can unreasonably favour or penalise the insured person. At the same time, with regard to the objective of the measure, it will lead to the reduction of the impact of the measure as a result of shortening the actually shared period. It seems that the author wanted to avoid a specific problem of non-contributory period which does not exist abroad because these periods are assigned by law a specific value which can become the subject of sharing. The issue of value of non-contributory periods in the Czech pension system lies in the fact that the value of these pension rights is not known until the calculation of benefits upon retirement, because it is tied to the average amount of the assessment base of the insured person who has acquired the non-contributory period. The problem does not arise if the distribution of shared pension rights occurs only when the second of the spouses retires because the non-contributory period can be assigned a specific value. If the rights are distributed earlier (e.g. upon divorce), the non-contributory periods cannot be assigned a specific value. The issue can be solved so that each spouse is entitled to half non-contributory periods acquired during their marriage as a separate pension right. Its actual value would be set up only upon the pension calculation, however, based on records of an individual who applies for his/her pension. After resolving this issue, the Swiss model can fully be followed and all pension rights acquired during their marriage can be shared between spouses.

The application of the "Swiss model" in the Czech Republic assumes that pension rights acquired for all full calendar years spent in their marriage would be shared equally between the spouses. A registered partnership would be taken into account equally as marriage under this institution. The pension rights would be shared: for the period after reaching the age of 18; by the end of the calendar year preceding the year when the first retiring spouse becomes entitled to his/her pension; and for the periods when both spouses were covered by the pension insurance in the Czech Republic. This applies to both the assessment bases for the calculation of the pension and to non-contributory periods and these would also be shared between spouses in equal shares.
The determination of the share obtained by the insured person with the application of the distribution of pension rights gained during the marriage would occur the moment when the other spouse applies for his/her pension; a widow or widower applies for an old-age pension or either spouse submits a final judgment of dissolution of marriage on the grounds of divorce. The first spouse becoming entitled to his/her pension would receive the pension based only on his/her own pension rights. The moment the other spouse applies for his/her pension, the shared rights are distributed, his/her pension is determined, and the pension for the first retiring partner is recalculated.

3.2   Microeconomic analysis

As shown in Tables 1 and 2, the results of the analysis show the obvious impact of the reduction limits on the amount of pension. In addition to the reduction limits, the measure would be another levelling element in the Czech pension system. The analysis also shown that in all tested combinations of the family income the sum of pensions would never lead to a decline in the total pension income of a family while sharing the pension rights acquired during the marriage.

Table 1: Pensions per family members with hypothetical variants of family life and income situations of family members arranged according to the income of men

	MAN				WOMAN			
	Existing rules	Sharing			Existing rules	Sharing		
Average	Man	Married	Divorced	Second marriage	Woman	Married	Divorced	Second marriage
1st decile income	8,118	9,835	8,977	9,571	14,577	12,268	13,423	12,623
Pension	7,685	8,818	8,251	8,643	9,679	9,305	9,492	9,363
2nd decile income	13,926	13,775	13,850	13,798	13,357	13,560	13,459	13,529
Pension	10,298	10,271	10,285	10,275	9,481	9,514	9,498	9,509
3rd decile income	17,113	16,436	16,774	16,540	14,569	15,478	15,024	15,338
Pension	10,866	10,745	10,805	10,763	9,677	9,825	9,751	9,802
4th decile income	19,499	18,576	19,037	18,718	16,026	17,268	16,647	17,077
Pension	11,291	11,126	11,208	11,151	9,914	10,115	10,014	10,084
5th decile income	22,005	20,686	21,346	20,889	17,045	18,818	17,932	18,545
Pension	11,737	11,502	11,619	11,538	10,078	10,366	10,222	10,321
6th decile income	24,620	22,536	23,578	22,857	16,786	19,586	18,186	19,156
Pension	12,202	11,831	12,017	11,889	10,037	10,490	10,263	10,420
7th decile income	27,352	24,570	25,961	24,998	16,887	20,629	18,758	20,053
Pension	12,689	12,194	12,441	12,296	10,053	10,659	10,356	10,565
8th decile income	31,245	28,285	29,765	28,740	20,113	24,092	22,102	23,480
Pension	13,319	12,855	13,118	12,936	10,575	11,219	10,897	11,120
9th decile income	36,871	32,448	34,659	33,128	20,235	26,183	23,209	25,268
Pension	14,024	13,469	13,747	13,554	10,595	11,558	11,077	11,410
10th decile income	61,505	51,348	56,426	52,910	23,307	36,963	30,135	34,862
Pension	17,111	15,838	16,474	16,034	11,092	12,971	12,193	12,732

Data source: Czech Statistical Office (2011) and own calculations

Table 2: Pensions per family members with hypothetical variants of family life and income situations of family members arranged according to the income of women

Average	MAN				WOMAN			
	Existing rules	Sharing			Existing rules	Sharing		
	Man	Married	Divorced	Second marriage	Woman	Married	Divorced	Second marriage
1st decile income	26,960	21,005	23,983	21,921	4,567	12,572	8,570	11,341
Pension	12,619	11,559	12,089	11,722	5,069	9,355	7,469	9,130
2nd decile income	26,960	21,005	23,983	21,921	4,567	12,572	8,570	11,341
Pension	12,619	11,559	12,089	11,722	5,069	9,355	7,469	9,130
3rd decile income	26,960	21,005	23,983	21,921	4,567	12,572	8,570	11,341
Pension	12,619	11,559	12,089	11,722	5,069	9,355	7,469	9,130
4th decile income	22,293	18,857	20,575	19,386	9,372	13,991	11,681	13,280
Pension	11,788	11,176	11,482	11,270	7,950	9,584	9,210	9,469
5th decile income	23,503	20,437	21,970	20,909	11,973	16,095	14,034	15,461
Pension	12,003	11,458	11,730	11,541	9,257	9,925	9,591	9,822
6th decile income	24,090	21,485	22,787	21,886	14,293	17,795	16,044	17,257
Pension	12,108	11,644	11,876	11,716	9,633	10,200	9,916	10,113
7th decile income	26,400	23,898	25,149	24,283	16,990	20,354	18,672	19,836
Pension	12,520	12,073	12,296	12,142	10,070	10,614	10,342	10,531
8th decile income	29,014	26,640	27,827	27,005	20,086	23,278	21,682	22,787
Pension	12,985	12,562	12,774	12,627	10,571	11,087	10,829	11,008
9th decile income	29,090	27,678	28,384	27,895	23,781	25,679	24,730	25,387
Pension	12,988	12,747	12,873	12,786	11,169	11,476	11,323	11,429
10th decile income	35,181	34,873	35,027	34,920	34,021	34,436	34,228	34,372
Pension	13,812	13,774	13,793	13,780	12,636	12,683	12,659	12,676

Data source: Czech Statistical Office (2011) and own calculations

4   Macroeconomic analysis

As shown in Table 3, the macroeconomic effect of the introduction of the institution of the sharing of pension rights between spouses in the Czech Republic would start gradually. As a result of that measure, additional costs of the pension system of CZK 752 million would incur during the year of start. Should the system operate on a long-term basis, the additional costs of CZK 21,263 million would amount to 2011, which accounted for 8.64% of expenses on old-age pensions in that year.

Table 3: Impact of the sharing of pension rights by spouses on old-age pensions (2011)

	Current legal framework	Expenses in the year of sharing	Long-term expenses
Expenses on old-age pensions in millions (CZK)	246,091	246,843	267,353
Expenses on old-age pensions (%)	100%	100.30%	108.64%

Data source: Czech Statistical Office (2011) and own calculations

5   Conclusions

Sharing assessment bases for the calculation of pensions between spouses as proposed by the Expert Committee on Pension Reform may be characterised as a specific form of the institution of the sharing of pension rights between spouses as applied in the insurance pension scheme of Switzerland. A comparative analysis has shown that, with regard to the objective of the measure, the original form of the institution proposed by the committee is not an optimum solution. More appropriate seems to be a proven model of the sharing of pension rights between spouses following the Swiss model. In order to test the potential of the sharing of pension rights between spouses, model analysis presents the impact of this form of the institution of sharing pension rights, which assumes the sharing of pension rights between spouses including non-contributory periods.

A microeconomic analysis using a SILC data file has shown that the application of the sharing of pension rights between spouses would contribute to achieving the expected objectives, particularly in the event that the relationship between the concerned income and a pension benefit would not be distorted. Due to the application of reduction limits when calculating a pension in the Czech Republic the effect of introducing the sharing of pension rights is somewhat limited. As for the women with income under the first four income deciles, the sharing of pension rights between spouses would make their pensions close to the level of pensions of their partners. Similarly, this can be observed as for the men in the first decile.

Quantifying the impact of the introduction of the "Swiss" variant of sharing pension rights between spouses in the Czech Republic has shown that additional costs would amount to 0.30% of expenses of the system on old-age pensions during the first year after. Relatively low costs are related to the existence of reduction limits used in calculating pensions. The total additional annual cost of the system would gradually increase by 8.64% of expenses on old-age system with the long-term application of the Swiss variant due to an increase in women's pensions which have a longer mean life expectancy. With regard to the amount of costs, it is reasonable to follow the Swiss reform even with regard to the reform of survivors' pensions. According to the estimate of Ministry of Labour and Social Affairs (2012), the costs of long-term widow's and widower's pensions amounted to approximately 9.02% of annual expenses on old-age pensions. In connection with the introduction of the sharing of pension rights between spouses, if the Czech Republic proceeds to the simultaneous cancellation of widow's/widower's pensions paid under Section 50 (e) of Act 155/1995, it would be a virtually neutral step in terms of the pension account balance.

Acknowledgements

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Impacts of Rent Deregulation Process on Household Behavior: Lessons from the Czech and Slovak Republics

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Abstract. Rent control can be treated as a measure which aims to subsidize specific group of households – tenants. The subsidy takes form of reduced rent which is financed both by the private owners and municipalities (i.e. public budgets). Besides the reduction of such subsidy, de-regulation process aims to improve effectiveness of housing market. This might increase overall mobility of households with subsequent potential positive impacts on diverse economic indicators.

Our analysis deals with one potential impact of rent deregulation process – changes in tenure choice patterns.Existing literature defines several typical factors which influence this key decision every household has to make. The paper examines the potential factors using an econometric model drawing on sample data (the panel data based on investigation of EU-SILC) in the Czech Republic and Slovakia. In our analysis we propose one more factor which might be of interest. Based on the Czech data covering the period of the rent deregulation process in 2007-2011 we assess to what extent rent deregulation itself has influenced the tenure choice patterns. Our analysis using probit model did prove that regulated rents were an important factor affecting tenure choice in the Czech Republic. After deregulation households living in apartments with regulated rent preferred to buy house rather than stay in rental sector.

Keywords: housing, tenure, rent, deregulation, regression.

JEL Classification: D12, P36, R21.

1   Introduction

Rent control can be treated as a measure which aims to subsidize specific group of households – tenants. The subsidy takes form of reduced rent which is financed both by the private owners and municipalities (i.e. public budgets). Besides the reduction of such subsidy, de-regulation process aims to improve effectiveness of housing market. This might increase overall mobility of households with subsequent potential positive impacts on diverse economic indicators. Our analysis deals with one potential impact of rent deregulation process – changes in tenure choice patterns

The decision to buy a house or to rent a flat belongs to key decisions made by any household. Tenure choice how is this decision usually referred could be affected by lots of factors (see e.g. Boehm 1981, 1982, Burgess 1982, Henderson , Ioannides 1983, Krumm 1984, Coolen 2002, Andersen 2009). Discussion on the different approaches in details is introduced in Špalková, Špalek (2014a). Research in housing economics is oriented on application of these factors on selected issues of public policy. Our analysis introduces one of such application in CEE context. We profit from the rent deregulation process which took part in both parts of former Czechoslovakia. The aim of the paper is to evaluate possible influence of the rent regulation on tenure choice. We hypothesize that the existence of regulated rents might shift tenure choice patterns compared to those in western countries (see e.g. Bazyl, 2009, Špalková, Špalek, 2014 for summary). The issue of tenure choice has been studied in the Czech context as well. Several factors have been touched - Lux and Sunega (2012) assessed the influence of the tenure on mobility, Tsharakyan and Zemčík (2011) studied impact of rent deregulation on households renting behavior or their ownership status, Špalková, Špalek (2014b) assessed the influence of rent deregulation process on tenure choice itself.

The analysis presented in the paper uses the methodology from the latter one. Based on the results of the econometric model, we have defined the factors that affect tenure choice of Czech and Slovak households over the period 2006-2011. Using the acquired factors we have further quantified their impact on the sample of Czech households in the rental sector. The data from Slovak survey do not allow replicating the analysis also for Slovakia. The aim is to assess, whether and to what extent has rent deregulation influenced the tenure choice patterns.

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2 Material and Methods

The research presented in the paper takes form of quantitative analysis of sampled data. As the tenure choice can be characterized by dichotomous variable, we employ a probit regression (e.g. Wooldridge, 2006). The model enables to calculate the conditional probability of the choice of a particular type of housing depending on a given factor, provided that the values of other factors are constant. Details of the probit model used in our analysis (explanatory variables, coefficients) can be found in Špalková, Špalek (2014a and 2014b)..

The analyses included in this paper are based on the data pertaining to Czech and Slovak households collected by the Czech and Slovak Statistical Offices. The data were collected under sample surveys of income and living conditions of households between 2007 and 2011 (called hereinafter the "EU-SILC"). The data set contains information on the social structure of households, their incomes and expenditures. The dates relate to the date of the investigation, i.e. the defined date in the spring of that year, only incomes are listed for the previous year. The sample selected is considered to be a minimally distorted representative sample of Czech and Slovak households (e.g., a total 8,866 Czech households and 5,801 Slovak ones were examined in EU-SILC 2011). To make this subsample of households applicable for the entire country, a new PKOEFF coefficient showing the weight of each household examined was constructed.

Households in both countries preferred homeownership to rented housing and keep increasing over time. The ownership percentage grew from 73.5 % in 2005 to 80.4 % in 2012 in the Czech Republic. Similar trend we can observe in Slovakia, where the percentage grew from 82.1 % (2005) to 90.4 %(2012).

In the Czech Republic there used to be approximately 80 per cent of rented flats with reduced rent. The low level of rent, however, was not derived from the characteristics of the tenants (e.g. low income levels), but it was derived from the type of the flat (flats where the former owner used to be state). Such unbalanced situation where tenants were favored on the account of owners used to be processed by the gradual increase of the rent. The difference between the regulated rent and the market one was such large made that the process of successive harmonization was very slow. Long tradition of rent control in the Czech Republic together with the reluctance of politicians against the risky topic ended into the more than 15 year process of the abolishment of the rent control. The process was characterized by ongoing discussions and conflicts of the various interest groups and other actors. Only a few years ago under the deregulation act (Act No. 107/2006 Coll.), a unilateral increase in rent for housing (hereinafter referred to as "deregulation Act"), a process of deregulating apartment rents was begun (in January of 2007), intended to lead to a convergence of regulated and market rents. The beginning of the deregulation process was also tied to the introduction (redefinition) of social benefits intended to ameliorate its impact on households. By 2013, rent controls were therefore to be completely eliminated, with rent prices exclusively determined by the market (Jahoda, Špalková, 2009).

In Slovakia the problem of rent control pertained only to small fraction of flats (compared to the Czech Republic) with the rent control applied only in less than 6 per cent of overall housing stock. Unlike in the Czech Republic, until 2000 there has not been any correction (i.e. increase) of the rent level, even covering the indexing due to inflation. Since the year 2000 the regulated rent has been gradually increased. Similar to the Czech reality the process was very slow and incapable to harmonize the controlled and market rent. The final process of abolishing the rent control was initiated later compared to the Czech Republic (in 2011 by the Act. No.260/2011 Coll.). The process is to finish in 2015. The de-regulation process in Slovakia was accompanied by the adoption of the housing conception document which arranged the relationship among renters and owners on the housing market. In the Czech Republic the rent control applied to approximately 750 thousand of flats (Jahoda, Špalková. 2009), while in Slovakia it was not more than 900 flats (with more than 80 per cent flats located in the capital city of Bratislava – MTCRD, 2008).

3 Result and Discussion

We divided our analysis into two steps. First, the factors affecting tenure choice of the complete sample of Czech and Slovak households are derived on the tenure choice model. Second, the effects of the rent deregulation onto the tenure choice are tested via subsample of households living in the rental sector. We presume that these types of households are those which might have been influenced by the deregulation process most. The process might force the households to move their house and to doubt the changing of the tenure. In line with the analysis carried out to date, we focused on the examination of the impact of the demographic and socioeconomic characteristics of the households on tenure choice. To some extent, the range of potential factors is determined by the used data source. Potential factors mostly comprise characteristics monitored within SILC survey (i.e. our source of data), or variables that can be derived from monitored characteristics. Therefore we have concentrated on the household heads – their age, gender and marital status and also on the household from the perspective of its economic status, disposable income or number and age of children.

4   Housing Tenure Choice – Complete Czech households sample

First our attention is paid to the complete sample of Czech households in our data set. As noted above, this sample comprises 8,866 Czech households. In order to distinguish a real impact of investigated factors on tenure choice it is necessary to use the econometric model, based on the probit estimation. Results of the regression analysis examining tenure choice determinants are summarized in Table 1. Marginal effects β_k are computed not only for the year 2011 but they also cover a seven-year time span (2007-2011). This enables to assess trends of development of these effects.

Table 1.Probit Estimation Results for Housing Tenure Choice in the CR and Slovakia (1=owner)

	Marginal effect (β_k)**					
	Czech Republic			Slovakia		
Factor (x_k)	**2007**	**2009**	**2011**	**2007**	**2009**	**2011**
Constant	4.928	6.287	6.114	2.345	1.904	2.424
Household size (number of persons)	0.148	0.189	0.149	0.150	0.122	0.089
Number of economically active persons	0.012	0.000	0.004	-0.090	-0.027	-0.083
Number of self employed	0.179	0.118	0.049	0.107	0.101	0.085
Age of household head	0.017	0.019	0.016	0.017	0.025	0.027
Household head - male	-0.063	0.026	0.014	0.111	-0.140	-0.040
Education (1=both primary school. 0-higher)	-0.223	-0.342	-0.315	-0.107	-0.299	-0.244
Marital status of household head - single*	0.100	0.223	0.233	0.119	0.129	0.206
- married*	0.435	0.459	0.479	0.061	0.482	0.492
- divorced*	-0.081	0.019	0.118	-0.205	0.041	0.128
Household with children*	0.094	0.044	0.199	-0.133	0.021	0.041
Fully unemployed household	-0.142	-0.086	-0.017	-0.094	-0.136	-0.082
Fully retired household	-0.263	-0.168	-0.004	-0.067	0.042	-0.124
Household resides in Prague/Bratislava region*	-0.635	-0.500	-0.627	0.293	0.138	0.258
Number of rooms per person	0.716	0.647	0.582	0.412	0.489	0.505
Household income (disposable)	0.271	0.355	0.368	0.202	0.121	0.202

Notes: *dichotomous variables take values 1 (Yes) / 0 (No)

**All values are statistical significant at 99% level (t-statistics are upon request by authors) excluded the coefficient market [n]

Source: Authors.

    As expected, one of the most significant factors affecting the choice of type of housing in 2011 (as in other years) was the marital status of the household head. If the household head was married ($\beta^{2011}=0.479$), the odds of choosing homeownership increased. The analogous assumption, i.e. that single or divorced persons would more likely prefer rented housing, was not confirmed. On the contrary, the singles were more likely to choose homeownership even if the strength of this factor was far weaker. The next strongest factor was the net disposable income of households ($\beta^{2011}=0.368$). Higher-income households tend to prefer homeownership to renting. The importance of this factor was growing over the covered period. Among other strong (and statistically significant) factors, affecting tenure choice in 2011, was education of household members ($\beta^{2011}=-0.315$) and residence in Prague ($\beta^{2011}=-0.627$). Our findings showed that households with lowest level of education (both primary education maximally) and Prague households were more likely to choose rented housing. The latter can be linked with a high proportion of rented flats as compared with privately owned flats (or houses) in the capital city and so renting is a much faster and simpler way to acquire a new home there. Prague is also a university city, where many students and mainly graduates obviously prefer renting.

    Others factors affecting tenure choice can be found. Own flat (or house) is characterized by higher number of rooms ($\beta^{2011}=0.582$). Rented housing was chosen with high probability by the households with a lower number of persons ($\beta^{2011}=0.149$). So the results corroborate the assumption that homeownership is affordable only for higher-income households, which usually corresponds to higher education. This housing type is preferred by families (not individuals), i.e. a higher number of persons per household, and also by households, whose members work, since it is necessary to make regular mortgage payments (i.e. the past significance of the number of economically active

persons grew much weaker in 2011). For the first time children within a household became significant towards choosing homeownership in 2010-2011. The influence of other factors, i.e. the number of self-employed, age or gender of the household head was not established.

Table 2 also indicates the development trends of the individual factors in tenure choice over the period 2006-2011. By contrast, a sharp decline in the significance of self-employed persons per household as a determining factor for tenure choice was observed throughout the period. While in 2006 a higher number of the self-employed per household markedly increased the odds of homeownership choice, (β^{2006}=0.178), by 2011 this factor nearly lost its significance (β^{2011}=0,049). An impact of the number of economically active persons, single or divorced persons or fully unemployed persons is rather variable and hence uncertain over the long term. Throughout this period the following factors had a decisive effect on tenure choice: income of the household; education of its members; whether the head of the household was married or not. If the head of the household was married, the members of the household had a higher than basic education and a higher income, it implies the choice of homeownership. Our results in this respect correspond to the results of similar foreign studies. Ulker (2008) in his article showed that there was a highly significant influence of socio-economic characteristics, such as income and education on the tenure choice of households in the USA. Both Ulker and Bazyl (2009) confirmed a decisive impact of marriage on tenure choice of households throughout all monitored European countries

The question is which above mentioned changes in the time span of our analysis can be linked to the rent-deregulation process. We hypothesize that three major changes could be mentioned. First, households of pensioners with the end of the process move their house out of the rental sector. Second, the households with children start to prefer ownership much intensively. And third, household income plays more significant role for choosing owner sector.

5   Housing Tenure Choice – Complete Slovak households sample

Secondary our attention is paid to the complete sample of Slovak households in our data set. As noted above, this sample comprises 5,801 Slovak households.

The most important factor that influences the tenure choice decision for Slovak households is number of rooms per person (β^{2011}=0.505).This means that ownership is more typical for the households which prefer flats with more rooms. As expected, the other significant factors of choosing homeownership were: marital status of the household head – marriage (β^{2011}=0.492) and the net disposable income (β^{2011}=0.202). While the influence of the income is somewhat weaker compared to the Czech Republic, the marriage of the household head is slightly stronger. In contrast to Czech Republic for owning is determining household resides in capital (Bratislava) or in this region (β^{2011}=0.258). Again, if the household members have lower education (β^{2011}=-0.244), there is high probability that the household will move to the rental sector.

Besides these key factors other factor that influence the behavior of Slovak household can be found –fully retired household. The factor of choosing rental is used to be a household with retired members (β^{2011}=-0,-124). Further is interesting the development of the influence of the rate of economic activity in the household. Alike as in the Czech Republic the factor is of low importance. But while the Czech households with higher economic activity are more likely to choose ownership of the house or apartment, the Slovak households preferred rental housing. The influence of other factors, i.e. age and gender of the household head, household with children or fully unemployed household was not established.

The influence of rent deregulation process is not visible in the Slovakia during the analyzed period. This might be due to different timing of the process (start in 2011with end in 2015). On the other hand, the data cover period after 2000, when the rent was gradually increased.

6   Influence of rent control on the housing tenure choice – subsample of Czech renters

One of the principal aims of our analysis is to assess potential influence exerted by rent deregulation (and its phasing out in the CR) on the spectrum of factors influencing tenure choice. Therefore our attention is focused on the households in rented housing only (whether with market or controlled rents). We thus explored behavior of almost a fifth of population (19.4 %) in 2011. We chose only the households really affected by the deregulation process and could face the decision whether to remain in deregulated rented housing or to leave for the ownership sector. In order to simulate hypothetical decision-making on (not) moving a house, we deduced their household tenure choice from their housing type in the following year.

The results of regression analysis exploring the tenure choice determinants are summarized in Table 2. Borderline effects of individual factors β_k are calculated not only for the base year 2010 (and related housing type in 2011) but also include the entire period of the last deregulation stage in the CR, i.e. from 2007 to 2011. In such a manner we can evaluate potential development trends in this field.

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Table 2.Probit Estimation Results for Housing Tenure Choice for Renters

Factor (x_k)	Marginal effect (β_k)[**]			
	2007/08	2008/09	2009/10	2010/11
Constant	4.413	2.872	-0.523	-1.394
Household size (number of persons)	0.151	-0.079	-0.060	-0.028
Number of economically active persons	0.008	-0.037	0.239	0.344
Number of self-employed	-0.326	-0.125	-0.313	0.063
Age of household head	0.000[n]	0.014	0.007	0.001
Gender of household head (0=F;1=M)	-0.145	-0.037	-0.005[n]	-0.033
Education in the household (1=both primary school. 0-higher)	-0.096	-0.524	-0.146	-0.024
Household head is single*	0.220	0.408	-0.107	-0.141
Household head is married*	0.154	0.169	-0.056	-0.117
Household head is divorced*	0.083	0.186	-0.089	-0.195
Household with children*	-0.225	0.027	0.272	0.153
Children under two years*	-0.254	0.230	-0.005[n]	0.125
Fully unemployed household	-0.361	-0.045	-0.326	0.391
At least one retiree	0.070	-0.226	0.124	0.590
Household head works in public sector*	-0.589	0.358	-0.019[n]	0.183
Household resides in Prague*	-0.083	-0.709	-1.460	-1.383
Total floor area per person	0.007	0.001	0.004	0.000[n]
Household income (disposable)	0.155	0.076	-0.161	-0.232
Regulated rent	0.219	0.268	0.068	0.090

Notes: *dichotomous variables take values 1 (Yes) / 0 (No)

**All values are statistical significant at 99% level (t-statistics are upon request by authors) excluded the coefficient market [n]

Source: Authors.

Compared with the results shown above (3.1), the established factors and their impacts differ considerably. The influence of household income is also observed but in contrast with previous results it is mixed. While in early stages of deregulation the influence was fairly "standard" and higher-income households were more probable to prefer owning to renting, after deregulation the trend was completely reversed. After the year 2010/11 a decreasing income had a tendency towards increasing homeownership probability ($\beta_{2010/11}$=-0.232). On the other hand, Prague residents increasingly tended to choose rented housing. Undoubtedly, it was strongly affected by the fact that the sample of rented apartments continuously diminished and households in Prague, where the rental sector is traditionally most strongly represented, played more and more important role.

The deregulation process also changed the behavior of households with children, which more often bought their own housing, particularly towards the end of deregulation (in 2007 it was exactly the opposite). A gradual drop in the households living in rent-controlled apartments during that period resulted in gradual weakening of the deregulation factor (variable *regulated rent*) and its influence on tenure choice. Its direction, however, remained the same throughout the entire period – households living in rent-controlled apartments were more likely to choose home ownership rather than renting. Household head status as well as their education played a very uncertain role in our sample of households in rented housing. The results failed to confirm the formerly established trend – which married household heads with higher education chose to own their housing.

7 Conclusions

Rent deregulation process brings about variety of socio-economic consequences. One of the key question is whether (and if so then how) this process changes housing market and housing structure in the country. One of the aspects of interest is tenure choice. The Czech and Slovak Republics, due to the same history and economic policy in the past, represent unique example where the possible influence of the rent (de)regulation on tenure choice can be studied. By comparing the tenure choice patterns in both countries in the period when the rent deregulation process took part (2007-2012), we can hypothesize about the factors being affected by the process.

The results presented in our paper show that both Czech and Slovak housing market prove to be influenced by several factors which are the same as in the western countries. Marriage together with high income of the household head point to owner occupied sector. On the other hand, lower level of education is more likely connected with rental sector. One of the strongest factors that increase the probability of being renter is in Czech Republic the residence in Prague. In Slovakia, on the other hand, the residence in capital city (Bratislava) is more likely connected with ownership. The reason might be by far larger proportion of regulated rents in Prague compared to Bratislava. Rent deregulation process as pictured by the subsequent analysis of renters in the CR changes the patterns – economically active persons or households with children prefer home ownership in 2011 (the end of the rent deregulation) compared to first year of the liberalization process (2007) when they preferred rent.

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Inclusion of Self-Employed from the Third Countries into the Czech Public Health Insurance System

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Abstract. Self-employed migrants from third countries, as well as their dependent relatives, are not covered by public health insurance system in the Czech Republic, if they do not have the permanent residence permit. This paper discusses estimated impact of their inclusion into the public health insurance system. For the calculation of contribution we use data on number of migrants and income distribution of self-employed; for the calculation of expense on the health care we use data from Czech Statistical Office. We conclude that the expected impact is neutral, with slightly higher income (contribution) than expenses. It can be argued that migrants from the third countries might have lower compliance rate, thus we are of the opinion that further changes can be made within the system to cover for such risk.

Keywords: Migration, Public Health Insurance, Self-employment, Third countries.

JEL Classification: F22, J15, J61

1   Introduction

Taxation and compulsory insurance of self-employed is often discussed in the Czech Republic and brings specific problems both from national and international viewpoint.

Following the national legislation the self-employed are in specific position. They can lower the tax base from business activity by so called lump sum expense, without expending the real expense. The lump sum expense also mirror in assessment base for compulsory insurance, since the contribution is calculated from the tax base from the business activity. As a result, in general self-employed pay less taxes and contribution than employees. This comparison is often pointed out and the difference in effective taxation of employees and self-employed is thus considered distortive (OECD, 2014).

This calculation of tax base and assessment base for compulsory insurance is relevant also for the self-employed migrants (registered as self-employed in the Czech Republic; we do not cover self-employed migrants registered in other countries and being "posted" to the Czech Republic within this paper) who are nationals of other countries. Nationals from the countries that are covered by Regulation 883/2004 about coordination of social security have basically the same conditions as Czech nationals, as the discrimination within these countries is prohibited. Nationals of the third countries on the other side do not have this kind of privilege (with certain exceptions for those covered by 1231/2010) and are treated differently for the purposes of social security and health insurance.

For the purposes of pension insurance, the self-employed migrants from the third countries are subject of the pension insurance and pay contribution on pension insurance from the real assessment base (50% of the tax base) or from the minimum assessment base. Further, they can participate on sickness insurance voluntarily, the same as Czech nationals.

The conditions for participation on public health insurance system are different from the pension and sickness insurance. The decisive factors for inclusion into the system are permanent residence or employment. Thus self-employed migrants from the third countries without permanent residence are not included in public health insurance (Česko, 1997).

International coordination of social security systems through bilateral agreements can provide solution even for non-European countries that are not covered by EU Regulation on social security. However, these agreements primarily deal with pension insurance and often do not cover health insurance (Ministry of Labour and Social Affairs of the CR, 2014).

Within the Czech public administration the discussion on inclusion of the self-employed migrants from the third countries without permanent residence to the public health insurance exists (Zdravotnické noviny, 2015). Advocates for the inclusion believe that the rise from the contribution paid by self-employed migrants would exceed the expenses on their health care and that their inclusion would be fair and appropriate as some misfortunate cases has already occurred. Opponents of such inclusion argue that expenses on their health care would be much higher than the contribution, pointing out the potential problems with collection of contributions and possible misuse of the system. Estimation of the number of legal migrants that are covered by commercial insurance, thus are of question for potential inclusion into the public health insurance, provides for example Hnilicová et al. (2012)

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on data from 2012 or Trbola and Rákoczyová (2010) on data from 2008; both publications estimate nearly 100,000 thousands of such migrants.

This paper is the follow up of the previous research (Tepperová, Zídková, 2015) where calculation of contribution to health insurance by self-employed from the third countries without the permanent residence was predicted based on the data from 2011, as well as contribution of their dependent relatives. Within this paper we use the same methodology with data from 2012, to compare the results and see its consistency. Further we consider expense on the health care published by Czech Statistical Office (further "CSO") in ČSÚ, 2013 to evaluate the effectiveness of the inclusion of self-employed into the public health insurance system and discuss the parameters of the system that can be assessed to increase the effectivity of the public health insurance of self-employed from the third countries.

2   Data and Methodology

For our analysis of the impact of the inclusion of migrants from third countries, we use the following data. For the calculation of revenues, we use the number of migrants to the Czech Republic published in the Migration report of the Ministry of Interior (Ministry of the Interior of the CR, 2013) and the data on the reported income according to section 7 of the Income Taxes Act of all self-employed persons in their income tax returns obtained from the system ADIS kept by the Ministry of Finance. For the calculation of associated expenses, we use the data published by the CSO in its Report on Health Accounts (ČSÚ, 2013).

For the calculation of potential 2012 revenues, we use the same methodology as in Tepperová and Zídková, 2015. We define the group of migrants who are not covered by public health insurance and focus on migrants with the long-term permit excluding those migrants falling under regulation 883/2004 (European Parliament and Council, 2004). Besides the regulation 883/2004, some countries conclude so called bilateral agreements on social security (Ministry of Labour and Social Affairs of the CR, 2014). These bilateral agreements differ according to their scope and therefore some include health insurance as others do not. The Czech Republic has bilateral agreements on social security with the coverage of health insurance with Turkey, Israel and countries of former Yugoslavia. The Czech Republic has also concluded agreements exclusively for health care purposes of migrants with temporary stay with Yemen and Cuba (Ministry of Health of the CR, 2014). Therefore we exclude migrants from the countries that signed these bilateral agreements. We do not adjust the number by the migrants covered by regulation 1231/2010 (European Parliament and Council, 2004a), as no relevant data are available. We further refer to the relevant group of migrants described above as migrants from third (non-contractual) countries or simply migrants if the context is clear.

We divide this group into two subgroups. (1) Self-employed would pay their health insurance contributions based on their business income. (2) Dependent persons, from both self-employed as well as employees, would be either state insured persons (if children or retired), or paying their minimal contributions as persons without taxable income. We further refer to those persons as non-working migrants. The possible 2012 contributions of self-employed migrants from the third non-contractual countries are derived from the distribution of income among all self-employed persons in the Czech Republic. The contributions of non-working migrants are calculated as product of their estimated numbers and the contributions paid on behalf of state insured persons by the state and the minimal contribution paid by persons without taxable income applicable in 2012.

Furthermore, we calculate the associated medical expenses incurred by health insurance companies in respect of newly included migrants. We use the information on average health care expenses spent on men and women according to their age group as published by the CSO (ČSÚ, 2013) based on detailed data provided by all health insurance companies in the CR. The distribution of migrants into the age groups is available from the Migration Report (Ministry of the Interior of the CR, 2013).

In the final stage of our analysis, we simply compare our estimated revenues and expenses associated with the specified group of migrants. The result would represent the impact on the public health insurance system arising from the inclusion of the discussed group of migrants.

3   Contributions of migrants

The table below shows the number of migrants in 2011 and 2012 according to their economic activity. The figures for 2011 and 2012 shown below do not include the migrants from countries that have signed a bilateral treaty with the CR on social security with the coverage of health insurance or exclusively on health insurance as well as migrants from Croatia which is now a part of the EU. This is the reason why the total number of migrants in Table 1 here is different from the number indicated in Tepperová, Zídková (2015), Table 1. These numbers are crucial for further calculation of contributions of both the self-employed migrants and the non-working migrants.

Table 1: Numbers of migrants from the third (non-contractual) countries in 2011 and 2012

Migrants according to their economic activity	2011	2012
Employees from third countries with long-term visa	36,640	20,745
Self-employed from third (non-contractual) countries with long-term visa (estimated)	31,939	31,050
Non-working migrants from third (non-contractual) countries with long-term visa (estimated)	42,382	71,050
Total migrants from non-contractual third countries (estimated)	**110,961**	**122,846**

Source: Ministry of Interior of the CR, 2012, 2013, own calculation

After determining the number of migrants from third (non-contractual) countries in the Czech Republic in 2012, we were able to compute the potential contributions to the public health insurance system based on our methodology used in (Tepperová, Zídková, 2015). Total migrants from third countries who are not employed amount to 102 101 persons. They are divided into three groups according to the method used to estimate their potential contributions to the public health insurance system. The contributions of self-employed are estimated based on an assumption that the income distribution of all self-employed persons in the Czech Republic is the same as the income distribution among the self-employed migrants. For the state insured migrants, the contributions are product of their number and fixed annual amount of the state contribution (CZK 723 multiplied by 12 months). For the persons without taxable income, the contributions are product of their estimated number and their minimum annual contribution (CZK 1,080 times 12). The results and their comparison to the 2011 contributions are summarized in Table 2.

Table 2: Estimated Health Insurance Contributions of specified migrants 2012

	Number of migrants		Total contributions	
	2012	2011	2012	2011
Self-employed	31,050	31,939	698,630,389	723,134,370
State-insured	16,271	12,291	141,163,067	106,635,825
Persons without taxable income	54,780	30,092	709,946,199	389,985,935
Total revenues			**1,549,739,654**	**829,770,196**

Source: Ministry of Finance of the CR, Ministry of Interior of the CR, CSO, own calculation

The summary above reveals that the estimated contributions in 2012 are much higher than in 2011. The increase is due to the higher number of non working migrants in 2012, especially the group of persons without taxable income who would pay their minimum contributions themselves.

4 Medical expenses incurred on migrants

For the calculation of total expenses to be incurred by the public health insurance system, we had to estimate the composition of the group of migrants discussed in respect of their sex and age. This was necessary for a correct estimate of potential expenses as the average medical expenses per person differ significantly for men and women of different age. Table 3 shows the estimated numbers of migrants from third (non-contractual) countries according to age groups.

Table 3: Estimated numbers of migrants according to their age

Age	0-18	19-25	26-35	36-45	46-55	56-65	66 and more	Total
All migrants	18,632	28,804	78,201	49,032	32,948	12,801	3,768	224,186
Migrants from third countries	8,486	13,118	35,615	22,331	15,006	5,830	1,716	102,101
Relative frequencies	0.083	0.128	0.349	0.219	0.147	0.057	0.017	1.000

Source: Ministry of Interior of the CR, own calculation

Subsequently, we calculated total expenses to be potentially incurred on medical treatment of migrants from third (non-treaty) countries per each age group and totally. We also considered the number of women and men in each group. The estimation is based on the data published by the CSO (ČSÚ, 2013). The results are summarized in Table 4 below. Total expenses are calculated in the amount of CZK 1,521,038,911.

Table 4: Estimated total medical expenses on migrants in 2012

Age	0-18	19-25	26-35	36-45	46-55	56-65	66 +	Total
Number of migrants	8,486	13,118	35,615	22,331	15,006	5,830	1,716	102,101
Women	3,327	5,143	13,963	8,755	5,883	2,286	673	40,030
Men	5,159	7,975	21,652	13,576	9,122	3,544	1,043	62,071
Exp. per women in CZK	11,569	7,887	9,144	11,533	17,712	32,141	58,559	
Exp. per men in CZK	11,459	11,021	14,656	15,041	19,789	27,029	49,316	
Total expenses in thousands CZK	97,604	128,457	444,991	305,163	284,717	169,260	90,848	**1,521,039**

Source: CSO, Ministry of Interior of the CR, own calculation

5   Conclusions

Our calculation reveals that the medical expense that would probably be incurred if the migrants from third (non-contractual) countries are included in the public health insurance system equals to CZK 1,521 mil. Potential contributions of these migrants including the non-working persons are in the amount of CZK 1,549 mil. If we compare these two numbers, we can see that the resulting impact is slightly positive. Nevertheless, the difference is rather small. Given the assumptions on the distribution of the income among the migrants and also the estimate of the number of self-employed migrants staying on long-term visa (using relative frequencies of all migrants -EU and non-EU - on long-term and permanent visa as explained in Tepperová, Zídková, 2015), we conclude that the expected impact is neutral.

We are aware of the weaknesses of presented analysis given by the assumptions. Income distribution of self-employed migrants from the third countries can differ from the income distribution of total self-employed migrants filing the income tax return. As well as, expense on health care provided to migrants from the third countries can differ from expense incurred on health care to total population.. In this context we search for more suitable data sets to improve our analysis. As to the estimation of the number of migrants that are at the core of the analysis, we also plan to search for further structured data that would allow us to gain more precise results.

If it is of the concern that the self-employed migrants and their dependent relatives would be burden to the public health insurance system due to their lower compliance, the discussion of modification of the system for this group should take place. To cover possible compliance cost (after its relevant argumentation) higher minimum contribution can be discussed. Further to eliminate the possible misuse of the system other elements could be implemented into such as limited stay in the country (probably in months) before inclusion of the migrants into the system or limited insurance of dependent family members.

In 2014, there was a discussion over the new legislation adjusting the commercial insurance of migrants from the third countries. Even though this proposal was taken back, it seems that the discussion of the possible changes to the public health insurance system so that it would be efficiently prepared for the inclusion of the migrants from the third countries, is not high on the agenda of relevant authorities, as rather commercial health insurance system is being supported and amended.

Acknowledgements

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Aspects of Spatial Distribution of Tax Revenues in Terms of its Usage in Regional Budgets

Petr Tománek[*]

Abstract. The paper is focused on the tax collection issue in the Czech Republic from the point of territorial view and the consideration of suitability of the fiscal federalism model in the Czech Republic conditions, all from the point of formation of regional budgets revenues. There are reflected the aspects of evaluation, which are influencing the tax collection by the affiliation to the relevant territory, where the territorial aspect of regions are monitored. The tax collection in regions is influenced by the number of conditions, especially by the aspects of effective tax administration including control possibilities. By the tax collecting, there is highlighted the effective tax administration. However the effective tax administration does not allow using of tax revenues collected in the relevant territorial units for usage as its own regional budget resources.

Keywords: tax, budget, region, fiscal federalizmus

JEL Classification: H71

1   Introduction

The aim of this paper is to evaluate the existing distribution of tax revenues in the territorial units, where the level of self-governing regions in the Czech Republic has been selected. This is with regard to the possibility of the usage of the own tax revenues model in self-governing regions. The paper pursues the issue of the appropriateness of tax revenues assigning to the territorial unit budgets with a focus on their own income, i.e. tax revenues that would be obtained by the territorial unit from taxes collected on its territory.

Paper is affecting the issue of appropriate tax revenue determination for decentralized budgets. It is an issue that is described in the works focused on public finance respectively fiscal federalisms where are discussed issues concerns of types of main incomes of decentralized public budgets. The main significance then has taxes, which are generally the main public revenues, but also transfers. However, the question of tax revenues becomes more and more important, if we begin to talk about these revenues for decentralized budgets because there are requirements for these revenues which are relating to the principles of fiscal federalism. To these questions, it is appropriate to recall some theoretical knowledge.

The assignment of taxes to individual levels of governance in the fiscal federalism is based on the principle that expenditure is paid where benefits of public goods take effect. If the benefit takes effect in a certain area, it should paid by its inhabitants. But you can also put the question of how to proceed when e.g. residents from one area own property in another area (Musgrave, 1994, p. 423).

It implies that the authors deal with this specific issue of decentralized budgets resources, however in other regards. For example, the other authors deal with issues of property values in taxation regarding income from property taxes (Almy, 2014), or the use of fiscal autonomy within federal states (Blöchliger, 2011), or there are solved questions of fiscal capacity balancing in order to apply similar tax burden. This is given in close connection with resources balancing within fiscal federalism (Blöchliger, 2007).

The issue in this paper is based on the specifics of the Czech Republic. There are considered various taxes as possible sources of decentralized budgets, but it is not expected that with these tax sources would be transferred to the territorial units also some taxing powers in setting tax rates or tax relief, etc. (Excluding taxes on immovable property). On the other hand, the fact that there are differences among the taxes in different countries causes for example at one of the sources of the EU budget, which is a value added tax, the need to carry out the calculation of payments on the basis of this tax in three steps leading to the establishment of harmonized tax base (Lacina, 2004).

It is described the issue of tax rates and its characteristics, which creates conditions for public goods financing from taxes (Buchanen, 1998); taxes are the existing form of the public budgets revenues and it is also described their redistribution, however, there are not dealt the questions of redistribution influence on decentralized budgets. E.g. income tax can due to children relief cause inability to secure resources for public goods in the municipal budget.

It can be stated that the diversity of financial resources within the financial autonomy in different countries shows the impossibility of finding common indicators in this area (Blöchliger, 2006)

Then the theory is not focused on details of tax collection conditions, such as taxation of large corporations with nationwide competence and other similar circumstances. For lower levels of government, there are

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recommended taxes which base is immobile. The question then is whether it would be easier to have only the federal tax, to which would be joined the surcharge by the lower level of government. However, in connection with the collection of taxes in the territory it is necessary to mention the issue of subsidies when their usage foresees the possibility of rise of big differences in tax collection e.g. in relation to the amount of pensions per inhabitant, etc., when it is necessary to equalize the conditions of providing of public goods by usage of the subsidy (Musgrave, 1994, p. 431).

In the typology of revenues of tax character for the budgets for territorial units it is used breakdown on entrusted taxes, shared taxes, local taxes, regional taxes, progressive taxes and indirect excises. In connection with the fact that citizens often consume goods elsewhere than they live, there's in general stated, that construction of taxes has a significant impact (e.g. in case of VAT). It can be said that in recent years it's more frequent sharing of individual income tax, eventually taxes of corporations, and also there are used shares on excises. Furthermore, in this context can be stated some aspects that should be respected by local taxes, e.g. tax burden adequate to public goods, simple and inexpensive tax administration, which is often the reason for centralized administration and tax collection. Shared taxes reduce the large disparity in tax revenue and allow spreading the risk of the tax revenues between the state and territorial unit governments (Peková, 2011, p. 120).

From the above it is pointed that in scope of tax revenues of decentralized budgets there were already identified number of requirements. On the other hand, there are brought other aspects, which limit the conditions for improving of the functioning of fiscal federalism, respectively theoretical knowledge should be developed in this area. These other aspects are the current real conditions of the economies of states in the 21st century such as globalization, industry networking, efforts on improving tax systems with target to prevent tax evasion, computerization, etc. Paper therefore follows and evaluate, on the particular values of tax revenues of certain taxes in the Czech Republic, the possibilities of their usage for budgets of territorial units.

2   Metodology and data

The basis of the analyses is the data about on tax collection in the Czech Republic in terms of territorial units. As observed territorial units here was chosen the self-governing regions where data about the taxes collection are available for a given region. Tax administration in the Czech Republic is divided among financial offices and customs office, acting on a territorial basis, corresponding to the territory of the autonomous regions, except specialized financial office, which acts on the whole territory of the Czech Republic, and which was founded in the context of efforts to increase the efficiency of tax collection. Office is focused on selected especially big tax payers. From the data from specialized financial office it's not possible to determine the territory where the tax was raised, due to the fact that this office operates throughout the Czech Republic, but also due to the fact that there are registered such tax entities that have national coverage.

Selection of territorial units in the size of the region was given by factors: first, there are territorial units with their own budget, second availability of data and the potential contribution take. In the paper is not mentioned next level of regional budgets i.e. municipalities, but in most cases, the conclusions can be also apply to the issue of resource management on municipality level.

Based on the first aspect of the issue, there can be compared the revenue structure of individual financial offices by regions (Table 1). The highest share here occupies a specialized financial office, where its share in the collection of taxes is 30.7% of the taxes collected by financial offices. The tax office in Prague reaches the similar value (28.6%). Shares of tax collection in individual regions may differ both in terms of the size of the population by region, but also in terms of other specifics of individual regions. Therefore, further analysis is based on tax revenues by the regions, but the evaluation is done among the regions by the amount of collected taxes per capita of the region due to the significant size differences between individual regions. This unifying aspect (population) may not be evident always the best in all the parameters of the financial needs of regions, but in this article is chosen as the key comparative basis. The analysis is carried out for individual taxes, see Table 2.

Table 1: Quotient of tax collection by financial office in the total tax collection in 2012 (in %)

	SFÚ	Praha	Středoč eský	Jihočes ký	Plzeňsk ý	Karlova rský	Ústeck ý	Liberec ký	Králové hradeck ý	Pardubi cký	Vysoči na	Jihomo ravský	Olomo ucký	Moravs koslezs ký	Zlínský
Value added tax	36.4	30.4	4.5	2.0	1.7	0.6	5.6	0.3	2.0	0.6	1.3	7.6	1.5	3.8	1.9
Total consumption tax	0.0	27.1	-14.3	0.0	0.4	0.9	0.0	0.0	0.5	0.0	5.2	73.3	0.0	4.1	3.0
Corporate income tax	42.1	23.1	4.9	2.4	2.1	0.7	3.7	1.6	2.5	1.6	1.6	5.1	2.3	3.7	2.5
Personal income tax	14.3	31.6	6.6	3.4	4.1	1.5	4.6	2.2	3.1	3.1	2.4	8.4	3.6	7.9	3.1
Gift and inheritance tax	0.0	35.9	12.4	3.8	3.9	3.0	5.7	2.4	3.0	6.5	2.0	8.4	3.0	7.5	2.7
Road tax	6.7	14.1	12.3	6.4	5.9	2.1	5.9	3.1	4.9	4.6	4.4	10.4	5.2	8.5	5.2
Property tax	0.0	7.7	15.2	7.0	5.5	3.3	9.4	4.4	6.4	5.7	5.4	10.0	5.9	9.3	4.8
Total	30.8	28.6	5.5	2.6	2.5	1.0	5.0	1.2	2.5	1.6	1.7	7.3	2.3	5.0	2.4

Note: overall amount of taxes accounted for 568,191 miles. CZK
Source: Ministry of Finance, Taxation statistics, own elaboration

Table 2: Taxes revenue in counties per capita in 2012 (thousand CZK/capita)

	SFÚ	Praha	Středo český	Jihočes ký	Plzeňs ký	Karlov arský	Ústeck ý	Libere cký	Králov éhrade cký	Pardub ický	Vysoči na	Jihomo ravský	Olomo ucký	Morav skoslez ský	Zlínsk ý	ČR
Value added tax	9.6	67.9	9.7	8.6	8.4	5.6	19.0	1.7	10.0	3.2	6.8	18.0	6.4	8.5	8.8	26.4
Consumption tax	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Corporate income tax	5.1	23.7	4.9	4.9	4.8	3.1	5.8	4.8	5.8	3.9	3.9	5.5	4.7	3.9	5.5	12.2
Personal income tax	1.9	34.5	7.0	7.4	9.6	6.8	7.7	6.8	7.7	8.1	6.4	9.9	7.7	8.8	7.3	13.0
- withholding	0.21	4.81	0.43	0.51	0.54	0.97	0.35	0.46	0.46	0.66	0.43	0.68	0.63	0.51	0.72	1.26
-from returns	0.00	1.75	0.12	0.13	0.34	0.18	0.26	0.12	0.04	-0.04	-0.01	0.08	0.12	0.08	0.10	0.31
- dependent activity	1.65	27.93	6.45	6.72	8.76	5.62	7.05	6.22	7.15	7.48	5.95	9.09	6.94	8.21	6.46	11.39
Gift tax	0.0	3.2	1.1	0.7	0.8	1.1	0.8	0.6	0.6	1.4	0.4	0.8	0.5	0.7	0.5	1.1
Road tax	0.0	0.6	0.5	0.5	0.5	0.4	0.4	0.4	0.5	0.5	0.5	0.5	0.4	0.4	0.5	0.5
Property tax	0.0	0.6	1.1	1.0	0.9	1.0	1.1	1.0	1.1	1.0	1.0	0.8	0.9	0.7	0.8	0.9
Total	16.6	130.4	24.2	23.1	25.1	18.0	34.6	15.1	25.7	18.1	19.0	35.5	20.6	23.0	23.3	54.0

Source: Ministry of Finance, Taxation statistics, own elaboration

2.1   Value added tax

Quotient of Value Added Tax on revenue of monitored taxes is 48.9%, about a third of this amount pay subjects managed by specialized financial office. The average value of revenue recognized for the region is 16.8 thousands CZK/capita, while the values of individual regions range from 1.65 thousand CZK/capita to 67.89 thousand CZK/capita in Prague. The maximum difference is more than 40 times. These values of differences establish a significant difference between Prague and other territorial units. Although it can be infer for example the higher production rate of economics in Prague, it is obvious that such high differences do not correspond objectively to reality of added value realized by territory and are there show up probably other causes.

The causes that lead to these differences in particular can be affected by the size of tax rates. Then in depends on the rate at which the company, which pays tax in the relevant territory, is situated. It's then about different tax rates, respectively excessive deductions, respectively tax deduction when exported. The impact of this tax is then also changing over time. E.g. in 2000, at the applicable tax rates of 5% and 22%, the yield of this tax in terms of collection in the region was spread so that in some regions the collection of the tax was negative (Tomanek, 2001, p. 146). Although the disparity in tax rates was decreased (now 15% and 21%), it is clear that this aspect may act in a further and in addition it seems inappropriate for tax fairness in terms of regional budgets that the set tax rate to product domain were the cause of formation of different sources for territorial budgets.

Further there also act the location of headquarters of many factories into Prague, which here do tax levies, but practical activities performed throughout the territory of the Czech Republic (e.g. network industries). These are then further reasons of disparities in tax incomes, i.e. between the activities carried out throughout the Czech Republic and the place of tax reimbursements.

2.2   Tax from personal incomes

Tax from personal incomes is the second most profitable tax (within the monitored range of taxes). Its yield reaches 13.0 thousand CZK per capita. The focus of the collection of this tax is in the regions and the biggest yield is 34.5 thousands CZK/capita in Prague. Spectrum of revenues in the other regions is from 6.4 thousands CZK/capita in the region Vysočina, to 9.9 thousand CZK/capita in the South Moravian region. In terms of other factors (e.g. the average wage) it can be accepted in this case the thesis of a bigger collection of this tax in the Prague (e.g. at least 3 times greater than in other regions), but even here not only the activity of individual persons act, but it can be the role of residence of headquarters of corporations which pay a tax from personal incomes by form of withholding tax. In addition, from the viewpoint of taxation, there is still a factor that influenced by tax deductions may significantly affect earnings in a territorial unit in relation to the structure of taxpayers when it's about the bond through tax discounts and size of entities (see Tomanek, 2014, p. 317). Into the problems of tax administration can be then reflected the place of factory, respectively the place of work of person which may not be in the same place as residence (where this tax should probably be necessary to allocate). Although this tax is often allocated to regional budgets by the territory collection, it is obvious that it did not meet the conditions of appropriate tax.

Due to the three basic parts of the tax it can be assessed their use for territorial budgets. It is a tax from dependent activity, from business and withholding tax.

Tax from personal incomes - withholding tax is the smallest part of the tax from personal incomes. This is particularly the taxation of contracts for work and tax on interest on deposits. Again significantly beyond Prague from average of tax collection per capita in the region which is again given by acting of number national authorities and higher employment, etc.

Tax from personal incomes – from business is tax when the tax revenues per capita show to a very small volume of collection of this tax in comparison with other taxes. In terms of spatial distribution, the tax is nowadays reflected in the budgets of municipalities by relatively significant percentage, i.e. 30% of the collected tax from the taxpayer's income tax is the revenue for the municipality and it is declared element filling stimulating role of taxes for municipalities. This tax could meet the role, but there are the problems with diminishing returns and also problematic application of the tax income among villages from the aspect of justice. There are significant influences of tax discount approaches, e.g. in the municipalities with a greater proportion of children is the tax income for the community decreasing due to tax discounts of parents (see Tomanek, 2014, p. 317).

Tax from personal incomes – dependent activity is the most profitable tax of the income tax section. The distribution of revenue by regions shows significant differences between Prague and other regions (more than four times). Except Prague are not the differences in values among regions so significant and range from 5.95 thousands CZK/capita (Vysočina region) to 9.09 thousands CZK/capita (South Moravian Region). The difference in the amount of the tax in Prague (27.93 thousands CZK/capita) and in other regions is reflected by higher wages in Prague and lower unemployment rate. This could be acceptable as legitimate effects of differences, but on the other hand, there is also important, that Prague is the seat of subjects with wider territorial activity than for Prague and are only paying here the taxes for employees. The other problem area is the impact on territorial units considering the tax discounts for a child and etc. (see above).

In the current system, this tax is used as a part of the stimulus taxes of municipalities, however, the measure there is not the tax collection in the relevant territory, but the distribution to municipalities is given by the number of people employed in the relevant municipality.

2.3 Tax from corporate incomes

Tax from corporate incomes is from the perspective of territorial profitability characterized by significant value of Prague against other regions (at least 5 times). These differences are due to the location of a number of company headquarters in Prague because of their national scope. In this case is not possible to assume the sharing of tax revenues of these companies to individual regions, it means that the territorial income allocation is not possible. Another reason may be the situation, when the company, from certain purpose, has its headquarters in Prague, although it realizes its activities mainly in another limited territory (contacts, assumption of lower tax audits, etc.).

Although there are not significant real differences in tax revenues/capita among other regions, i.e. from 3.1 thousand CZK/capita (Karlovy Vary region) to 5.8 thousand CZK/capita (Ústecký and Hradec Králové region), it is clear that in the real values of tax revenues express many forms of spatial spillover of revenues, respectively the ability to capture of the tax by territory.

2.4 Road tax

Road tax revenues by region are relatively balanced, incl. Prague. The tax revenues are now allocated to the State Fund of Transport Infrastructure and they are used for infrastructure needs nationwide. The tax is collected from motor vehicles intended for business resp. of vehicles with fixed weight. In case of this tax could be considered the binding on the financing of road infrastructure. However, the problem here would be that the Road Administration in the Czech Republic is divided into three budget levels: central, regions and municipalities, and its structure varies by regions and even the use of roads by vehicles may be not given by the relevant territory of vehicle registration, respectively tax collection. Thus, the existing allocation of revenues seems to be appropriate.

2.5 Property tax

Property tax is the whole income of municipal budgets. In terms of revenue distribution among regions per capita is evident that this tax belongs among the taxes with relatively small differences. However Prague differs. Income tax in Prague is relatively the least, although various coefficients, which increase the tax base, are highest in Prague. The results of these values shows, that the agricultural lands are significantly applied in the amount of tax revenues, where their share on the territory of Prague is relatively small compared to other regions. This also creates some of the questions about the appropriateness of tax assigning on agricultural land based on soil quality (Bonita), because the soil can be considered as natural resource and tax revenues from natural resources are recommended to be centralized (Musgrave, 1994, p. 439).

2.6 Other taxes

Property tax included in 2012 the revenues of inheritance tax, gift tax and real estate transfer tax. Since 2014 this tax has been only including the tax on transfers of immovable property. The revenues of this tax are more significant in Prague and it is clear that they come into being only in individually in the above context. Irregularity of the formation of tax and also the relatively low revenue of the tax show their designation for central budget.

In the analysis, there are not shown consumer and energy taxes, which are managed by the Customs Administration (in tables included excise taxes are only small portion of revenues of excise taxes). Even without displaying of selecting values for individual regions, there is significant, that these taxes are paying by producers (not individual consumers, with them could be associated the revenues of local budgets). Their selection is determined by the location of producers of selected commodities, but also by the consumption on the whole territory. This is the fundamental contradiction for the application of the territorial aspect of the tax and, therefore, these consumer and energy taxes are not suitable like the own revenues of local budgets.

3 Conclusions

Performed analysis of tax revenues of individual duties for the reasons of assessing the possibility of applying of taxes as own resources of territorial budgets (i.e. when selected tax in the concrete territory is an income of adequate territorial budget) showed that:

- currently in many cases it's not possible to detect territorial binding of paid taxes in term of applied management of tax (due to a different seat of taxpayer and place of business),
- the concentration of activities into big companies operating on a relatively large territory (and thereby in huge number of territorial units) does not allow the division of tax revenues into lower territorial units,
- pension taxes, especially taxes from corporate incomes, are given by profits, depend on its size and can vary, although there needn't be change in the range of activities in the territory. The impact is reflected in the size

of the tax, but the need for the size of public goods and services will not change, which would affect the stability of territorial budgets based on revenues from this tax,

- in the case of tax from personal incomes in territorial units there is a cross-impact. For example the territorial units where is greater proportion of children, etc., and they need more resources to provide public goods, there are shown lower tax revenues because of the impact of tax discounts of parents. The application of this tax in the territorial budgets shows inappropriate aspects that should be addressed e.g. by providing of transfers or by other methods of tax collection,

- the practical results of the analysis of tax revenues associated with significant differences among regions indicate that following the strengthening of the role of own revenues would be necessary to create a mechanism for compensation of resources for security of certain standard of public services in the territory and thus create a system of transfers incl. determination of the relevant criteria,

- according to the actual conditions of the structure of the tax system in the Czech Republic and according to revenues of taxes in terms of territory, it is shown, that the possibilities of usage of taxes determined by state as revenues of territorial budgets are very limited and in each subsequent extension it would lead to the need to supplement the system by balancing transfer system,

- applied knowledge are based on an analysis of taxes collected in the regions, however, in the case of similar reasoning of own taxes for lower level budgets, i.e. budgets of municipalities, it can be expected on the one hand the same conclusions and also in terms of smaller elements (municipalities) then e.g. the numerical values of the differences among territorial units will be far greater,

- above knowledge of analysis show that the current system of own tax revenues of territorial budgets in the Czech Republic is not always appropriately designed and should be modified in particular areas. However, on the other hand, it's shown that this system, which is in partly based on sharing of tax revenues by more budgets on the bases of criteria, suppresses potential problems of territorial aspect of the administration and collection of taxes and is a reflection of the real possibilities of providing of taxes to territorial budgets.

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Returns to Education in selected EU Countries: Comparison of OLS and Quantile Regression

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Abstract. Returns to education in connection to job and educational mismatch are a topical issue of current labour market discussion. As the literature overview shows university educated people are often placed at jobs requiring lower educational degree. Similarly undereducated workers are penalized for their deficit of education. This paper analyses influence of job and qualification mismatch on returns to education using OLS and quantile regression. For the comparison of these methods authors use data from European Social Survey in 2010 showing interesting results. Dispersion of returns to education, over and undereducation conditional on wage distribution are quite different from mean based OLS estimates. It indicates that over and undereducated people have to bear the penalty for working at inadequate jobs.

Keywords: job mismatch, quantile regression, OLS, education, European Social Survey.

JEL Classification: I26, J24, J31

1 Introduction

The labour market in Europe indicates growing numbers of higher education graduates and persistent demand for further education in the population. On the other hand increasing amount of university educated people indicates discrepancy in placement of these graduates to qualified jobs. Often happens that these university educated people are employed on positions requiring lower qualification. Therefore researches are interested in the mismatch between earnings, qualification and skills. They confirm that overqualified workers may not benefit from formal education as much as they could. Theoretical concept is based on the human capital theory in the area of returns to education (Becker, 1964). It leads to overqualification as well as job mismatch as show data and research results all around the world (see Sattinger, 2012; McGuiness 2006 and others). McGuinness notifies that educational mismatch may be costly for the economy as a whole, i.e. waste in tax revenues or loss of efficiency of less-productive overeducated workers and thus decreases public also returns to education.

Since job and qualification mismatch has become such as topical theme, the paper focuses on analysis of different variables as education, gender, experience and age on returns of individuals. Comparing two different approaches author got data with significant difference in returns using two different regression methods.

2 Literature overview in educational and job mismatch

Since Freeman (1976) highlighted a phenomenon of educational mismatch many papers analyzed this topic both on national and international set of data. Theoretical approach defined terms both in educational and skill mismatch. For some of them, see Table 1. Kim (2012) points out that there are two types of education and job mismatches: horizontal and vertical mismatches. A horizontal mismatch refers to a mismatch between the field of study and the job, whereas a vertical mismatch refers to a mismatch between the level of education and the job (e.g., overeducation or undereducation). According to Kim (2012), vertical mismatch analyzing negative effects on wages declare penalties for overeducation from 13 % to 19 %. Horizontal mismatch penalties range between 10 % and 32 %.

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Table 1: Job and Education Mismatch definition

OVEREDUCATION	Underutilization of skills – to have more years of education than needed in a current job position
OVERQUALIFICATION	Have higher qualification than needed in a current job position
OVERSKILLING	Situation where an employed worker reports that their skills are not fully utilised in their job.
VERTICAL MISMATCH	vertical mismatch refers to a mismatch between the level of education and the job (over/underqualification)
HORIZONTAL MISMATCH	Refers to a mismatch between the field of study and the job

Source: http://www.cedefop.europa.eu/EN/publications/16102.aspx,own elaboration

2.1 Risk and Investment in Education

Risk is undoubtedly a crucial determinant in any financial investment decision; however it is often neglected in the human capital investment decision. Comparing to other aspects of investment in education relatively little research papers discuss issue of risk-return trade-off for different human capital investments. Palacios (2003) was one of the first who empirically analyze risk properties of various human capital returns. He presents an empirical comparison of risk adjusted human capital investments to financial investments (Palacios, 2003). Investment in higher education bears very high variance of risk and the risk of graduation is the crucial one. Once students enter the university some of them do not graduate, income differences between graduates even in the same field of study can be large. Also students cannot find adequate job for their level education or skills (educational and skill mismatch) and even they overtake a risk to become unemployed does exist. Nevertheless the level of unemployment of graduates differs significantly between developed countries in Europe, in the Czech Republic it is around 20 % comparing to Portugal or Spain where unemployment of graduates exceeds 50 %.

Firms´ human capital investments also carry the risk of a loss of value. The risk may take several forms like depreciation or obsolescence of skills and abilities, employee turnover, non-conforming behavior, requirement of skills different than those possessed by the current employees; need to cut down the numbers and so on. Managers need to manage these risks in order to stabilize returns from the firm's human capital (Bhattacharya 2003). Pereira and Martins (2001) studied the relationship between risk and returns to education using data from 16 countries. They found that there is a positive relationship between risks and return, as suggested by finance theory, and that the risk-return trade-off is rather large. They identified a compensation to face the risk associated with the investment in education to be a 1 percentage point (pp) increase in the average return to education for a 2 pp increase in risk (Pereira and Martins, 2001). The issue of risk is an important aspect of returns to education analysis however due to a limitations of this paper it is not included in the practical part of authors calculations.

3 Data – description and basic statistics

The data of ESS5 survey used by authors of this paper for comparison of returns were collected in the year 2010 and carried out in 26 countries. Original number of respondents in all surveys together was 52458. For this paper there were used data for 21 EU countries, set contained 11 137 respondents (EU incl. the Czech Republic). According to calculations carried out by authors Lepič and Koucký, it was showed that around 15 % of the respondents on the European labour market are undereducated and approximately 18 % are overeducated. Of those, the highest rate of overeducation has a tertiary education. The distribution of required qualifications for different job positions in Europe currently has two main peaks. Distribution of education illustrates data from European Social Survey from 2010 in the Table 2.

Table 2: Percentage distribution of adequate education, under- and overeducation

	All	Male	Female
Undereducated	29.34	32.40	26.43
Adequately educated	22.43	21.36	23.42
Overeducated	**48.24**	**46.24**	**50.14**

Source: ESS5, own calculations

There is a surprisingly big share of respondents who believe that their jobs require a minimum of education or training and also a high number of respondents who believe they need between 3-5 years of education or professional training.

4   Methodology and Data Analysis

Methods of measurement explained in the literature (i.e. Levels, 2013, Urbánek, 2013) are basically three: First, one's education is compared to their self-assessed qualification required to perform one's job. Second an "expert" definition of an educational requirement for a given occupation is used. Third, the distribution of education is calculated for each occupation; employees who depart from the mean or median by more than some ad hoc value (generally one standard deviation) are classified as overeducated. As Levels (2013) at al. and many other authors point out a significant expansion of the classic Mincerian wage function proposed by Duncan and Hoffman enables researchers to use a model that evaluates individuals' attained levels of education and the levels of education required in their job. This model is also known as the ORU model (where O stands for Overqualification, R for Required and U for Underqualification). Using the ORU model, the authors found out that the relationship between the required number of years of schooling and wages is positive. The strength of the relationship indicates that each additional year of required schooling yields a wage premium of approximately 8 %. The effect of overeducation is less than half that amount, with an estimated 3.3 %. This means that each additional year of education yields a wage premium of approximately 3 %. Undereducation is negatively related to wages and each year of undereducation yields a wage penalty of around 2 % (Levels, 2013).

The effects of overqualification and of underqualification on earnings (i.e. on returns to adequate schooling, over- and under-schooling) were estimated using a modified Mincer's earnings equation based on Cohn (2000) and converted to the following equation:

$$\ln w_i = X_i \beta + \alpha_1 ADSCH_i + \alpha_2 OVERSCH_i + \alpha_3 UNDERSCH_i \tag{1}$$

$$+ \alpha_4 AGE + \alpha_5 GEN + \alpha_6 EXP + \alpha_7 EXP^2 + u_i$$

where: $\ln w_i$ is the natural logarithm of gross earnings, α are regression coefficients, $ADSCH_i$ is the number of years of adequate schooling, OVERSCH and UNDERSCH are numbers of years of over-schooling and under-schooling (OVERSCH = SCHOOL − ADSCH, where SCHOOL is the number of years of actual education; similarly UNDERSCH = ADSCH - SCHOOL), EXP are years of experience, GEN is a dummy variable for the gender of the respondent, X_i is a set of other variables assumed to affect earnings and u_i is a disturbance term (index i is for individual i).

To compare traditional ordinary least-square regression with quantile regression, firstly authors carried out Ordinary Least Square (OLS) regression data. Using above mentioned model with ESS5 for all selected countries, we obtained following results presented in Tables 3 and 4.

Table 3: Summary of OLS Regressions for all EU Countries

Model		R	R Square	Adjusted R Square	Std. Error of the Estimate
1		.364[a]	.132	.132	.83224
a. Predictors: (Constant), Experience square, Years necessary for job calculated for full time education, Gender, OVERSCH, UNDERSCH, Age of respondent, Total number of years in full-or part time work					

Source: ESS5, own calculations

Table 4: Returns on adequate education, overeducation and undereducation in all EU countries together

Selected EU countries (21 countries, 11,137 respondents)	Unstandardized Coefficients		t	Sig.
	B	Std. Error		
Adequate schooling	.126	.005	26.811	.000
OVERSCH	.091	.006	14.418	.000
UNDERSCH	-.066	.010	-6.505	.000

Source: ESS5, own calculations

The general results of OLS regression presented above for adequate schooling, overeducation and undereducation show that education mismatch is a crucial problem in selected EU countries investigated in this research. It is also challenge for educational decision makers and prospective university students. Research carried out in this part of the paper addressed questions connected with education and earnings and with returns on investment in education based on the human capital theory. Next we did comparison of OLS and quantile regression on above mentioned ESS data. At the time being and also for limited scope of the paper for this conference we did only basic and general form of quantile regression. This quantile regression (and some similar advanced econometric methods we did not use here) applied to returns to education, overeducation and undereducation in heterogeneous groups of workers is innovative feature of our research paper. To measure and analyze heterogeneous patterns of return to education on data analysed in this paper, the authors used quantile regressions on our modified Mincer equation (Cohn 2000). As i.e. Koenker and Bassett (1978) or Pereira and

Martins (2001), who used similar modified Mincer equations, quantile regression which estimates the equation through certain points of the distribution (quantiles) will be used. This has the advantage of giving the influence of the covariates at different points of the curve (Pereira and Martins, 2001). Using the data of ESS5 for all selected 21 EU countries (11,137 respondents) and regressing our model with the method quantile regression we obtained results for nine deciles (from 0.1 to 0.9) presented in following Table 5.

Table 5: Returns on adequate education, overeducation and undereducation in all EU countries together

Quantile	Constant	QR Gender	QR Age	QR Education	QR Over education	QR Under education	QR Experience	QR Experience square
0.1	5.273	-.322***	-.024***	.094***	.122***	-.024	.06***	-.001***
	(.150)	(.039)	(.004)	(.009)	(.012)	(.020)	(.007)	(.000)
0.2	5.092	-.352***	-.009***	.113***	.121***	-.027	.046***	-.001***
	(.135)	(.035)	(.004)	(.008)	(.011)	(.018)	(.007)	(.000)
0.3	4.745	-.361***	-.002	.157***	.121***	-.095***	.043***	-.001***
	(.132)	(.034)	(.004)	(.008)	(.011)	(.017)	(.006)	(.000)
0.4	5.170	-.306***	-.006	.156***	.087***	-.117***	.045***	-.001***
	(.117)	(.030)	(.003)	(.007)	(.010)	(.015)	(.006)	(.000)
0.5	5.610	-.297***	-.008***	.144***	.077***	-.108***	.044***	-.001***
	(.100)	(.026)	(.003)	(.006)	(.008)	(.013)	(.005)	(.000)
0.6	5.902	-.308***	-.007***	.137***	.073***	-.099***	.041***	-.001***
	(.077)	(.020)	(.002)	(.005)	(.006)	(.010)	(.004)	(.000)
0.7	6.115	-.285***	-.005***	.131***	.068***	-.093***	.034***	-.001***
	(.062)	(.016)	(.002)	(.004)	(.005)	(.008)	(.003)	(.000)
0.8	6.249	-.281***	-.005***	.129***	.07***	-.075***	.034***	-.001***
	(.056)	(.014)	(.002)	(.003)	(.005)	(.007)	(.003)	(.000)
0.9	6.346	-.292***	-.002	.128***	.069***	-.054***	.035***	-.001***
	(.065)	(.017)	(.002)	(.004)	(.005)	(.009)	(.003)	(.000)

Note: *** $p < 0.01$; ** $p < 0.05$; * $p < 0.1$; Bootstrapped errors in parentheses
Source: ESS5, own calculations

Figure 1: Comparison of OLS and QR regression on Educational Variables
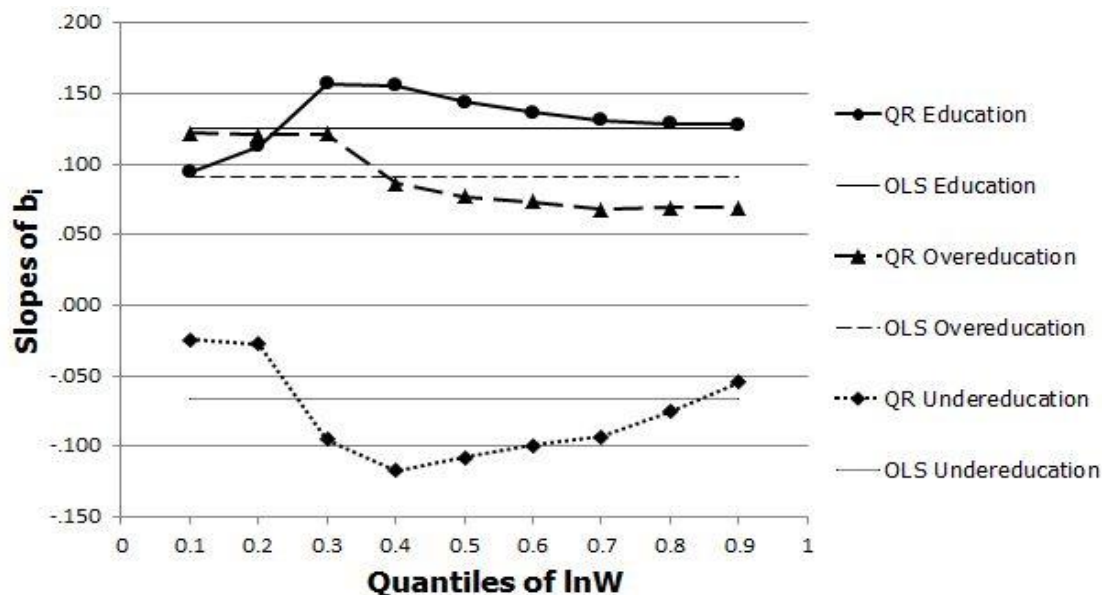
Source: ESS5, own calculation.

As the paper focuses on educational aspects, Figure 1 points out comparison of OLS a QR for these variables, i.e. for returns to education, overeducation and undereducation for nine quantiles and results of OLS regression for these respective returns. In the following Figure 2 there are results of quantile regression for quantiles 10 % - 90 % for all variables in our model.

Figure 2: Results of Quantile Regression for all Variables in the Model
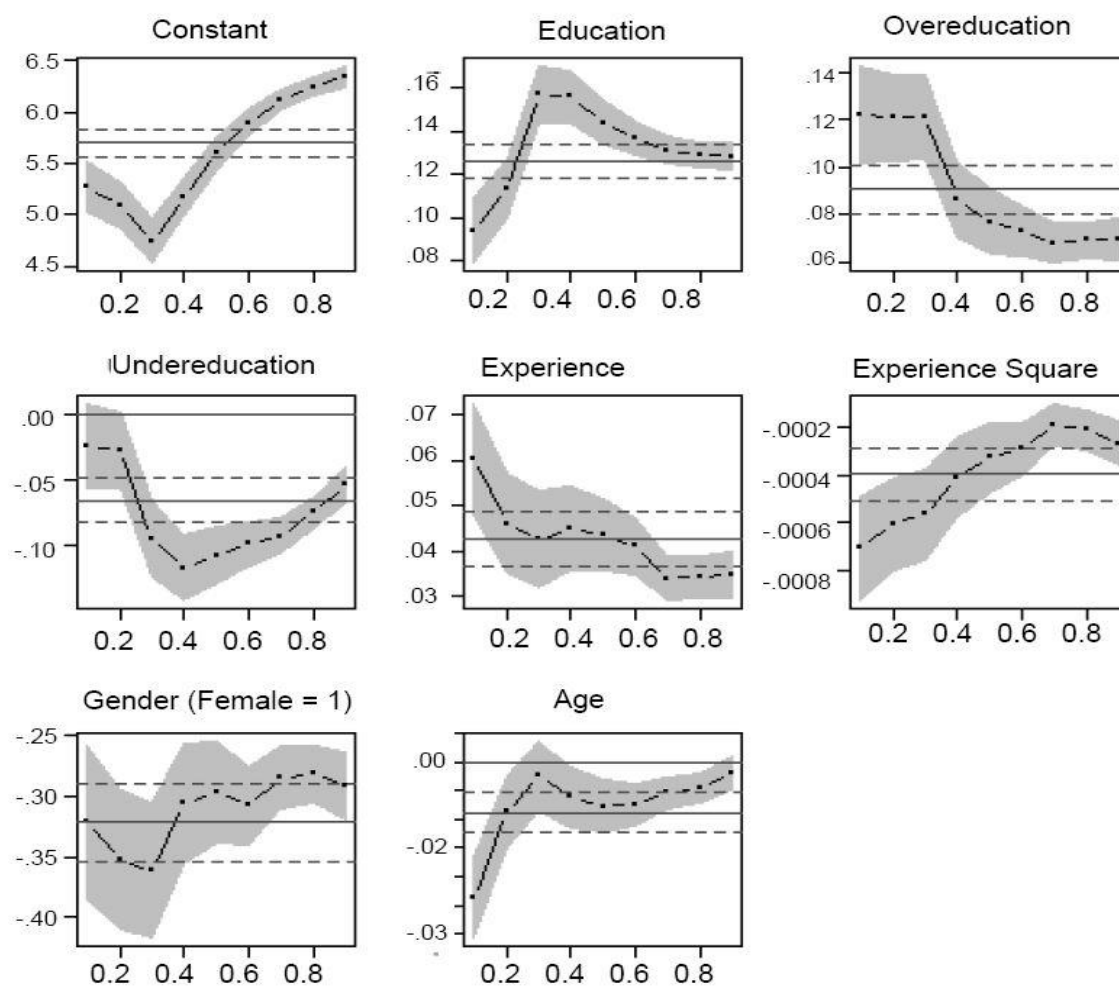
Notes: The y-axes measure values of variables from the model, the x-axes depict quantiles of the conditional wage distribution (ln W). In all graphs, the horizontal line shows the OLS estimate and its 95 % confidence interval. Each figure depicts one of the seven coefficients in the quantile regression and a constant. The dotted line represents 9 point estimates of the coefficients for quantiles from 0.1 to 0.9. The shaded grey area shows a 95 % confidence band.
Source: ESS5, own calculation.

5   Results and discussion

The aim of the paper is to compare results of quantile regression with traditional OLS regression. Generally speaking most of results of quantile regression show that coefficients in our model obtained in obtained by OLS conventional least square regression are different from coefficients for deciles ranging from 0.1 to 0.9 for dispersion of wages. Returns to adequate education are low in the 0.1 decile (9.4 %), their maximum is in 0.4 decile (15.6 %) and then go the minimum in 0.9 decile (12.8 %). Our tentative explanation of this result is that wages around median bring to relevant workers most economic effects; low end of wage distribution and similarly high end are both less effective for the workers because of differences in supply and demand for these groups of workers, especially low paid workers. However this explanation is only our previous view of reasons for this result. Returns to overeducation are quite high in low deciles of wage distribution (12.2 %) and are decreasing to their low value 6.9 % in 0.9 decile. It can mean that high-paying employment together with effects of overeducation lead to decreasing effects of education for overeducated workers. The curve of returns to undereducation has U-shape with low value in 0.4 decile (-11.7 %) what means inversely to education that results are good for workers in low-paid and high-paid employments. Results of quantile regression coefficients for variables gender, age and experience are mostly similar to results of OLS regression (shaded areas lay predominantly in the area of 95 % confidence interval of OLS confidence). It means that OLS results are quite satisfactory for all dispersion of wages. One exception is coefficient of Age which is quite low for low-end of wage dispersion; it can mean that for low paid workers with age connected experience decrease their wage level.

6   Conclusions

In this paper we analyze and compare returns to education, overeducation and undereducation in selected EU countries. Empirical results are based on data from European Social Survey (ESS5) in 2010. Comparison of OLS and quantile regression results show that OLS indicates average values, however quantile regression reports to heterogeneity of results. These findings imply that returns to education are not evenly spread on all wage distribution and are substantially different at lower and higher-ends of this distribution. Explanation of these different returns to education show that there are other factors influencing this wage distribution than education – first of all abilities and skills, which are not included in our set of variables. Other explanation is based on market forces and means that demand for workers with different wage expectations is also distributed unevenly. Similar effects are also visible in the results for overeducation and undereducation where distribution of returns conditional on wages is not regular. From the practical point of view, job mismatch can be understood as one of the risk aspect of education. The penalty for overeducation and undereducation, as described in our quantile regression coefficients, is information for both workers and firms to be more careful in creating of new job contracts and try to decrease job mismatch.

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Employees' and Self-employed Persons' Income Distribution in the Czech Republic: Data availability and Initial Results

Alena Vančurová[*] – Petr Mazouch[†] – Stanislav Klazar[‡]

Abstract. The necessity of knowledge of income distribution in the society is generally recognised. On the other hand, suitable universal database resources for its measurement are currently not available in the Czech Republic. We utilize the unique combination of two datasets – Tax information system (ADIS) database and the Assessment Base for Pension Insurance (StatMinVz) database, which cover literary the whole population of employees and self-employed persons. On the basis of the statistics, the employees' income level is significantly higher and more variable compared to the situation of self-employed individuals. More specifically - median of employees' (self-employed persons') income was 300 (105) thousands CZK respectively, mean of employees' (self-employed persons') income was 480 (170) thousands CZK (for the whole year in both cases). The quintile rage for employees' (self-employed persons') income was 435-205 (186-57) thousands CZK respectively. Moreover the individuals submitting the tax returns are described in the statistics in sufficient extent. Unfortunately individuals not submitting the tax returns are covered in less sufficient extent and it will be necessary to endeavour to interconnect the data between these two large databases in order to measure the level and structure of their income more accurately.

Keywords: Income distribution, employee, self-employed persons.

JEL Classification: D3, D63, E24, J2

1   Introduction

The accurate income distribution for basic social groups is hard to obtain in the Czech Republic. There is no academically accessible database that would cover all employees and self-employed persons or even all economic subjects in appropriate format. On the other hand it is important to define and recognise the income of individuals as detailed as possible. It is necessary because of addressing the different socio-economic problems, such as tax fairness, tax incidence, solidarity of social systems atc. (ANO 2013, CSSD 2013).

Nowadays, the high-quality databases (e.g. BLS, PSID) exist in developed countries (although mainly in the USA) but only estimations exist for the Czech Republic, more or less accurate, based on the surveys (CZSO 2015, MPSV 2015), or there are some attempts of income distribution simulations using the probabilistic methods (Bartošová 2007, Marek 2010).

The research objective of this paper is to compare the employees' and self-employed persons' income distribution using the data from currently available databases. The motivation of the paper is to make the analysis of the incidence of income taxes for both large groups of economically active population possible in the future.

The main contribution of the paper is to utilize the unique combination of two datasets – ADIS and StatMin, which cover literary the whole population of employees and self-employed persons. Authors as the members of Minister Committee (2014) gained direct access to these datasets to describe the level and the variance of income distributions of focused socio-economic groups. The advantage of this approach is the usage of the whole working population which is better than those based on sample surveys because descriptive statistics are exact numbers and not just estimates as statistics based on sample surveys are (Thompson 2012). On the other words the emphasis is put on the completeness of dataset which can be an interesting and useful enlargement and improvement of currently used methods.

2   Methodology and definitions

The subject of our research in this phase was reduced to "exclusive" employees and "exclusive" self-employed person. First, we tried to exclude the individuals who are probable to make their living not only by the means of occupational income from the database. The attention was paid to pensioners and students. It was assumed that the pensioners' principal income is their old-age or invalidity pensions. There is not enough data available in the

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databases for the exclusion of students and dependent children (parents have the maintenance obligations in respect of them). For the time being, the authors were not able to unequivocally identify these individuals. It is assumed that, in the future, the databases will be interconnected to make it possible even for the academic purposes.

For the research objective, the employee was defined as an individual who does not have any other taxable income than the income from employment. Furthermore, it was necessary to exclude those individuals from the group of employees that cannot be assumed to "make their living" by the monitored kind of income, or rather they can have different, unregistered incomes that are not possible to cover in our research. To meet this assumption, the limit was selected corresponding with approximately the amount of 12 times the minimum wage per year; to simplify, the limit was defined as 100,000 CZK. We proceeded from the consideration that the employee who is fully focused on his employment cannot have lower salary; to simplify: if the employee works full time, his salary cannot be lower than the minimum wage (see Fischer at al., 2014 for proper discussion of influence of minimum wages and socio-economic development). The individual whose total basis from employment does not exceed the limit of 100,000 CZK was not considered an employee.

The definition of the self-employed individual was more difficult, these individuals have a wide range of various kinds of incomes as the professional incomes are a mixed kind of income including the occupational income as well as the capital income. Excluded were the individuals having simultaneously the income from employment exceeding 100,000 CZK. Their exclusion was introduced because the main kind of income of these individuals cannot be regarded as a self-employed activity.

Table 1: Summary – Definitions of Exclusive Individuals

	Exclusive employees	Exclusive self-employed persons
Income from employment	Annual gross salaries of 100,000 CZK minimum	Annual gross salaries of 100,000 CZK maximum
Professional income	Annual incomes of 100,000 CZK maximum after casting of costs	No limitation

Source: Own arrangement

From the above mentioned, it is evident that the individuals with mixed incomes were excluded from the research because their categorization into the above mentioned groups was not clear. However, the authors believe that it did not have any significant influence on the information analysis capacity, on the contrary, it made the research objective more accurate, at least the first phase of research. The practical application of the above mentioned restrictions is being expanded in the following section of the paper.

3 Dataset – Discussion and Usability

The authors worked with two databases registering personal incomes, the ADIS database based in the Ministry of Finance and the StatMinVZ database of the Czech Social Security Administration based in the Ministry of Labour and Social Affairs.

Table 2: Coverage and Structure of the ADIS and the MPSV Databases

ADIS database	Frequency (in thousand)	In % of all TRs
Number of tax returns	1,915	x
Number of self-employed (with potential income concurrence)	1,012	52
Number of employees (with potential income concurrence)	1,104	58
Exclusive self-employed (see Table 1 for definition)	700	37
Exclusive employees (see Table 1 for definition)	800	40
Super exclusive employees (ONLY with the income from employment exceeding 100,000 CZK, other income is zero)	590	30
MPSV database		In % of all individuals
MPSV employees	3,900	x
MPSV employees, wages exceeding minimum wages	3,200	82

Note: TR stands for tax return

Source: Own arrangement based on the ADIS and the MPSV data

On one hand, the simultaneous use of both databases was beneficial and allowed the authors to include into the analysis all personal income and social insurance taxpayers, moreover without the exception of social security insurance payers. On the other hand, this process contains a range of drawbacks, the major one being a significant

penetration of individuals between both databases. To illustrate this, it is currently not possible to determine whether the particular individual in the StatMinVZ database (MPSV) receives some incomes from different sources (like self-employed activity). This issue is planned to be further analysed by the authors to suggest possible solutions in the future.

In Table 2, there are some examined groups mentioned from both databases. It shows that a part of employees, even those without any other income than the one from the employment, submits the tax returns and are thus included in the ADIS database. There are almost 4 times more individuals with the income from employment than there are the individuals with the professional income. It can be estimated that approximately 4,711 thousand of individuals have incomes included in the income tax base. Only 17 % of individuals covered by datasets do not have any incomes from employment in the examined databases.

4   Results and Discussion

The basic results of the analysis are presented in the following section. First, the results based on the percentage of subjects of our examined exclusive groups not reaching a certain level of income are presented. Afterwards, the results based on a percentile distribution of the examined subjects are presented.

4.1   The Percentage of Subjects Not Reaching "a Certain Level" of Income

The percentage of the subjects from the particular group not reaching a certain level of income can provide an interesting view on the income distribution between the subjects or between the different groups of subjects. The level of income can be given arbitrarily. We chose the amounts "interesting" from the point of view of social system duties (minimal bases of assessment for social contributions, see Vančurová, Láchová 2014) or from the point of view of social position (minimum subsistence level). The results are summarised in the following table.

Table 3: The Percentage of Subjects Not Reaching "a Certain Level" of Income

Employees				
level	MSL	MW	AW	2*AW
the amount in CZK	40,920	100,000	300,000	600,000
relative frequency in % as per ADIS	0	0	47	79
relative frequency in % as per MPSV	0	0	67	94
Self-employed persons				
level	MSL	MW	AW	2*AW
the amount in CZK	40,920	100,000	300,000	600,000
relative frequency in % as per ADIS	23.9	47.1	91.6	98.1

Note: MSL means minimum subsistence level, MW means minimal wage, AW means average wage, 2*AW is the minimum base for health insurance as a subsystem of social system.
Source: ADIS, MPSV, own arrangement.

The gross income is being compared to the relevant limit in case of the employees, with a certain simplification, as for the self-employees, it is the tax base. The percentage stands for the relative frequency of the subjects not reaching the relevant limit. To illustrate this, 94 % of all employees registered in the MPSV statistics did not reach the gross income of the amount of approximately twice the average wage (2*300,000 CZK per year) but if only the employees submitting the tax return were taken into consideration, which means the employees registered in ADIS database, it is "only" 79 %.

4.2   The Percentage of Subjects in a Certain Relative Range

A slightly different view of the given issues is offered by the table below. In this case, the income limits are not selected in advance in relation to which percentages of subjects reaching them are evaluated but they are calculated in accordance to the real presence of individuals in individual income range. Both of the above mentioned approaches have their justification.

Table 4: The Basic Quintile Income Distribution, in CZK, annually.

	Annual gross wages (employee)	Self-employed persons' (I-E)	Self-employed persons' (TB)
10 % of the poorest	139,330	13,515	18,507
25 % of the poorest	205,202	44,775	56,556
half the population	299,223	105,859	119,142
25 % of the richest	436,767	177,690	186,296
10 % of the richest	717,100	305,832	327,972
the average	478,216	163,385	189,189

Note: I-E means the difference between income and expense, TB means tax base. Data for the exclusive employees or self-employed individuals.
Source: ADIS, own arrangement.

The interpretation of the table is as follows. The amount of e.g. 205,202 CZK in the second column means that 25 % of employees receives the gross wage lower than this amount (annually). Or, e.g. 305,832 CZK in the fourth column means that 10 % of self-employed person realizes the higher income that this amount (annually). Interesting is the comparison of the employees, when this income range (measured by wage) is reached by half the employees (see 299,223 CZK, which is close to 305,832 CZK).

In this context it is suitable to introduce the survey results of the Research Institute for Labour and Social Affairs (VUPSV 2014) which evaluate the abilities of the employees and self-employed persons to cover the expenses that can be regarded as a good rate of the given group's standard of living. The study comes to conclusion that, according to the tax returns, the income of the self-employed persons ranges under the income level of the employee, on the other side, the self-employed persons' households does not have any issues to cover their expenses. The income level of the majority of self-employed persons enables them to cover even the inessential needs without any problems.

5   Conclusions

The authors analysed the available databases containing information about the incomes of basic socio-economic groups of tax payers. Even though the determination of the income distribution in the society is a basic condition for effective tax justice setting and for an estimation of actual tax incidence, but also for appropriate level of the solidarity of social systems through benefits, the authors observe that the suitable statistics or database sources for its measurement are currently not available in the Czech Republic.

The authors were provided for the ADIS database (tax information system; based in the Ministry of Finance) and the Assessment Base for Pension Insurance database (based in the Ministry of Labour and Social Affairs; Czech abbreviation: MPSV). It was the unique opportunity to work with the whole population, which is covered by these databases.

The ADIS database fully covers the groups of self-employed individuals (all individuals having professional incomes have the duty of submitting their tax return), similarly, the MPSV database includes all employees. The authors defined the so called "exclusive employees" and "exclusive self-employed persons" to make the comparison of their incomes possible. The results show that the employees' income level is significantly higher and more variable than the situation of the self-employed individuals. Median of employee's (self-employed person') income was 300 (105) thousands CZK, mean of employee's (self-employed person') income was 480 (170) thousands CZK (for the whole year in both cases). The quintile rage for employees (self-employed persons) was 435-205 (186-57) thousands CZK.

Moreover, the authors conclude that it will be necessary to endeavour to interconnect the data between these two large databases in order to measure more accurately the income from employment of subjects not submitting the tax returns and to identify the total payers' income, which means the incomes from various sources. According to the authors' opinion, the individuals submitting the tax returns are described in the statistics in sufficient extent.

Acknowledgements

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Czech Pension Policy at the Crossroads

Jaroslav Vostatek[*]

Abstract. The Czech public "pension insurance" hides a significant universal pension and a minor earnings-related pension. The housing benefit is a solidary supplement of this pillar. Universal pensions are typical for the modern liberal welfare regime. The social-democratic pension regime originally relied on universal pensions; however, it currently accentuates a combination of universal social insurance and generally conceived solidary pillars. Simple rationalization of the Czech public pensions may be carried out by dividing today's first pillar into two conceptual pillars.

The Czech private pension saving is significantly different from standard third pillars, as it features high number of participants, great diversity of the terms for the providers and even of the fiscal incentives. With regard to a potential reform, it is mainly useful to consider the liberal and social-democratic approach, based on the elimination of fiscal incentives, up to a transition to the Swedish premium pension.

Keywords: old-age pensions, welfare regimes, housing benefit

JEL Classification: H55, J26, G22

1 Introduction

In terms of the general economic theory, the simplest solution would be for each individual to get his own economic security in old-age or in the period when he is worn-out. However, things do not work that way and we only explain in our theory that this is given by the short-sightedness of people's actions and, objectively speaking, unpredictability of the length of our life. The willingness to purchase lifelong pensions under "standard market terms" is very low – this fact may be also explained by the generally recognized "market failures". Generally speaking, we can state that (Barr, Diamond, 2008):

- the primary objective of pension is economic security in old-age, achieved through consumption smoothing, insurance, poverty relief, and distribution;
- the primary objective of pension design is to optimize old-age security, including the cost of providing it.

The objective of this paper is a model analysis of the Czech pension system as a whole, with resulting recommendations for the Czech government policy. The paper relies on the summary of fundamental pension policies in the world, applying the theory of welfare regimes of Esping-Andersen (1990) to the area of pensions. The range is expanded to four pension regimes (Bovenberg, Ewijk, 2012), adding a neoliberal regime that has evolved since the 1990s (Vostatek, 2014). Ideally, each system should rely on one of the aforementioned welfare regimes.

2 Welfare regimes and pensions

The classical liberal welfare regime does not: comprise public pensions, support occupational pension schemes or motivate the population to take out private pensions. The modern liberal regime comprises universal (flat-rate) or means-tested pensions, non-contributory and tax-financed. An exemplary form of means-tested pensions is the "Age Pension" in Australia that provides – together with supplements and rent assistance – an income exceeding the EU poverty at risk line (60% of the income median) to the poorest senior citizens. An exemplary universal pension is the "Superannuation" in New Zealand, tax-financed, providing income exceeding the OECD poverty line (50% of the income median). Universal pensions have existed in a number of other countries. They represent the basic alternative of today's solidary pension pillars, in combination with housing benefits, for example. Other pension pillars were formed in liberal countries; however, they cannot be considered a part of the modern liberal regime. These other pillars apply a complete range of products and concepts, originating from different welfare regimes: public insurance pensions, occupational schemes – voluntary, mandatory, and quasi-mandatory – as well as personal and workplace pensions with hard or soft compulsion.

Conservative pension welfare regimes represent a mix of various pension security concepts – for different social groups, proportionally to their specific standing and needs. They include both the civil servants security schemes, social insurance schemes, and originally voluntary occupational pensions. The third pillar comprises personal pensions, supported by government, e.g. by applying one of the tax theory approaches, according to which pension savings contributions should be deducted from an income tax base, with benefits being fully taxed.

Social-democratic pension welfare regimes have evolved from originally liberal regimes (universal pensions) – by adding a universal social insurance pillar (earnings-related pensions). With regard to this concept (ideology),

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the solidary state pension pillar must be designed in a manner to adequately secure low-income seniors (not only employees), who live in the given country on a long-term basis and do not require long-term care. The modern social-democratic regime focuses on securing earnings-related pensions for middle-income employees. The solidary pension pillar is closely linked to this insurance pillar. Senior housing benefit tends to be an important supplement. Moreover, quasi-mandatory occupational pension schemes that cover more than 90% of employees play an important role in the respective countries. The social-democratic regime does not assume government support of the third pension pillar.

Neoliberal pension welfare regimes accentuate mandatory private pension savings, strongly regulated by the government. The economics of this pension model is built on the premise of high investment returns that would also cover high margins of private pension savings/insurance providers. Returns on savings were rather high during the period of intensive globalization – consequently, pension funds had a great advantage. However, it has recently been clear that the high investment returns of the rapid globalization period are gone. Interest on government bonds has been declining on a long-term basis, with negative real returns being the medium-term outlook. Investments in shares target inflation-adjusted returns of about 3% per year. This roughly corresponds to the conditions prevailing during the 1950s and 1960s, when funded social insurance systems were transformed into pay-as-you-go systems due to economic rationalization.

Above all, the pension welfare regime selection continues to be a matter of public choice. This choice tends to be strongly affected by ideology or general policy, as appropriate. The pension theory and policy of the past decades have been significantly affected by the development of pension schemes in a number of countries. One of their conclusions is the urgent need of clear profiling of individual pension pillars. Therefore, each pension scheme must include a solidary pillar – the only question is how it should be constructed and how important should it be within the system as a whole. Modern liberal pension schemes are dominated by universal pensions as a poverty relief tool for elders, completed with other means-tested pension. Today's conservative and social-democratic schemes are dominated by social pension insurance. The neoliberal policy bets on private savings schemes; however, neoliberal systems are associated with much higher costs than comparable public pensions.

3   Czech pension pillars and reforms

After 1992, the progressivity (solidarity) of the Czech universal system of pension security was intentionally promoted by significantly shifting the bend points downward, while also adding a new "basic amount" of pensions. This could be linked to the liberal trends promoted at the time, which could have even resulted in the transformation of the "pension insurance" to a universal pension. This was also matched by the indexing system of paid pensions, which enabled governments to unilaterally promote the role of the basic pension amount. In 2010, the Constitutional Court of the Czech Republic concluded that "the entire complex construction of the pension system lacks transparency to a point, where it is *de facto* absolutely incomprehensible for intended addressees; therefore, the calculated pension benefit amount becomes unverifiable for most insureds" – and annulled bend points for calculating the percentage amount of the pension (Constitutional Court, 2010).

Figure 1: Relation of pension and housing benefit to 2015 gross wage (insurance period of 43 years), all in % of AW (single pensioner, rental housing in a municipality with population of 50,000 to 99,999)
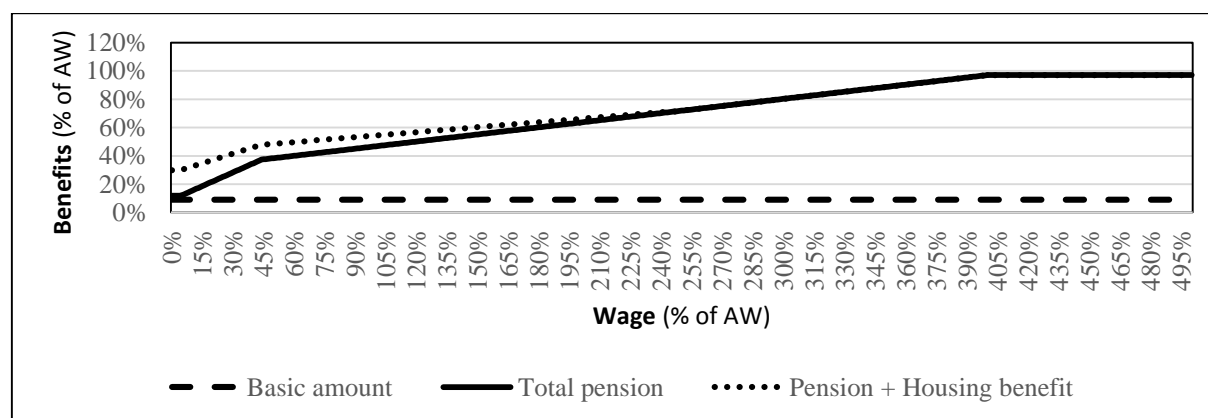
Source: Author

The Government of Nečas reacted to the Decision of the Constitutional Court by introducing the "small" pension reform, during which individual parameters, particularly bend points, were amended in several chronological steps. As of 2015, the first bend point is newly set at 44% of the general calculation base, basically the average nationwide wage (AW); the second bend point has been significantly increased: to 400% of AW. Any earnings over 44% of AW are reduced to 26% when calculating pensions, with earnings over 400% of AW being

reduced to zero. The basic amount has been parametrized at 9% of AW. Therefore, the small pension reform established some comprehensible relation of pensions to prior earnings – from the first bend point upwards – see Figure 1. However, the basic problem has not been eliminated: solidarity still dominates the insurance principle within the "pension insurance" pillar. This great problem may only be resolved through a major pension reform, not by more or less amending parameters such as bend points.

The first bend point, used in calculating the percentage amount of pension, plays an important role in the construction of pensions. Although its "purpose" is to level out pensions of individuals with earnings over 44% of AW, it in fact results in an absolutely low level of pensions up to the given bend point – as apparent from Figure 1. The minimum old-age pension amounts to CZK 3,170 (basic amount of CZK 2,400 + minimum percentage amount of CZK 770, as provided by law). Therefore, the question is how seniors with only minimum old-age pensions or no entitlement to old-age pensions get by. In such cases, housing benefits play an important role in many countries.

The development of the housing benefits in the Czech Republic is currently derived from real (however, no more than normative) housing costs in rental or owned/cooperative apartments, from which it is necessary to deduct 30% (35% in Prague) of household income (however, at least from the subsistence minimum). The normative housing costs in rental apartments are differentiated by five groups of municipalities according to population. The normative housing costs of a single-occupant household vary from CZK 4,409 to CZK 7,623 per month in 2015. To analyze the importance of the housing benefit, I selected rental housing of an individual within the "median" municipality with the population of 50,000 to 99,999. In this case, the normative housing costs (NHC) amount to CZK 5,767 per month. This amount represents 21.67% of AW. With regard to AW, we use the value of general assessment base for 2015 in the amount of CZK 26,611 per month. The housing benefit (HB) is then calculated as follows:

$$HB = NHC - 0.3 * I = 0.2167 * AW - 0.3 * I = 5{,}767 - 0.3 * I \tag{1}$$

where I = income of an individual; however, no less than his subsistence minimum (CZK 3,410).

I drafted the values calculated for old-age pension recipients in Figure 1 as pension increase. It is clear that, on a model basis, the housing benefit is a significant increment to pensions. The minimum pension from pension insurance with the housing benefit of CZK 4,744 increases to CZK 7,914 in total, i.e. 29.74% of AW. Therefore, the housing benefit can be considered a solidary pension pillar – definitely with regard to pensioners who live alone or as a couple. After all, the almost identical formula is applied within the Chilean solidary pension pillar, for example.

In case seniors are not entitled to old-age pensions and have no other income, they are entitled – with other factors being constant – to housing benefits in the same amount (CZK 4,744), while also being entitled to subsistence benefit in the amount of subsistence minimum of CZK 3,410; therefore, they receive CZK 8,154 in total – i.e. 30.64% of AW.

From the system perspective, the basic pension amount (9% of AW) is incidental, similarly as the first bend point with the percentage pension amount as well as the construction of the housing benefit. However, two graduated rationalizations of old-age pensions come to mind for the given parameters – simply by inspecting the above Figure 1:

- Increase of the basic pension amount from 9% to about 30% of AW, while eliminating the bend point of 44% of AW, whereas a percentage pension amount shall be awarded for each year, at the rate of 1.5% * 0.26 = 0.39%.
- Transformation of the basic pension amount to a universal pension for all residents at about 30% of AW, whereas the "residual" universal social old-age insurance shall be provided by pensions in the amount of 0.39% for each year of insurance.

The transformation of the basic pension amount to universal pensions at about 30% of AW for all residents is a significant pension reform already; however, one that does not change the degree of solidarity prevailing within the existing pension pillar, in combination with the housing benefit and the subsistence supplement. The reform would be automatically reflected in partial reduction of claims for the housing benefit– see Figure 2. A question arises whether the housing benefit should be reduced in the course of the reform so that the overall minimum income by reason of a universal pension and a housing benefit (in Figure 2: over CZK 11,330) exceeds the at-risk-of-poverty line for an individual (CZK 9,674 per month in 2013).

The aforementioned alternatives of the old-age pension rationalization mainly reflect efforts for transparent pension calculation system. They only make larger sense if this reform is followed through with all systemic consequences, if the public pension financing is reformed accordingly in the Czech Republic.

Figure 2: Relation of pension and housing benefit to 2015 gross wage (insurance period of 43 years), all in % of AW (single pensioner, rental housing in a municipality with population of 50,000 to 99,999): transition to universal + earnings-related pension
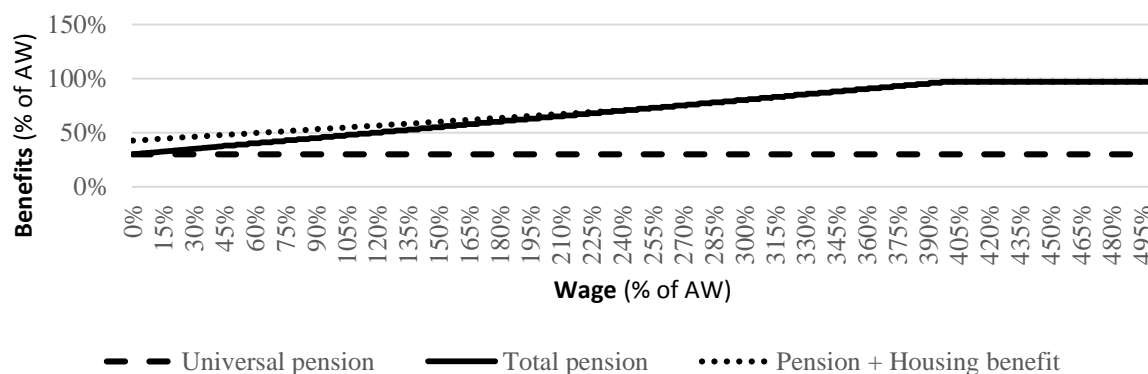
Source: Author

Today's Czech "pension insurance" is a "mere" public expenditure program, financed from the government budget. The government budget revenue also comprises pension insurance premiums. No significant explicit ties exist between such expenditure and revenue. No functional "pension account" exists with revenue and expenditure in the form of insurance premiums and pension benefits, respectively.

Universal pension in the relevant countries represents public expenditure program that is regularly assessed in terms of fulfilling its role of the primary pension security for seniors in the given country. Similarly, the pillar's sustainability is regularly assessed as well, within the broader context of the public finance sustainability. This is also reflected in potential modifications of the universal pension parameters.

Normally, the social pension (or just old-age) insurance pillar is an independent component of the public finance – it is not part of the government budget. A NDC system is a modern evolution of the social old-age insurance. The advantage of the system is essentially automatic reflection of the population ageing in the pension amounts – through actuarial methods, continuous adjustment of pension mortality tables – and consequently conversion rates used to convert personal account assets to lifelong pensions. The automatic stabilization mechanism also provides for the NDC system stability under changing economic conditions.

The proposed rationalization of the Czech public pensions also includes the reduction of (social) pension insurance premiums; the new insurance scheme makes do with insurance premium lower by about 11% of wage – i.e. coincidentally today's combined insurance premium rate for pension and health insurance paid by employees. Therefore, even a more extensive restructuring of the insurance premium is possible – substitution of the insurance premium amounting to 11% of wage paid by employees with equivalent increase in employees' income taxes. Consequently, insurance premium will only be paid by employers – in the same amount as today.

The introduction of supplementary pension insurance with government contribution in 1994 was a relatively positive measure for the development of financial services, not only in the area of pension savings. The government contribution played an important role in getting the third pension pillar started. The rapid development of the supplementary pension insurance was coupled with the formation of a strong pension lobby, leading to further promotion of fiscal stimulation for the sector. The lobby of insurance companies was also partially successful. This resulted in the formation of a segmented system of the third pension pillar that is unrivalled throughout the world. The number of supplementary pension insurance contracts exceeded 5 million at the end of 2012. In addition to this, there are 3.5 million "private life insurance" contracts in the Czech Republic, with only 1.5 million of those claiming income tax base deductions according to the Ministry of Finance data. The great pension reform of the supplementary pension insurance has improved transparency and introduced limits of pension companies' expenses; however, it has not touched upon the area of private life insurance, tax deductions, and zero payments of social/health insurance premiums in case of employers' contributions to supplementary pension insurance or private life insurance, although the government regulation of the third pension pillar as a whole should be – by its very nature – uniform.

Absolutely inadequate government regulation of the private life insurance in combination with extreme government support has led at least one retail network to base the sale of this insurance on the fact that wages could be partially paid out through life insurance policy – employees also get minor risk insurance and employers save on social/health insurance premiums (Prouza, 2013). As of 2015, this single blatant problem has been eliminated through a minor amendment to the definition of private life insurance in the Income Tax Act.

Parallel existence of several systems of generous fiscal support (government contribution, tax deductions, exemption of employers' contributions from social/health insurance premiums), even for a single product (supplementary pension savings), represents a major market deformation. Public expenditure (including tax

expenditure) on these types of support amounted to CZK 16.4 billion in 2013 - i.e. 0.4% of GDP. Overall, investment returns are low and often downright negative (private life insurance). Considering the extremely high number of participants, this entire (hypertrophic and chaotic) "system" may be classified as soft compulsion. In line with the World Bank classification of pension pillars, it is a second pillar, not a third pillar.

The reform of existing supplementary pension savings and private life insurance products is imperative and, generally speaking, there are several "public choice" alternatives available. From a technical perspective, the least complicated is the liberal as well as the social-democratic policy: i.e. to eliminate any fiscal support of the aforementioned products. The "lost" revenue of individuals may be globally compensated by lowering the pension insurance premium rate from 6.5% to 5.1% of wage or by equivalent reduction in the personal income tax. This would translate into yearly benefits of about CZK 4,300 for employees with average wage.

The following may be described as a conservative reform: transition to exclusive claiming of tax deductions or exemption from personal income tax, with payouts of pension savings being fully taxed with personal income tax (EET). This is the most common practice throughout the world.

A neoliberal concept within the reform would be to implement a comprehensive modern soft compulsion system – i.e. to admit it concerns the "second" pension pillar. In this case, it is possible to apply employees' auto-enrolment, with a very limited time offer to leave the scheme after a short period of time and get back all contributions paid. Mandatory contributions of participants could be set at, for example, 3% of wages (contribution rate may be later increased by the government), with possibility of extra contributions as well as employers' contributions (these contributions could eventually be mandatory). Government contributions would be made to the mandatory contributions of participants in the amount of, for example, 1% of wages (i.e. one third of the participants' contributions). Clients would only have one account with a single provider. Employers would be required to provide basic service (workplace pensions). Providers must apply a low-cost business model, as reasonable returns for clients cannot otherwise be secured on a long-term basis. A low-cost state pension company may contribute in this regard, with a default fund, in which new clients are automatically enrolled (with potential conversion to another provider). This state (public) company may also act as an exclusive provider of old-age pensions and it may invest financial funds of all participants in funds of their choice - without such private funds knowing their clients' names and addresses. Soft compulsion may ultimately be replaced with mandatory participation of employees within the system – eventually coming to the "premium pension" used in Sweden, which has been purposefully presented as the "second" pension pillar throughout the world. However, this pension (with mandatory insurance premium at 2.5% of wage) is considered a third state pension tier in Sweden, in addition to NDC and the "guaranteed" pension. The premium pension may be characterized as social pension insurance, with the private investment option at the clients' discretion. The corresponding tax regime is TTE (contributions from taxed income, capital gains taxation, no taxation of benefits).

The conservative and the neoliberal reforms of the Czech "third" pension pillar both require superior and very intensive government regulation. The liberal reform – in general fully corresponding to the social-democratic welfare regime as well – is the least complicated solution of the poor "third" pillar in the Czech Republic; it is only necessary to consider potential political consequences or the reform marketing, as appropriate. Naturally, this reform is in conflict with various interests of pension companies and life insurance companies. However, those companies have contributed to the problem and most of their current "savings" products only generate very low returns for clients, to say the least – without intensive support by the government. The neoliberal reform offers a wide range of options – their pros and cons are basically known throughout the world. The result may be even more demanding fiscally than the current "third" pension pillar in the Czech Republic. There is a question concerning the enforceability of an alternative that is relatively most beneficial for both the clients and the government – Swedish premium pension, where the neoliberal trace is basically mere icing on the cake.

Introduction of "retirement savings" as of 2013 – as a new "second" pension pillar – was a miscarried attempt at "diversifying" the Czech pension system in a situation where we in fact had a "second" pillar – just in a different form and with 5 to 6 million participants! It is safe to state, with a hint of irony, that the government should have first done away with the "diversification" of the previous second pillar (supplementary pension insurance and private life insurance), while figuring out what it really wishes to do. In this regard, the President of the Czech Republic clearly communicated to the Cabinet that it does not make sense to have two almost identical pension pillars. The infrastructure of the newly introduced "retirement savings" could apparently be used for the neoliberal transformation of the supplementary pension savings and private life insurance.

Both significant Czech pension pillars are greatly deformed from the perspective of any pension welfare regime or system logic, as appropriate. The least complicated reforms would involve an application of the liberal and the social democratic approach in both pillars: transition to universal pension, complemented with universal pension insurance, and annulment of the fiscal support of the third pillar. The missing second pillar concerns occupational pensions; the minimum program is the elimination of the ban on formation and establishment of occupational pension insurance institutions. They could mainly be successful in the mining sector.

4   Conclusions

In principle, the Czech Republic has a universal public pension system, financed from the government budget, which is a nontransparent mix of the solidary and the insurance pillars and which consequently does not fit into any welfare regime. Housing benefit is a supplementary solidary allowance, increasing low pensions of resident seniors to about 30% of average nationwide wage. The reform of this pillar aimed at its transparency is relatively simple: introduction of universal pensions at about 30% of average nationwide wage and formation of universal social pension insurance, financed from insurance premiums.

The third pension pillar in the Czech Republic is a non-conceptual mixture of two absolutely differently regulated components, with active participation of 50% of the entire population, mainly due to significant fiscal support. It basically concerns a (unorganized) neoliberal soft compulsion system – i.e. in fact a second pension pillar according to the World Bank classification. In this regard, we should also mainly consider the application of the liberal/social-democratic approach, in the form of the fiscal support elimination, compensated through reduction of existing high pension insurance premium rate. Generally speaking, we could also envisage the unification of government support and of the entire government regulation system – after the transformation to the system of funded social old-age insurance, with the possibility of individual allocation of clients' assets into private pension funds, in line with the model of Swedish premium pension.

The new second pension pillar in the Czech Republic is a neoliberal system of another soft compulsion type – therefore, it is redundant from the system perspective and the current government envisages its elimination. Occupational schemes have been banned so far.

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Fiscal Effectiveness of Investment Incentives

Václav Vybíhal[*]

Abstract. The paper deals with the issue of fiscal effectiveness of the provision of investment incentives in the environment of corporations operating within the territory of the Czech Republic. Foreign direct investments have a significant and positive impact on macroeconomic indicators and the microeconomic sphere of the national economy. They bring new state of the art technology to the production and economic environment, as well as proven management practices, classical standards of business conduct with a positive impact on employment, GDP growth, a significant impact on the foreign trade balance, and ultimately generally attractive employee benefits for employees. The stated facts also have a positive effect on the competitiveness of the national economy of the Czech Republic. Foreign direct investment inflows are significantly reflected in the creation of sources of revenue for public budgets in the Czech Republic. For this reason, the research team is dedicated to the design and improvement of methodological approaches to measuring the effectiveness of fiscal investment incentives and their verification in the environment in major corporations, investment incentive recipients. It appears that the fiscal benefits are not negligible and need to be addressed in earnest.

Keywords: investment incentives, fiscal effectiveness, measuring, competitiveness, methodology, corporation, verification, Czech Republic

JEL Classification: H 2, H 22, H 25.

1   Introduction

Investment incentives are among the major public spending programmes. In the Czech Republic, the scale of investment incentives includes deductions on income tax returns (100% deduction, i.e. tax holidays for 5 years), grants for municipalities for technical equipment, convenient transfer of land owned by the Czech Republic or municipalities, material support for the creation of new jobs, and material support for retraining employees. Accompanying programmes have also been adopted within the system of investment incentives, namely the programme to support subcontractors and the programme to support the development of industrial zones, resulting in economic benefits for the given business entities.

Investment incentives as a form of support for foreign direct investments play an important role in determining the allocation of investments and fall within the sphere of priority interest, in particular in undercapitalised countries with transition economies. These countries then compete in how to attract foreign capital. Investment incentives should contribute to economic recovery (growth), support active employment policy, contribute to the restructuring of the national economy and ultimately increase the level of competitiveness of the national economy.

Forms of support of foreign direct investment are safeguarded by resources from public budgets. In terms of fiscal effectiveness, it is primarily about the state's investment, which should have its return and provide effects, if possible multiple effects, in benefit of the revenue aspect of public budgets.

2   Literature overview and methodology

In the Czech Republic, investment incentives are provided and financed from public budgets, especially from the state budget. It is therefore necessary to monitor the return on these funds provided by the state, as well as the fiscal effectiveness of the provision of investment incentives in terms of public budget revenue and expenditures.

According to economic theory, the category of effectiveness can be expressed as the ratio between inputs and outputs, where activities that are considered effective are those where all resources are fully used at the highest possible efficiency, and the amount of inputs delivers the maximum amount of outputs (Synek, 1996). Effectiveness is therefore given by the ratio of inputs and outputs and is the most efficient use of economic resources to satisfy the people's needs. An economy thus produces effectively when it cannot produce more of one good without producing less of another good. An effective economy is thus at the limit of its production possibilities. At this limit is the economic result in which there can be no reorganization or transaction that would increase the utility or satisfaction of another entity (Vybíhal, 2004). Under certain limited conditions, perfect competition leads to allocative effectiveness (the so called Pareto effectiveness). Generally, effectiveness refers to the use of economic resources that brings the maximum level of satisfaction achievable with the given inputs and technologies. Stiglitz (1997) even states that when assessing various alternative programs, economists always

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emphasize effectiveness, and to assess the degree of inefficiency, they ask "how much would you be willing to pay for removal of a particular ineffective measure?"

Different income tax rates and different net fiscal benefits or burdens affect the location of economic activity and create a tendency to not allocate resources where their use is more effective. Precisely this is an important stimulus for investors (investors invest where their use is more effective, i.e., where taxes are lower). This leads to a distortion of allocative efficiency on a global scale (Musgrave and Musgrave, 1994). The decision on the location of production is thus not always made on the basis of comparative advantages, i.e., the relative costs of resources, but it is quite frequently influenced by differing tax burdens.

When evaluating the fiscal effectiveness of investment incentives, it is necessary in the measuring of outputs and inputs to construct this indicator so that the outputs express the revenue from collected taxes and fees, i.e., resources on the revenue side of public budgets, and inputs the individual segments of the investment stimulation process, i.e., funds provided from the expenditure side of public budgets, which should at the same time generate economic growth and boost employment especially in geographic areas with relatively higher unemployment rates, or also in areas affected by the restructuring of the national economy.

The outcome of the process of monitoring fiscal effectiveness is the actual revenue from taxes, from social and health insurance, and possibly also from other public budget revenue, as the decisive source of the revenue side of public budgets. A certain role may also be played by savings on the expenditure side of the state budget, such as savings on unemployment benefits, if we manage to execute the change of the individual's position from job candidate to employee.

When measuring the fiscal effectiveness of investment incentives, a number of methodical and practical problems arise; these problems also had to be dealt with in our research. For example, when assessing the dynamics of the fiscal effectiveness indicator, it was the issue of the collection of value added tax (the actual tax obligation and the excessive deduction), the inflation trend, the time value of money, the payback period for the inputs, the type of investment (greenfield project, expansion, brownfield project), and the business sector (the automotive, mechanical engineering, electronics, electrical engineering, glass, health care, and wood processing industries, or other sectors of the national economy).

Another important methodological issue is the decision on the time interval that should be used to monitor fiscal effectiveness. Given that tax credits are granted for five years, and business plans in enterprises are also prepared for five years, the calculation of fiscal effectiveness is also monitored in five-year intervals, starting with the year following the date on which the investment incentive is granted. Then, for example, the financial support for the creation of new jobs or the benefit arising from a lower price of land must be treated on an accruals basis over a period of 5 years. Based on our experience and the results of expert analyses, a five-year period is considered to be optimal for the given area.

Vybíhal and Cedidlová (2014) provide an overview of what attention should be paid to research concerning investment incentives in the Czech Republic.

Vybíhal (2002, 2004) developed a methodology to measure the effectiveness of investment incentives usable for the business environment of the Czech Republic, including the application of verification methods for objectification of the given method for a selected group of recipients of investment incentives. Even doctoral programme students were involved in this research. Subsequently, Vybíhal and Šachrová (2005) conducted research directly in the environment of the recipients of investment incentives and demonstrated the suitability and merits of the application of this methodology.

The current research done by Deloitte (2006) in the Czech Republic contains The final report of evaluation of investments drawing incentives and the evaluation of the effectiveness of CzechInvest Agency Ministry of Industry and Trade ordered an analysis to find out the situation and prospective of investment incentives. According to this report[*] are investment incentives effective. Evaluation of economic contribution from investment incentives including methodology of economic model prepared Deloitte company together with experts from CERGE-EI, University of Economics in Prague and Czech Statistical Office. This study analyses all investments from 1998 to 2008 which received decision about the receiving of investment incentives.

However Schwarz et al. (2007) carry out the Analysis of investment incentives in the Czech Republic. He discuss the 8 myths about investment incentives.

The research provided by Schwarz is very critical to the Deloitte (2006) findings especially because of the direction of investment incentives to regions with the highest GDP. He claims that the unemployment rates has not been decreased because of investment incentives were directed to the regions with the lower rate of unemployment rates. It was pointed out that the new working place created by investment incentives pull the employees over from other existing companies. Deloite findings claim that investment incentives are effective however Schwarz et al. (2007) is criticising them.

Schwarz et al. (2007) expressed the idea that in the region of the central Europe, there is very strong tax competitiveness and countries are competing among each other by general tax rates and the rates and subventions

and by investment incentives. They criticized the system of current investment incentives in the Czech Republic and the results of Deloitte analysis. This research group doubted about positive influence of spillover effect.

In conducting research on the efficiency of providing investment incentives, it is necessary to follow the procedure, based on Figure 1. In the implementation of research, however, I found that when obtaining data, direct personal contact in the company seemed to be significantly better, where it is possible to become familiar with the issue in detail. This method of data and information collection can not be fully replaced by any other method (e.g. by e-mail or telephone, etc.).

Concerning the effectiveness of investment incentives, it is possible to judge it by the comparison of the costs related and yields received or gains followed from the incentives.

This part will explain how to calculate the effectiverness of investment incentives. At first it is necessary to focus on theoretical aspects that influence fiscal (tax) effectiveness, provided investment incentives are one of the possible kinds of public support provided by the government.

In the calculation of the effecctiveness of investment incentives from the government's point of view are considered the revenues (inputs) especially taxes, charges, insurance and the public health security. Taxes are considered as the yield of income tax resulting from the dependent activity of the firm's employees (15 %), the tax yield of the legal entity, and the income tax yield collected from the separated tax base special tax rate. Further, tax yields stem from the Vehicle Excise Duty, estate duty and various charges. Another source of revenues is insurance on social security; an employee pays 6.5 % and employer deducts 25 % from the employee's salary. The last revenue source is public health security, of which the employee pays 4.5 % and employer 9 %.

Regarding tax effectiveness was concerned Vybíhal (2002). Tax effectiveness is possible to express as revenues divided by expenditures in the following formula:

$$Ef = \frac{Tn + Tw + Tv + Te + To + I + H + S + T_{LE}}{Wp + \mathrm{Re} + Tr + Di + Tc} \tag{1}$$

Figure 1 Proceedings of the Research
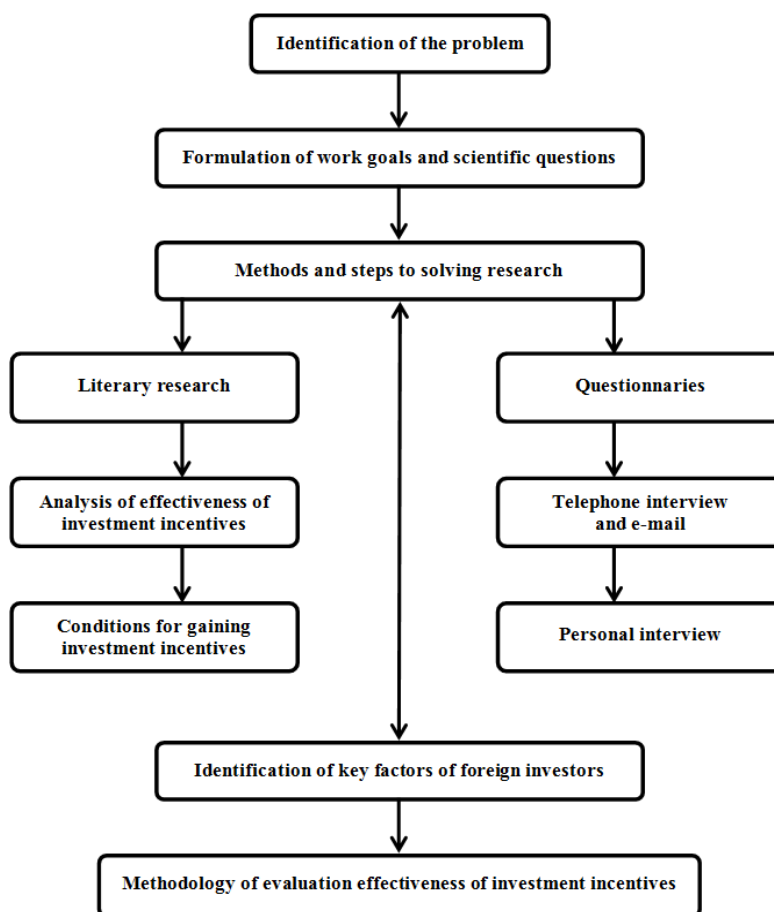
Source : Author´s compilation.

In the numerator are several variables considered as inputs to the state budget:

- (Tn) yield of income tax of a natural person from the dependent activity,
- (Tw) yield of income tax which is collected from the separated tax base special tax rate, i. e. yield from the withholding tax,
- (Tv) yield from the vehicle excise duty,
- (Te) yield from the estate duty,
- (To) various charges,
- (I) insurance on social security,
- (H) public health security,
- (S) savings on the expenditure side of the state budget, for example savings on the amount of provision in the change of physical person on account of employment,
- (T_{LE}) tax yield of the legal entity.

Outputs in the process of pursuing fiscal (tax) effectiveness (Ef) is the real yield from taxes, alternatively other incomes from the state budget, as the determinative source of the income side of the public budgets, in particular considered as the denominator in the equation:

- (Wp) financial support on the created working place, in CZK,
- (Re) subvention for costs related to the retraining of employees, in CZK (other cost for retraining which are paid from the public budget),
- (Tr) the amount of income tax relief, in CZK,
- (Di) subvention for support the development of the industrial estate,
- (Tc) administrative costs related to tax collecting.

Financial support for a newly created working place and subsidizing part of the cost for retraining are expenses from the point of view of the public budget. Its source lies in the collection of taxes and social insurance. The amount of tax relief does not belong to the expenditure part of the public budget as the investment incentives should have produced income for the public.

It should be noted that from the methodological point of view the model of the fiscal efficiency was modified and there are not included yields of value added tax. In the studied companies, the export exceeded the import, which influenced the excessive deduction, i. e. that the tax on input is higher than the amount of tax in output. It is assumed that investment incentives are direct imputs in the category of effectiveness and it is possible to consider them as investment of the government and it is expected some returnability. It should be measured the effects on the income side of the state budget, especially the source oriented tax yields, charges, insurence and duties.

3   Results and Discussion

Based on my own research carried out in 12 companies that received investment incentives, the impacts on the revenue side of public budgets were quantified and the fiscal effect was calculated.

A calculation of effectiveness was provided all CASE for the duration of 5 years, beginning the zdar after receiving investment incentives. According to the results of speciál consultations and expert opinions, the 5 year period is an optima duration for study that reflects the real situation of business plans of the recipient sof investment incentives. The research results are summarised in Tables 1 and 2.

Table 1. Overview of the fiscal effect of providing investment incentives (in thous. CZK)

Marking of companies	Inputs	Output	E_f (abs.)	E_f (relat.)
A	139,999	198,011	58,012	1.41
B	100,029	411,277	311,248	4.11
C	98,826	201,444	102,618	2.04
D	542,132	992,061	449,929	1.83
E	100,458	334,026	233,568	3.33
F	275,141	602,555	327,414	2.19
G	229,548	244,019	14,471	1.06
H	132,560	418,247	285,687	3.16
I	124,537	616,216	491,679	4.95
J	123,654	511,011	387,357	4.13
K	66,206	324,524	258,318	4.90
L	212,645	210,898	-,1,747	0.99
Total	2,145,735,	5,064,289	2,918,554	X

Source: data collected by own investigation.

Data presented in Table 1 shows that apart from the business marked by the symbol "L", in all other cases the value of the indicator of fiscal efficiency was E > 1. In terms of the business marked with the symbol "L", this indicator is almost close to the value of $E_f = 1$. This means that the state funds contributed through investment incentives, including 5-year tax deduction ("tax holiday") may be considered effective. Outputs (primarily collected taxes and insurance premiums) exceed the inputs for the sample of 12 companies as a whole by 2.9 billion CZK, which from the perspective of the national economy is certainly not a negligible effect. In relative terms, this fiscal efficiency ranges in an interval from 0.99 to 4.95 in simple arithmetic average of the sample as a whole in the amount of 2.84. Invested funds of the state are thus returned approximately 2.84 times, in conditions where the taxation of legal entities and taxation of natural persons is among the lowest in the European Union, perhaps with the exception of social security premiums. The economic benefit is that with the taxation of natural persons, including the payment of health and social insurance premiums, entities will not escape abroad, as they are bound by their resources to the Czech Republic, they are transparent, easily controllable, objectively defined, opposed to taxation of legal entities, where profits, i.e. tax bases can be transferred abroad by a relatively simple manoeuvre.

Vybíhal and Cedidlová (2014) published results of extensive research concerning the fiscal effectiveness of investment incentives, in which the subject of examination was a total of 30 companies that received investment incentives. Within the given sample, greater variability of results was found when compared to the level of individual companies. The indicator of fiscal efficiency of investment incentives ranged from 0.16 to 13.51 at a simple statistical average of 3.13. This means that investments in the form of providing investment incentives are returned to the state approximately 3.13 times. They compared the results achieved with models and results attained by Schwarz et al. (2007).

The Vybihal's formula does not take into account net present values but instead makes use of real numbers from the accounting statements such as balance sheets, annual reports, general ledgers, and profit and loss statements charting the five years since the receipt of investment incentives.

The Schwarz´s formula, on the other hand, works with estimated fiscal outputs from the side of supported investors, estimated fiscal yields from the corporate taxes from the side of the suppliers of supported investors, estimated fiscal yields from the suppliers of supported investors, and amounts of estimated fiscal yields from individual taxes from suppliers of supported investors. Moreover Schwarz et al. work with the probabilities that the investments may not have taken place without investment incentives, estimate the role of employee poaching from the other companies in the Czech Republic and estimate the rate of the orders which suppliers would have gained even in the case of foreign manufacturing. This calculation is difficult, and by using estimates and probabilities cannot be as precise as Vybihal´s formula.

As an example, it is possible to provide a comparison resulting from both of the aforementioned methodological approaches (Table 2).

Table 2: Comparative results of the calculation of the indicator of fiscal efficiency of investment incentives according to the methodology of Vybíhal and Schwarz (randomly selected 5 companies from a total of 30)

Company No.	Vybíhal´s formula	Schwarz´s formula	Modified formula
1	1.45	1.42	1.36
2	2.76	2.51	2.64
3	3.41	3.01	3.22
4	2.42	1.86	2.13
5	2.93	2.01	2.63

Source: Vybíhal and Cedidlová (2014)

The highest effectiveness is found with Vybihal´s formula because it works with real numbers. Schwarz's formula used three probabilities which cannot always be precise, and the estimates made by financial managers are not always accurate. For example, the probability that a specific foreign company would invest in the Czech Republic is an estimate. Moreover the estimate regarding the number of employees poached from other companies in the Czech Republic is questionable because there are many aspects playing a role in decision to change employer. Probably the greatest weakness is found in the estimated rate of the orders the suppliers would have received even in the case of foreign manufacturing. This is a speculative parameter. By correcting the formula the results are improved because this calculation added values from accounting tables.

The decisions of foreign investors about the location of direct investments will continue to affect the economic indicators of the national economy. There are many factors based on which investors make their decisions, but the offer of investment incentives will continue to remain one of the decisive moments in their decision making.

Figure 2: Factors influencing foreign investors about the investment decision in the Czech Republic
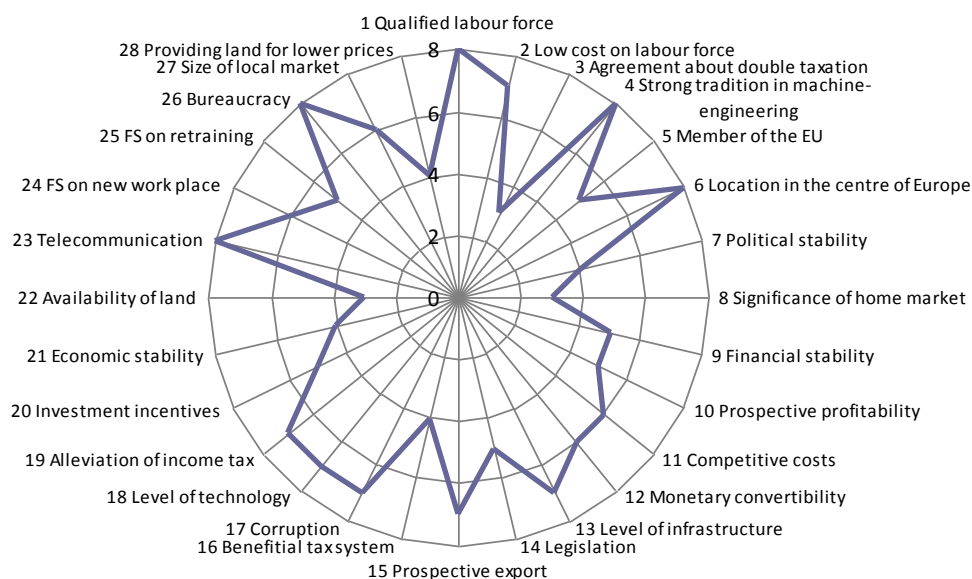
Source: Vybíhal and Cedidlová (2014)

4 Conclusions

Based on the research conducted, we can conclude that the path of business support embarked on through offering investment incentives has brought positive impacts to the Czech economy and its competitiveness. In particular, impacts of fiscal nature determining the revenue aspect of public budgets, are significantly positive, as well as impacts on the level of the employment rate, GDP growth and the foreign trade balance. Foreign investors value the Czech Republic not only as a country with significant engineering tradition, but also infrastructure, high quality subcontractors and labour, positioned in the centre of Europe, with company management equipped with language skills, a high level of telecommunication and international connectivity. As the researched companies were from the sphere of subcontractors to the automotive sector, one of the few disadvantages in this respect is a higher degree of sensitivity to the existence and course of economic recession.

The issue of researching the impact of investment incentives and foreign direct investments on the Czech economy and its fiscal aspect will continue to belong among the key areas of economic research.

Acknowledgements

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VAT as an Indicator of Economic Activity of Regions in the Czech Republic

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Abstract. The paper is focused on an analysis of relationships between GDP, which serves as the indicator of economic activity of particular regions in the Czech Republic, and regional VAT revenues and returns. Firstly, the introduction and literature overview is provided, including VAT taxation aspects in the Czech Republic. The methodology is based on correlation analysis (both the Pearson's and the Spearman's correlation coefficients), using data from official statistics of the Czech Republic. The main idea of the paper is that VAT in particular regions should give us the picture of economic activity of residents and entrepreneurs in these regions. Based on the results, we can say that VAT revenues indicator and its development can give us information regarding economic activity of particular regions and its development. On the other hand, VAT returns indicator is not suitable for the purposes of economic analysis of particular regions.

Keywords: VAT, Macroeconomic indicators, Correlation Analysis, Regions, Czech Republic

JEL Classification: E62, H25, H71, R11

1   Introduction

Focusing on economic activity of particular countries or regions, we can use different indicators as GDP, unemployment, inflation and balance of trade, or their components (consumption, investments etc.). These indicators show us the economic health of particular regions and we can use them to compare the development of particular regions in selected period.

There are many scientific studies dealing with issues of regional economic health and focusing on particular macroeconomic indicators. For example Arhipova and Rudusa (2005) focused on development of territories within countries in transition period, mainly in Latvia. They analysed GDP, unemployment level, the number of economically active enterprises and businesses, nonfinancial investments and the amount of income tax. The results of their research should contribute to strategic cooperation for the improvement of entrepreneurial processes. Martinčík (2008) indicates that the most known reasons for the differences between particular regions can be historically divided to the ways of creation of GDP in particular regions, demographic characteristics, natural conditions, transportation infrastructure and volume of direct foreign investments. Cebula and Clark (2014) provided preliminary analysis for OECD countries and non-G8 OECD nations; they focused their research on study of the impact of economic freedom, regulatory quality and relative burden of taxation on the level of GDP in period 2003 – 2007. They analysed the relationships between the degree of economic freedom and GDP, the level of regulatory quality and GDP and the overall tax burden and GDP. Reshina and Vocish (2011) deal with budgetary policy and inter-budgetary relations at the regional level in Latvia, particularly the taxation capacity (financial potential) across the regions. Szarowska (2011) analysed the effect of tax burden on economic growth in the countries within the European Union. The analysis is performed on a panel data of 24 EU countries in a period 1995 – 2008, methodology is based on panel regression with fixed effects. Author presents statistically significant negative effect of both tax burden and direct tax on GDP growth, moreover negative correlation between corporate income taxes and GDP growth. Folster (2002) focused on relationship between taxation and self-employment, using a panel data from OECD countries and Sweden. He presents a strong negative correlation between the tax burden and the share of self-employed within total employment. Tepperova et al. (2012) deal with the hypothesis that the revenue from taxes that self-employed must pay is affected by macro variables such as change in GDP, unemployment, or the differential in taxation and social security contributions between employees and self-employed. The analysis is based on data from 28 European countries in the period 1995-2009.

Generally, economic theory assumes that the relationship between indirect taxation and economic growth is negative, for example Mendoza et al. (1997); moreover specific excise taxes generate less distorting effects on

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economic growth than the general consumption tax, as stated in Widmalm (2001), focusing on Czech literature Kubátová (2010) and Vítek (2008).

We can see that there is a lack of studies focused on the relationships between particular VAT characteristics and the economic development. In the Czech Republic, VAT is regulated by Act No. 235/2004 Coll., on value added tax (Czech Republic, 2004). The trends in particular tax rates development and fiscal indicators development in the Czech Republic are shown in Table 1. Regarding VAT, tax rates were changed 3-times in the analysed period, moreover reduced tax rate was the highest within the EU countries (Široký et al., 2014).

Table 1: Overview of macroeconomic indicators in period 2005 - 2011.

	2005	**2006**	**2007**	**2008**	**2009**	**2010**	**2011**
VAT rates	5; 19	5; 19	5; 19	9; 19	9; 19	10; 20	10; 20
PTQ - VAT	6.9	6.4	6.3	6.8	6.9	6.9	7.1

Notes: VAT - Value added tax, PTQ – partial tax quota.
Source: Czech Republic (2004), Denis et al., eds. (2014)

As is mentioned in the previous part, there is a lack of studies focused on the relationships between particular VAT characteristics and the economic development. Since the authors are interested in differences between particular regions of the Czech Republic, their economic indicators and economic performance, the main goal of this paper is to analyse relationships between regional GDP and regional VAT revenues and regional VAT returns.

2 Data and methodology

2.1 Data

The main data sources used to analyze relationships between selected indicators of economic activity of regions in the Czech Republic (GDP) and regional tax revenues obtained from taxes imposed on economic activity (VAT) are the following: Czech Statistical Office (CZSO, 2015) and Financial Administration of the Czech Republic (FACZ, 2015). For the purposes of the correlation analysis, the following data are used: GDP in the regional breakdown, value added tax (VAT) revenues in the regional breakdown and number of tax returns of VAT in the regional breakdown.

Figure 1 Development of number of tax returns for VAT.
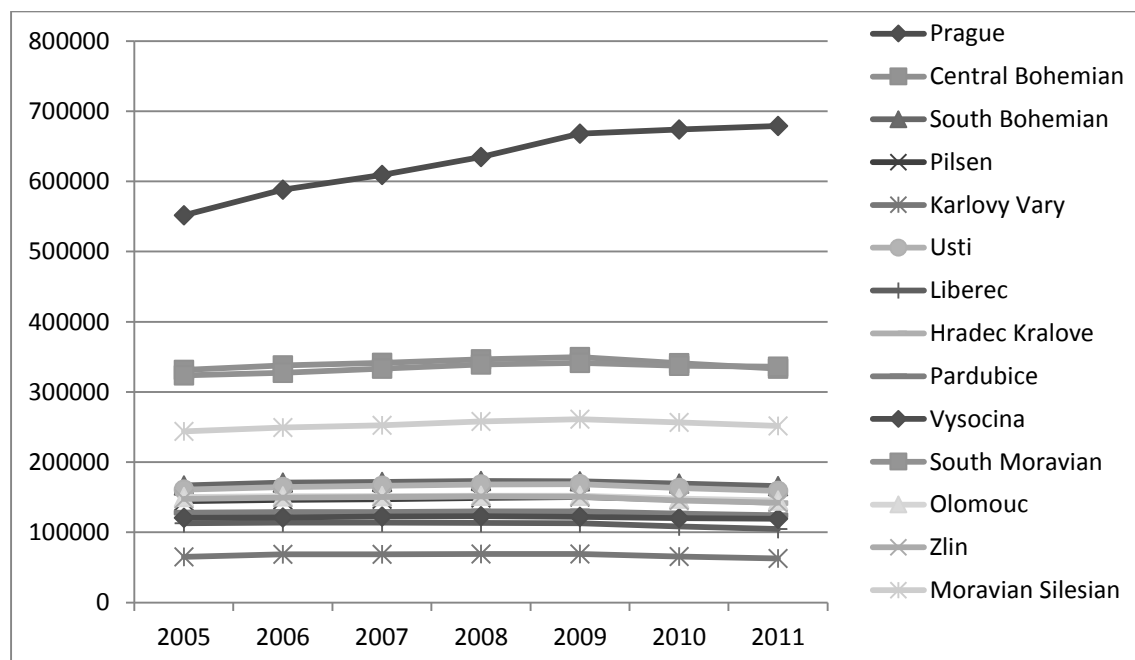
Source: FACZ, 2015; authors.

Figure 1 illustrates the development of number of tax returns for VAT in all regions in analyzed period 2005 - 2011. All of the regions show similar trends in the analyzed period. Exception is Prague, where we can see significant increase between 2005 and 2009 and increasing continued in years 2010 and 2011. Focusing on situation in the other regions, the number of tax returns was declining since 2009.

2.2 Methodology

For the purposes of achieving the main objective of the paper, the authors use the correlation analysis. Thanks to the calculation of the correlation coefficients, the correlations between selected economic indicators and the tax revenues are studied. Correlation coefficients can take the value in the interval $<-1; 1>$, whereas the positive or negative values signal the dependence direction. The absolute value expresses the strength of the dependence. The dependence can be studied as linear (the Pearson's correlation coefficient) or nonparametric (the Spearman's correlation coefficient).

The Pearson's correlation coefficient is defined as

$$r = \frac{\sum_{i=1}^{n}(x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_{i=1}^{n}(x_i - \bar{x})^2 \sum_{i=1}^{n}(y_i - \bar{y})^2}} \tag{1}$$

and the Spearman's correlation coefficient as

$$\rho = \frac{6\sum_{i}^{n}(p_i - q_i)^2}{n(n^2 - 1)}. \tag{2}$$

The modified F-test is used for testing of Pearson´s correlation coefficient. Coefficient is not recalculated to statistic with F-distribution. Recalculated critical value of F-distribution to critical values of correlation coefficient is used:

$$r = \left(\frac{F_k}{(n-2)+F_k}\right)^{\frac{1}{2}}. \tag{3}$$

Hypothesis H_0: $r = 0$ is testing (there is no linear relationship between the studied variables) again the alternative hypothesis H_1: $r \neq 0$ (there is linear relationship between the studied variables (more e. g. Hendl, 2012).

Regarding the testing of Spearman´s correlation coefficient, hypothesis H_0 ($\rho = 0$; there is relationship between variables) is rejected for small selection ($n < 30$), when:

$$|\rho| > r_{s_{\frac{p}{2}}}(n). \tag{4}$$

Z-test hypothesis H_0 can be used for big selection ($n \geq 30$)

$$z = |\rho|\sqrt{n-1}. \tag{5}$$

Alternative hypothesis H_1 is $\rho \neq 0$ (there is relationship between the studied variables).

These correlation coefficients were successfully applied by the authors in their previous research connected with the impacts of particular economic instruments of public economy in the Czech Republic (Zimmermannova, 2012; Zimmermannova and Mensik, 2013) or in research focused on the dependence among various variables - income structure, health and social insurance and personal income tax; GDP per capita, net disposable household income per capita, and the mean gross monthly wage in the Czech regions (Kvicalova et al., 2014).

For the purposes of this paper, the correlation analysis is performed for the period 2005 – 2011 as a whole. Analyzed data set was evaluated as suitable for testing by correlation coefficients; spurious correlation in time series was eliminated by using the first differences.

3 Results

Firstly, we should focus on the relationships between selected indicator of economic activity of regions within the Czech Republic (GDP) and regional tax revenues obtained from taxes imposed on economic activity (VAT), based on linear dependence.

The following Table 2 shows us the results of correlation analysis based on the Pearson's correlation coefficient. The amount of observations was 7 for each indicator and region (from 2005 to 2011).

Focusing on the testing of Pearson´s correlation coefficient, critical value is $r_{(\alpha,n)} = 0.875$ ($\alpha=0.01$; n=7) and $r_{(\alpha,n)} = 0.754$ ($\alpha=0.05$; n=7).

Analysing the relationship between VAT revenues and number of tax returns for VAT, there is low level of correlation coefficients (except of Liberec, South Moravian and Prague, where it applies, $0.915 > 0$; $0.791 > 0$ and $0.772 > 0$). We can see no statistically significant relationship between these indicators. Hypothesis H_0 is confirmed.

Regarding the relationship between VAT revenues and GDP, we can see statistically significant relationship in the most of the regions. The values of Pearson's correlation coefficient are higher than 0.754 in ten of fourteen cases; precisely in 8 regions there is positive correlation coefficient – VAT revenues were increasing and simultaneously values of GDP were increasing in the analyzed period, in 2 regions there is negative statistical significant relationship (Usti and Pardubice) - VAT revenues were decreasing but values of GDP were growing in the analyzed period. It could be caused by movement of the seats of regional companies to other regions for the

purposes of lower frequency of financial controls. There is significant linear relationship between the studied variables and hypothesis H_0 is rejected.

Table 2: The Pearson's correlation coefficients.

Regions	RVAT and NVAT	RVAT and GDP	NVAT and GDP
Prague	0.772∗	0.687	0.898∗∗
Central Bohemian	0.673	0.930∗∗	0.525
South Bohemian	0.240	0.888∗∗	0.476
Pilsen	0.493	0.795∗	0.234
Karlovy Vary	0.058	0.367	0.204
Usti	-0.163	-0.866∗	0.404
Liberec	0.915∗∗	-0.266	-0.456
Hradec Kralove	-0.446	0.960∗∗	-0.397
Pardubice	0.664	-0.806∗	-0.206
Vysocina	0.104	0.572	0.003
South Moravian	0.791∗	0.934∗∗	0.925∗∗
Olomouc	0.102	0.828∗	-0.325
Zlin	0.712	0.984∗∗	0.700
Moravian Silesian	-0.201	0.916∗∗	-0.207

Note: ∗Correlation is significant at the 0.05 level. ∗∗Correlation is significant at the 0.01 level. RVAT means revenues of value added tax, NVAT means number of tax returns for value added tax, GDP means gross domestic product.
Source: authors.

Analysing the relationship between number of tax returns for VAT revenues and GDP, we can say that the Pearson's correlation coefficient is significant only in 2 regions - Prague and South Moravian. Regarding other regions, the values of correlation coefficients are not statistically significant. Hypothesis H_0 is confirmed.

The following Table 3 shows us the results of correlation analysis based on the Spearman's correlation coefficient. The amount of observations was 7 for each indicator and region (from 2005 to 2011).

Table 3: The Spearman's correlation coefficients.

Regions	RVAT and NVAT	RVAT and GDP	NVAT and GDP
Prague	0.929∗∗	0.821∗	0.750
Central Bohemian	0.714	0.893∗	0.393
South Bohemian	0.143	0.857∗	0.500
Pilsen	0.500	0.464	0.000
Karlovy Vary	0.250	0.643	0.607
Usti	-0.107	-0.714	0.536
Liberec	0.679	-0.321	-0.429
Hradec Kralove	-0.143	0.964∗∗	-0.321
Pardubice	0.321	-0.821∗	-0.143
Vysocina	0.179	0.143	0.107
South Moravian	0.536	0.857∗	0.679
Olomouc	0.393	0.750	-0.107
Zlin	0.536	0.964∗∗	0.429
Moravian Silesian	0.179	0.857∗	0.250

Note: ∗Correlation is significant at the 0.05 level. ∗∗Correlation is significant at the 0.01 level. RVAT means revenues of value added tax, NVAT means number of tax returns for value added tax, GDP means gross domestic product.
Source: authors.

Focusing on the testing of Spearman´s correlation coefficient, critical value is $\rho_{(\alpha,n)} = 0.929$ (α=0.01; n=7) and is $\rho_{(\alpha,n)} = 0.786$ (α=0.01; n=7).

Focusing on the Spearman's correlation coefficients and the relationship between revenues and number of tax returns for VAT, the results are similar as in case of the Pearson´s correlation coefficient. There is only one region with statistically significant value of correlation coefficient - Prague. Hypothesis H_0 is confirmed.

Regarding VAT revenues and GDP, there can be visible positive statistically significant relationship. The values of Spearman's correlation coefficient are higher than 0.786 in eight of fourteen regions. Hypothesis H_0 is rejected.

In analyzing of the relationship between number of tax returns for VAT revenues and GDP, we cannot see any statistical significant values of correlation coefficient. Hypothesis H_0 is confirmed again.

4   Discussion and Conclusions

The paper presents the first analysis of possible relationships between GDP, which serves as the indicator of economic activity of particular regions in the Czech Republic, and regional VAT revenues and returns.

The methodology is based on correlation analysis (both the Pearson's and the Spearman's correlation coefficients), using data from official statistics of the Czech Republic.

Based on the results of the correlation analysis between VAT revenues and GDP, it is obvious, that there is statistically significant relationship in the most of the regions – in nine of fourteen regions, precisely in Prague, Central Bohemian, South Bohemian, Pilsen, Hradec Kralove, South Moravian, Olomouc, Zlin and Moravian Silesian. We can say, that the development of VAT revenues in these regions have similar trend as the development of GDP in these regions. Therefore VAT revenues indicator and its development can give us information regarding economic activity of particular regions and its development.

Based on the results of the correlation analysis between number of tax returns for VAT revenues and GDP, there is positive statistically significant relationship only in 2 regions – Prague and South Moravian; however these regions have the biggest amount of VAT returns in the Czech Republic. We can say that VAT returns indicator and its development can give us no information regarding economic activity of particular regions and its development.

It is obvious that the information about amount of VAT returns in particular regions cannot automatically means the information about the economic activity of these regions. The real economic activity of particular regions can be described by more suitable indicator – VAT revenues in particular regions.

As is mentioned above, there are weaknesses of the presented research, based mainly on the differences between official seats of particular companies and the place, where the company really operate. However, the results show that in spite of this situation, there can be significant relationship between some of the analysed indicators. Comparing the results with for example Mendoza et al. (1997), we can say that our results are "the other side of the same coin" – the relationship between indirect taxation and economic growth is negative; however higher regional VAT revenues represent higher economic activity of particular regions, expressed officially by regional GDP indicator.

We can conclude that the regional VAT revenues can serve as an additional source of information about regional economic activity for the purposes of decision making of policy makers on governmental or regional level.

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Tax Capacity and Tax Effort in Visegrad Group Countries and in Old Member EU States

Zdeňka Žáková Kroupová[*] – Josef Slaboch[**]

Abstract. The paper presents the research that estimates tax capacity and tax effort of the Visegrad Group (V4) countries and other member of EU in time period 1993 – 2013. The research is based on a stochastic tax frontier model for panel data. The Battese and Coelli model and random parameters model were estimated by software Limdep 9.0 on the base of fourteen European countries (namely the Czech Republic, Poland, Slovakia, Hungary, Germany, France, Great Britain, Spain, Italy, Belgium, Sweden, Denmark, Finland and Portugal). From the results are evident the following conclusions. The estimates indicate that public expenditures on education have the highest positive impact on tax capacity on average. That is, the more educated people can better understand the relationship between publicly provided goods and taxation. Also government debt has positive effect on tax capacity because the government uses the tax revenue to repay the debt and its interest. On the other hand the effect of inflation is negative. That is the inflation can reduce the real value of tax revenues. All analyzed countries operate almost on the tax frontier.

Keywords: tax effort, tax capacity, European countries, panel data, stochastic frontier model

JEL Classification: B22

1 Introduction

One of important factors for economic growth is the existence of effective tax system. Effective tax systems are essential both for the developing and the developed countries. Considering the fact that budget deficits have grown dramatically in many countries after implementation of simulation packets supporting economic growth in the period 2008-2009, governments were forced to look for possible ways to increase tax incomes for financing of public expenses and reduction of deficit without large distortion of economic activity.

A relatively few works and studies deal with a tax effort. Most of these works uses a cross-section of empirical methods and thereby they ignore changes in time. Lotz a Mors (1967) published one of the first papers to a study of international tax relations whereas as an explanatory variable the gross national product was used and a trade (represented by a relation of export and import per gross domestic product (GDP)). Alfirman (2003) analysed a tax capacity in Indonesia and came to a conclusion that a local government was far from its tax capacity. Thereby they could significantly increase tax incomes. Gupta (2007) used a regression analysis on a panel data and found out that some structural factors, like GDP per inhabitant, a relation of agriculture per GDP, trade openness etc. affect significantly the tax incomes. Pessino and Fenochietto (2010) confirm the foregoing analyses of positive and significant relation between tax capacities and development degree of trade and education. The study also showed a negative relation among tax capacity and inflation, distribution of incomes, difficulty of tax collection and corruption. Pessino and Fenochietto (2010) defined tax capacity as the maximum tax revenue that could be collected in a country given its economic, social, institutional, and demographic characteristics. Tax effort is than a ratio between actual tax revenue and tax capacity.

The aim of the paper is to estimate tax capacity and tax effort of the Visegrad Group (V4) countries and evaluate development of the tax effort and its main determinant. The main research questions are: Is the tax effort lower in the Visegrad Group than in the old EU country members? Did the tax effort increase in Visegrad Group after the accession of V4 countries to the EU? Is the tax effort affected by the income inequality and corruption in V4 countries and are the effect of these determinant same as in the old EU members?

2 Materials and methods

The analysis of tax effort is based on the Stochastic Frontier Analysis (SFA), which was introduced by Aigner, Lovell and Schmidt and Meeusen and van den Broeck in 1977. The SFA is wildly used for measurement of production efficiency, namely technical efficiency. However, there exist a few studies which used this approach also for evaluation of tax effort (e.g. Alfirman (2003), Pessino and Fenochietto (2010), Fenochietto and Pessino (2013), Alm and Duncan (2013), Cyan et al. (2013)). These studies based on panel data assume that tax frontier, represented the maximum level of tax revenue that a country can achieve considering a set of inputs, has a Cobb-Douglas form:

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$$lny_{it} = \beta_0 + \sum_n \beta_n lnx_{nit} + v_{it} - u_{it},\qquad(1)$$

where y_i represents the tax revenue to gross domestic product (GDP) ratio for country i and time t,

x_{it} is the vector of variables affecting tax revenue for country i and time t,

β is a vector of unknown parameters,

u_{it} is the nonnegative technical inefficiency for country i and time t,

v_{it} is the statistical noise for country i and time t.

The tax effort is than defined as the ratio between actual tax revenue to GDP ratio and the corresponding stochastic frontier tax revenue ratio (tax capacity) and has a value in interval <0;1>:

$$TE_{it} = \frac{\exp(\beta_0 + \sum_n \beta_n lnx_{nit} + v_{it} - u_{it})}{\exp(\beta_0 + \sum_n \beta_n lnx_{nit} + v_{it})} = \exp(-u_{it}).\qquad(2)$$

Because the studies also assume that the tax effort can vary in time they used the Battese and Coelli (1992, 1995) models. That is why Battese and Coelli (BC) model is used as a benchmark in our research. On the other hand, Danquah et al. (2013), as well as Green (2005), pointed out that the Battese and Coelli models can provide a biased measure of inefficiency because the estimated inefficiency can captures unobserved productive unit specific factors that are unrelated to inefficiency. In tax frontier analysis, we can face to country specific factors, like legal and political environment that may be inappropriately labeled as inefficiency. To reduce likelihood of this misspecification we use Random Parameter Model (RPM) which allows the function to vary across countries. The detail specification of this model is described in Tsionas (2002), Green (2005) and Danquah et al. (2013).

The main difference between the usage of the SFA in a production analysis and in a tax analysis is the uncertainty of variables included in a frontier model. The determinants of production are very clear. However, there exist a lot of factors that determinate a tax capacity and a tax effort (see Alfirman, 2003). Cyan et al. (2013) mentioned three types of these factors: economic, demographic and institutional. Economic factors contain GDP per capita, trade openness, shares of agriculture in GDP, inflation rate, government debt, income inequality and capital investments. Demographic factors include level of education, age dependency and population density and as institutional factors they include level of corruption, political fractionalization and tax morale. Majority of these factors can be also found in studies of other authors (e.g. Fenochietto and Pessino (2013), Alm and Duncan (2013)). Some authors used also other factors, e.g. Le et al. (2008) added rate of population growth into the demographic factors (similarly Bird et al., (2008)) and bureaucratic quality into institutional factors. However, Pessino and Fenochietto (2010) mentioned that there exist some uncertainty which factors affect tax capacity and which tax effort. From previous study we can assume that tax capacity is depended on economic development, measured by GDP per capita, on inflation, measured by harmonized consumption price index, on level of education, measured by total public expenditure on education as percent of GDP, and on relative weight of government debt. Tax effort is assumed to be influenced by income inequality, measured by GINI coefficient, by rate of population growth and by corruption. The effect of mentioned factors is analyzed by correlation analysis, due to missing value of mentioned measurement in our sample.

Fenochietto and Pessino (2013) mentioned also second difference among usage the SFA in production frontier analysis and in tax analysis. This difference is connected with interpretation of the result. Tax effort contains jointly technical inefficiency and policy issues (differences in tax legislation). That is, the difference between current tax revenue and tax capacity can be interpreted only as the level of unused tax, but not strictly as a measure of tax inefficiency. However, we can find this strict interpretation in study of Cyan et al. (2013).

The BC and RPM models were estimated by software Limdep 9.0 on the base of fourteen European countries (namely the Czech Republic, Poland, Slovakia, Hungary, Germany, France, Great Britain, Spain, Italy, Belgium, Sweden, Denmark, Finland and Portugal) data gained from Eurostat in time period 1993-2013.

3   Results

Results of this work are divided in two subchapters. The first part concerns a basic statistical characteristics of countries V4 (the Czech Republic, Slovakia, Hungary, Poland) and other evaluated EU countries (Germany, France, Great Britain, Spain, Italy, Belgium, Sweden, Denmark, Finland and Portugal) in a time period 1993-2013. The second part of results is created by a model (BC, RPM) of tax effort for all evaluated states – see the chapter 3.2.

3.1   Characteristics of tax capacity and its determinants

Basic characteristics of evaluated indicators are introduced in the following tables. The Table 1 shows values for the countries of "V4" (the Czech Republic, Slovakia, Hungary, Poland), and the Table 2 then the other "evaluated" EU countries. Disparity of these two groups of evaluated countries is in the basic statistics obvious. The most important difference is in an indicator Gross Domestic Product when the countries of V4 have an average 7.57 while the other evaluated states of the EU reach an average value 25.79 per inhabitant. Other very significant difference is in perception of corruption, respectively in a corruption index (set by the agency Transparency

International). The average amount of index in V4 countries is 46 (whereas the value 100 means without corruption, 0 – maximal corruption). Vice versa, other evaluated states have an average corruption value 75.23 (northern countries have steady the corruption index over 90; Spain and Portugal have values significantly lower moving in a range 55 – 64). An interest result is also divergence in indebtedness. While V4 countries have an average debt to GDP 44 % (with a value range 11 – 84 %), the other evaluated states are at average more indebted (67.8 % to GDP, with an extent of values 27 – 131 %). Divergence of both groups of countries is documented also by an amount of expenses for education, and the tax incomes. The expenses for education are at average by 1.2 % higher in other EU countries against V4 countries. Also a share of tax incomes in GDP is higher in these states. In V4 countries, the values moves in a range 28 – 41 % (the average 35.16 %), and in other evaluated EU states the range of tax incomes is 31 – 52 % (the average 42.36 %).

Table 1: Characteristics of V4 countries

Measure	Mean	Std. Deviation	Minimum	Maximum	Cases
Tax revenues [% GDP]	35.16	3.29	28.30	41.00	84
Gross domestic product [PPP, € per inhabitant]	7.57	1.98	4.20	11.70	84
Government debt [% GDP]	44.47	20.80	11.60	84.50	67
Expenditure on education [% GDP]	4.67	0.58	3.61	6.30	82
Harmonised consumer price index [%]	97.24	22.09	46.04	144.85	72
GINI coefficient [%]	27.25	3.13	23.70	35.60	43
Corruption index	46.15	6.22	34.00	60.00	71

Source: Own calculation based on Eurostat data.

Table 2: Characteristics of other countries

Measure	Mean	Std. Deviation	Minimum	Maximum	Cases
Tax revenues [% GDP]	42.36	5.64	31.60	52.10	210
Gross domestic product [PPP, € per inhabitant]	25.79	6.36	12.00	39.90	210
Government debt [% GDP]	67.82	25.94	27.30	131.10	210
Expenditure on education [% GDP]	5.83	1.22	4.23	8.81	194
Harmonised consumer price index [%]	100.03	10.92	77.92	126.10	180
GINI coefficient [%]	29.17	4.18	20.00	38.10	171
Corruption index	75.23	16.07	30.00	100.00	190

Source: Own calculation based on Eurostat data.

3.2   Tax effort and its development

The tax stochastic frontier estimates on the base of Battese and Coelli model (BC) and on the base of Random Parameters Model (RPM) are presented in Table 3. As can be seen, almost all parameters are statistically significant, moreover on 0.01 level of significance (scale parameters for constant and harmonized consumer index are exceptions). From a comparison of estimated parameters, we can conclude that parameters do not differ significantly among these two model specifications, the parameter of harmonized consumer price index (HICP) is the exception. The reason of HICP parameter difference could be found in variability of mentioned variable which is very low compared to the variability of the rest of variables. This is also the reason that scale parameter of HICP is not statistical significant. On the other hand, the size and magnitudes of the rest parameters are robust under different model specifications. The estimates of lambda and sigma are reasonable and statistical significant on 0.1 level of significance.

The estimates indicate that public expenditures on education have the highest positive impact on tax capacity on average. That is, the more educated people can better understand the relationship between publicly provided goods and taxation. The pretty similar influence has also economic development of the country. As we suppose, a high economic development is connected with greater demand for expenditures what is logically accompanied by higher tax payment. Also government debt has positive effect on tax capacity because the government uses the tax revenue to repay the debt and its interest. On the other hand the effect of inflation is negative. That is the inflation can reduce the real value of tax revenues.

The value of lambda suggests that the variability of tax capacity is determined more by variability of tax effort than by the variability of statistical noise. Thus, there is evidence of technical inefficiency in dataset. Comparing BC and RPM models, we can see that lambda is higher in BC model. However, it is more statistical significance in RPM model. That is the RPM represents a lower band of inefficiency estimates compared to the BC model.

Both models do not take account of any cyclic fluctuations and is based on the assumption of no autocorrelation. The analysis of mentioned issue will be done in future research.

Table 3: SFA parameter estimate

	BC			RPM					
				Means for random p.			Scale parameters		
Variable	Coeff.	SE	P [|z|>Z*]	Coeff.	SE	P [|z|>Z*]	Coeff.	SE	P [|z|>Z*]
Constant	3.7744	0.1671	0.0000	3.3043	0.1124	0.0000	0.2264	0.1867	0.2254
LGDP	0.1509	0.0167	0.0000	0.1531	0.0116	0.0000	0.1114	0.0161	0.0000
LGD	0.1159	0.0129	0.0000	0.0945	0.0064	0.0000	0.0243	0.0064	0.0001
LEE	0.1602	0.0351	0.0000	0.1626	0.0316	0.0000	0.3146	0.0432	0.0000
LHICP	-0.2427	0.0328	0.0000	-0.1548	0.0195	0.0000	0.0520	0.0349	0.1370
Lambda	1.7121	1.0241	0.0946	1.4577	0.7662	0.0571			
Sigma	0.1204	0.0054	0.0000	0.0530	0.0067	0.0000			
Eta	0.0114	0.0108	0.2926						
Log-Likelihood	259.57			379.67					

Source: Own calculation based on Eurostat data.

The statistic characteristics of tax effort estimates for analyzed two groups of countries based on BC and RPM models are presented in Table 4. The mean values of tax effort calculated on the base of RPM are higher than in the case of BC model. It confirm the hypothesis that BC model overestimate inefficiency.

Evaluating tax effort calculated on the base of RPM, we can conclude that the mean value of tax effort is higher in the old EU members and has similar value before and after the year 2004 in these countries. On the other hand, the variability of tax effort in the old EU member slightly increased in the second analyzed period, as the minimum value decreased. This was caused by three percent points decrease of Germany tax effort in the year 2010. This year a slight reduction of tax duty happened in Germany (enlargement of tax brackets). The decrease of tax effort can be recognized also in V4 countries. However, this was caused especially by low data availability of Poland and Slovakia. Focus only on the Czech Republic and Hungary, where dataset is complete, we can see almost one percent point increase of the mean value of tax effort after the accession to the European Union.

Table 4: Tax effort estimate

		Tax effort - BC				Tax effort - RPM			
		Mean	Stand. Dev.	Min.	Max.	Mean	Stand. Dev.	Min.	Max.
V4	1993-2004	0.932	0.043	0.867	0.969	0.963	0.018	0.928	0.984
	2005-2013	0.930	0.043	0.867	0.972	0.957	0.034	0.879	0.990
Others	1993-2004	0.872	0.074	0.758	0.972	0.968	0.010	0.945	0.989
	2005-2013	0.889	0.065	0.776	0.975	0.968	0.012	0.929	0.989

Source: Own calculation based on Eurostat data.

Based on our dataset we can conclude that the accession to the EU had a positive impact on tax effort in the Czech Republic, Hungary and in Slovakia when we analyzed also the results of BC model. However, the increase was not immediate in all mentioned countries. Exactly, the Hungarian tax effort slightly decreased in 2005 and 2006 and significantly increased in 2007 (5 percent points in comparison to 2006). In 2007 in Hungary, a tax for legal entities was increased by 4 % to total 20 % (so called solidarity tax). Development of the tax effort in the Czech Republic seems pretty stochastic. The years of increased were followed by the years of decreased (2006, 2008, 2009). However, the last three years can be characterized by the slight year-on-year increase.

The statistical characteristics of tax effort RPM estimates for each of analyzed countries are presented in Table 5. All analyzed countries operate almost on the tax frontier. Slovakia is the country with the lowest value of tax effort. On the 1st January 2004, a tax system came in force in Slovakia in which equal tax was implemented in amount of 19 % for a personal income tax and a corporate tax. The low rate of the corporate tax was already since 2004one of the reasons of inflow of foreign investment in Slovakia and economic growth of the country. Before an economic crisis Slovakian economy showed one of the highest economic growths of the EU countries.

On the other hand, Portugal is the country with the highest mean value of tax effort. However, the absolutely highest value of tax effort was gained by Hungary in 2013. Portugal was significantly affected by an economic crisis which showed itself in growth of tax burden for inhabitants. Provided financial injections projected in governmental cuts and in tax increase. For example in 2012, the government rapidly increased income taxes – from 9.8 % to 13.2 % to overcome budget deficiency. It also increased VAT rate from 19 to 20 % and other accompanying taxes were implemented.

Table 5: Country specific tax effort estimate - RPM

Country	Czech Republic	Slovakia	Poland	Hungary	Germany	France	Spain	Great Britain	Portugal	Belgium	Italy	Sweden	Denmark	Finland
Mean	0.968	0.885	0.971	0.964	0.965	0.970	0.967	0.969	0.973	0.971	0.971	0.969	0.966	0.968
St. Dev.	0.015	0.009	0.005	0.021	0.015	0.007	0.014	0.008	0.007	0.007	0.011	0.009	0.014	0.014
Min.	0.940	0.879	0.964	0.928	0.929	0.957	0.938	0.948	0.963	0.956	0.944	0.952	0.947	0.935
Max.	0.984	0.897	0.975	0.990	0.986	0.981	0.989	0.978	0.981	0.979	0.984	0.984	0.987	0.989

Source: Own calculation based on Eurostat data.

The tax effort vary in the analyzed time period, especially in the Czech Republic, Hungary, Germany, Spain, Italy, Denmark and Finland. Table 6 presents correlation coefficients of tax effort and its determinant. The correlation coefficient of tax effort (based on RPM) and time is negative in V4 as well as the old EU countries. Thus, we can conclude that tax effort decreases in the analyzed time period and the countries have been moving away from their tax frontier since 1993. The decrease is slightly more pronounced in V4 than in the old EU countries. The correlation coefficients of income inequality and corruption have positive values in V4 countries, however these coefficients are negative and statistically insignificant in the old EU member. This divergence can be caused by the uncompleted dataset. The corruption index measured the risk of corruption, with larger value meaning lower risk. So the positive value of correlation coefficient seems to be reasonable. On the other hand the higher value of Gini coefficient means the higher inequality in society. Finally, we can conclude that the corruption and its political implications are the significant determinants of the development of tax effort.

Table 6: Tax effort correlation - RPM

		Gini	Corruption	Time
V4	TERPM	0.1103	0.4734	-0.1853
Others	TERPM	-0.0177	-0.0760	-0.1768

Source: Own calculation based on Eurostat data.

4 Conclusions

The paper analysed situation in two groups of countries – V4 and other EU countries. We can conclude that these groups differ especially in the gross domestic product when V4 countries have the average 7.57 while the other evaluated states of the European Union reach the average value 25.79 per inhabitant. Other very significant difference is in perception of corruption, respectively in the corruption index. The average corruption index in V4 countries is 46. The other evaluated states have the average value of corruption index 75.23. An interesting result is also a divergence in indebtedness. While the V4 states have the average debt to GDP 44 % (with the extent of values 11 – 84 %), the other evaluated countries are at average more indebted. The divergence of both groups is documented also by the amount of expenses for education, and tax incomes. The expenses for education are at average by 1.2 % higher in other EU countries in comparison with V4 states. Also the share of tax incomes in GDP is higher in these countries. In V4 states, the values move in the extent 28 – 41 % (the average 35.16 %) and in other evaluated EU countries the range of tax incomes is 31 – 52 % (the average 42.36 %).

The estimates of SFA indicate that public expenditures on education have the highest positive impact on tax capacity on average. That is, the more educated people can better understand the relationship between publicly provided goods and taxation. Also government debt has positive effect on tax capacity because the government uses the tax revenue to repay the debt and its interest. On the other hand the effect of inflation is negative. That is the inflation can reduce the real value of tax revenues.

The mean value of tax effort is higher in the old EU members than in V4 countries. However, the development of this measure is negative in the analyzed time period. Focus on the Czech Republic and Hungary, the mean value of tax effort increased, especially after the accession to the European Union. That is, the accession to the EU had a positive impact on tax effort in V4 countries. All analyzed countries operate almost on the tax frontier. Slovakia is the country with the lowest value of tax effort. On the other hand, Portugal is the country with the highest mean value of tax effort. However, the absolutely highest value of tax effort was gained by Hungary in 2013.

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Deferred Tax Presentation in Financial Statements of Listed Companies at the Prague Stock Exchange

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Abstract. Deferred tax is provided in full on temporary differences that arise between the carrying amount of assets and liabilities for financial reporting purposes and their corresponding tax bases. Based on information from financial statements of listed companies at the Prague Stock Exchange, this paper brings analyses of frequently presented deferred tax assets and deferred tax liabilities either on face of financial statements or in the notes. Paper compares disclosed information from financial statements of listed companies at PSE with requirements on deferred taxes in the Czech Accounting Standard.

Keywords: Deferred taxes, tax base, disclosure of deferred taxes.

JEL Classification: H25

1   Introduction

Deferred taxes were introduced into the Czech accounting rules in late ninetieth and the whole procedure was rather limited as for the accounting entities referred to and as for the scope of timing differences giving rise to deferred taxes too.

Regulatory guidance for accounting contented procedures concerning deferred taxes, where only those entities in a group were accounted for deferred taxes. Moreover, only the differences between taxable income and accounting profit arising from any different between tax and accounting depreciation of both tangible and intangible long-term assets were title for deferred tax recognition. This was rather unique situation and it was criticised by accounting practitioners (Žárová 2011). Despite the fact that method for deferred taxes wasn´t determined in the accounting rules exactly, this could be deduced as income statement liability method from the recognition of timing differences and the applicability of future tax rates. Moreover, the outcome deferred tax asset or deferred tax liability was presented in the balance sheet either as a current asset or a current liability only. On the other hand, deferred tax asset was to be recognised only if there were no doubts about its future utilisation as the consequence of the principle of conservatism.

Since 2001, the scope of deferred tax accounting was broadened and encompassed not only the timing differences arising from different tax and accounting depreciation, for which the recognition was compulsory, but also from other sources. Radical change in deferred taxes requirements was introduced into the Regulatory guidance, Provision of MF No. 281/89 759/2001, since January 2002. Recognising deferred taxes became mandatory for accounting entities which had to have their financial statements audited. The second major change in deferred taxes methodology has been realized. There was move from the income statement method to the balance sheet liability one, and therefore timing differences were enriched by another group of titles for deferred taxes, temporary differences. Temporary differences represent difference between carrying amount of assets and liabilities for financial reporting purposes and their corresponding tax bases. New method, in compliance with IAS12, balance sheet liability method was introduced into Decree, which is in force since 2003. Despite the fact that method was correctly introduced into the Decree, the mechanism of method wasn´t either described. On the other hand, there is a stress on the fact that the calculation of deferred tax shall be based on the liability method arising from the balance sheet approach and other important rule was introduced, first-time application. Under the first-time application, an entity has to divide the resulting amount of deferred tax into two parts depending on their relation to the current and prior periods. Since 2002, deferred tax assets and deferred tax liabilities balances were moved from current assets and current liabilities into long-term liabilities. Finalization of deferred taxes regulation toward the IAS12 requirements was awaited when the Czech Accounting Standard on deferred taxes was issued.

Expectation hasn´t been met. Definitions of terms are not introduced into the Standard while procedure on calculation of deferred tax asset or deferred tax liability calculations are introduced. Standard introduced the rule that accounting entity shall always account for a deferred tax liability while deferred tax asset recognition should be realized under the prudent concept consideration. However reassessment of once unrecognised deferred tax assets settled is not introduced either to Standard or to the Decree (Žárová et all, 2009). The standard states that "deferred tax shall be computed on all temporary differences resulting from a different accounting and tax treatment of items shown in the books of account", but there isn´t implication of any exception from this rule. Among other shortages in deferred taxes regulation like recalculation of account´s balances and restatement of

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financial statements when tax rate is altered, goodwill recognition, prohibition of discounting treatment, those weren´t eliminated by Standard, there is absence in manner and scope of deferred tax disclosure.

Paper focuses on two aspects of deferred tax data research. This paper brings overview analyses of frequently presented deferred tax assets and deferred tax liabilities either on face of financial statements or in the notes in annual reports of listed and registered companies on the Prague Stock Exchange, on prime market. Secondly, paper quantifies deferred tax assets and deferred tax liabilities under prudence principle consideration.

2   Literature overview and methodology

Not a lot of research articles from abroad concern deferred tax disclosures. One of useful text is written by Astrid K. Chludek (*2011*), where she provides the first value relevance analysis of deferred tax disclosures under IFRS/IAS and shows that investors generally do not consider deferred taxes to convey relevant information for assessing firm value, with the exception being large net deferred tax assets. Recent discussion paper on deferred tax disclosures in Germany was developed by Evers (2014). Gordon (2004) examines whether U.K. managers use the flexibility provided under the partial method for deferred taxes to measure unrecognized deferred taxes opportunistically. One implication of the results is that the recent U.K. standard change eliminating the partial provision method for deferred taxes potentially has reduced the usefulness of deferred tax disclosures. As a framework for discussed topic, there could be used paper on ''Voluntary Corporate Disclosure by Swedish Companies'', written by Cooke (1989). This paper reports on the extent of voluntary disclosure in the corporate annual reports of unlisted and listed Swedish companies. In addition, the paper assesses whether there is a significant association between a number of independent variables and the extent of disclosure.

In the Czech research literature, serious criticism is concerning the goodwill as goodwill is completely omitted in Czech Accounting Standard. The topic of goodwill is important and for the purpose of goodwill recognition IAS 12 should be implemented. However, the rules stated in IAS 12 does not permit the recognition of the resulting deferred tax liability because goodwill is measured as a residual and the recognition of the deferred tax liability would increase the carrying amount of goodwill (Pelák, 2009). Still, the reasoning of IAS 12 that goodwill was a residual and any increase in its carrying amount, resulting from the recognition of a deferred tax liability, would not have been appropriate, is understandable and with the related goodwill definition also conceptually defendable (Filinger, 2009). Recognition of goodwill in Czech accounting differs from IFRS approach and deferred taxes arise from business combination are not allowed to be account directly to goodwill, but in compliance with Czech Accounting Standard, into acquiree's equity. Fair value adjustments and revaluation of assets in a business combination or capital investment will give rise to differences which will result in a deferred tax (Skálová 2009). The carrying value of assets shall be increased to the fair value but the tax base shall remain in the amount computed according to the original acquisition cost. Where differences in respect of such assets arise, the accounting entity shall include them in the calculation of deferred tax in the following way.

For the purpose of quantifying qualitative data, content analysis was used. In order to collect data for deferred tax assets and liabilities determination ratio to balance sheet total, annual reports of listed and registered companies on the Prague Stock Exchange (PSE) were used. Data were collected from the published companies´ annual reports manually, within two subsequent years 2012-2013, on prime market at PSE. Ratio of deferred tax assets and liabilities to balance sheet in 2012 and 2013 were in separate graphs realized. Qualitative analysis in order to determine different deferred tax components of deferred tax assets and liabilities in notes to financial statements concerning deferred tax assets and liabilities was used in the second part of research task.

3   Discussions and results

Deferred taxes are regulated by the Czech Accounting Standard on deferred taxes. Main shortages were overviewed in the introduction of this article. Among shortages in deferred taxes regulation in the Czech Republic, there is absence in manner and scope of deferred tax disclosure. In order to improve procedures in deferred tax disclosure regulation, research observed ''best practice'' procedures used in financial reporting. Best practise is represented by accounting information based on IFRS. As companies listed on European financial market are obliged to prepare their consolidated financial statement in compliance with IFRS, research focused on companies listed at PSE. For the purpose of research, paper compares disclosed information from financial statements of listed companies at PSE with requirements on deferred taxes in the Czech Accounting Standard. At first, paper quantifies deferred tax assets and deferred tax liabilities under prudence principle consideration. Secondly, paper analysed data collected from face of the balance sheet and notes to financial statements and determines different deferred tax components of deferred tax assets and liabilities in notes to financial statements in order to recognize most frequent components to be disclosed.

4   Quantification of deferred tax assets and deferred tax liabilities

Accounting entity shall always account for a deferred tax liability while deferred tax asset recognition should be realized under the prudent concept consideration. Assessment of deferred tax asset and deferred tax liability in compliance with this concept was introduced into Czech Accounting Standard on deferred taxes. Consider prudence concept, there might be higher amount of deferred tax liabilities than assets. For the purpose of quantification of deferred tax assets and deferred tax liabilities, data from annual reports of 13 listed and registered companies on the Prague Stock Exchange (PSE) were used. Research period was determined from January 2012 till December 2013. Besides quantification of deferred tax liability and deferred tax asset, another research aspect was determined. It might be interesting to recognize whether deferred tax asset and deferred tax liability recognition on face of balance sheet is because of materiality concept. For the purpose of materiality consideration, ratio of deferred tax assets to balance sheet total and ratio of deferred tax liabilities to balance sheet total were constructed.

Overview of ratios of deferred taxes to balance sheet total for listed companies on PSE, in percents, is in the Table 1.

Table 1: **Ratio of deferred taxes to balance sheet total in %**

Company Name	2012	2012	2013	2013
	Ratio of deferred tax assets to balance sheet total (%)	**Ratio of deferred tax liabilities to balance sheet total (%)**	**Ratio of deferred tax assets to balance sheet total (%)**	**Ratio of deferred tax liabilities to balance sheet total (%)**
1.Borealis	2.748	4.197	2.498	3.437
2.CETV	0.254	2.394	0.044	0.047
3.ČEZ	0.110	3.431	0.128	2.998
4.Erste Group Bank	0.328	0.161	0.335	0.079
5.Fortuna	1.171	0	0.744	0
6.Komerční Banka	0.004	0.695	0.004	0.404
7.NWR	0.511	0.502	0.910	0.088
8.O2 C.R.	1.183	4.040	0.563	3.698
9.Pegas Nonwovens	0	3.386	0	3.679
10.TMR	0.01	4.078	0	5.469
11.Unipetrol	0.606	0.761	0.106	0.799
12.VGP	0.045	1.914	0.036	0.320
13.VIG	0.355	0.535	0.218	0.398

Source: Author's own research according to http://www.pse.cz/Kurzovni-Listek/Oficialni-KL

Data collected from annual reports of listed and registered companies on the Prague Stock Exchange bring a proof of prudence concept. Analysis of published data assessed that there is higher amount of recognized deferred tax liabilities over deferred tax assets in compliance with prudence concept.

Considering materiality, ratio of deferred tax assets to balance sheet total and ratio of deferred tax liabilities to balance sheet total were constructed. Investigated companies bring evidence, that ratio of deferred tax assets to balance sheet total and ratio of deferred tax liabilities to balance sheet are immaterial in majority of companies. As listed companies were analysed, and recognized deferred taxes were immaterial, there should be consider different aspect of disclosure deferred taxes on face of balance sheet. Companies listed on European stock exchanges have obligation to prepare their consolidated financial statements in compliance with IFRS, where disclosure of deferred taxes is a result of IFRS requirement, respectively IAS12 not realization of materiality.

In two subsequent years, 2012 and 2013, ratios of deferred taxes to balance sheet total for listed companies on PSE were constructed. Figure 1 represents ratios of deferred taxes to balance sheet total for listed companies for accounting period covering year 2012, Figure 2 data for year 2013.

Figure 1: Deferred tax assets and deferred tax liabilities on face of balance sheet at the end of 2012
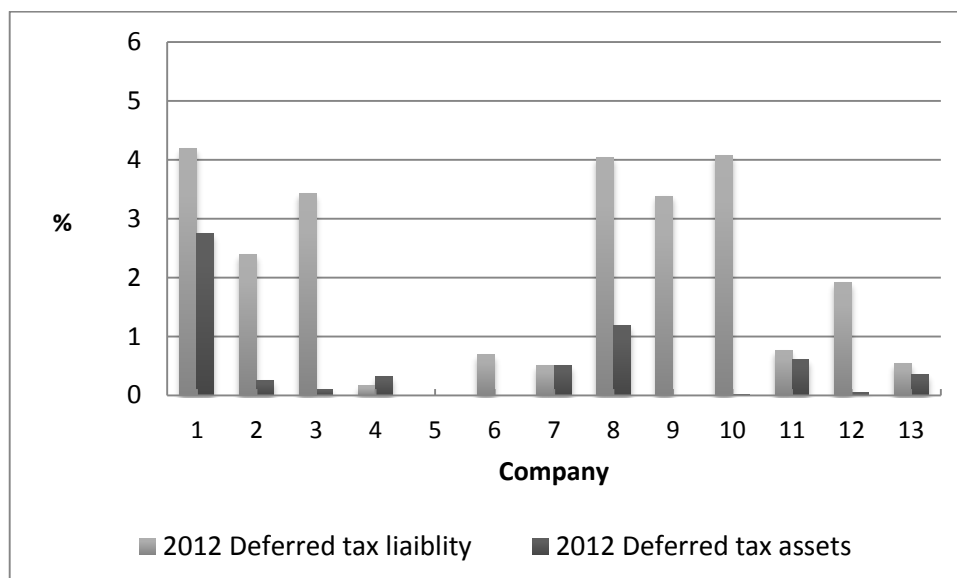
Figure 2: Deferred tax assets and deferred tax liabilities on face of balance sheet at the end of 2013
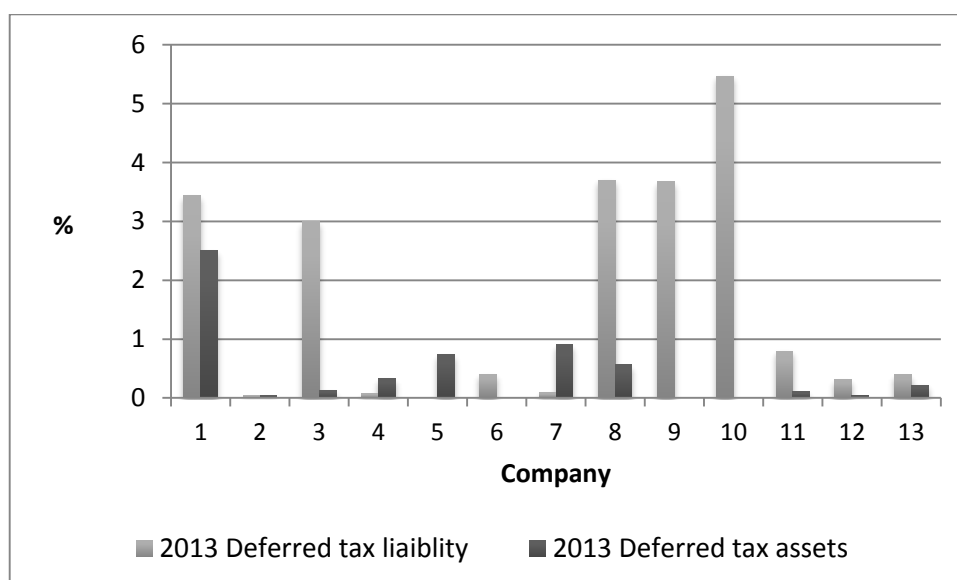
5   Deferred tax assets and deferred tax liabilities decomposition

Paper analysed data from 13 companies listed and registered on PSE at the balance sheet day during the period 2012 - 2013 and brings closer view at components of deferred taxes disclosed in annual reports. In spite of the fact that all 13 observed companies disclosed deferred taxes on face of balance sheet, 2 companies haven´t provided detailed information on components of deferred taxes in notes. Table 2 represents most frequent components of deferred taxes.

Table 2: Deferred tax assets and liabilities decomposition

Items	Deferred tax assets	Deferred tax liabilities	Both	Total
other temporary differences	4	1	3	8
tax loss carry forwards	3		3	6
intangible assets	1		4	5
investment			1	1
derivatives		1		1
revaluation of financial instruments	2	1	2	5
loan to other institutions and advances	1			1
amortization of investment in subsidiaries	1		1	2
leases		1	1	2
property, plant , equipment	1	4	5	10
accumulated provision	1			1
inventories	2			
receivables		1	2	3
unrecorded deferred tax asset	2		2	4
financial assets - available for sale	1			1
re-measurement of retirement benefits plan	1	1		2
revaluation of hedging derivatives	1	1		2
revaluation of available-for-sale financial assets	1	1		2
currency translation			1	1
reserves		1	1	2
impairment adjustments and provisions		1		1
financial liabilities at amortized cost	1	1		2
other provisions	2	1	2	5
banking provisions and allowances		1	1	2
non-banking provisions	1		1	2
long term employee provisions	1			1
sundry provisions	1		2	3
other liabilities			1	1

Source: Author's own research according to http://www.pse.cz/Kurzovni-Listek/Oficialni-KL.

Table 2 represents sample of 13 listed companies and provides overview how frequently different deferred taxes are reported in financial statements and disclosed in notes. Most frequently reported component relating to: property, plant and equipment, intangible assets, revaluation of financial instruments, other provisions and tax loss carried forwards. In 8 observations, companies disclosed deferred taxes as other temporary differences without detailed decomposition of items. Deferred taxes information disclosed in notes is in compliance with disclosure requirements in ISA12.

6   Conclusions

The topic of deferred taxes were introduced into the Czech accounting rules in late ninetieth but the whole procedure was rather limited and unmethodical. Finalization of deferred taxes regulation toward the IAS12 requirements was awaited when the Czech Accounting Standard on deferred taxes was issued. Despite the fact that Czech Accounting Standard on deferred taxes is in force since 2003, as amended, the standard hasn´t been modernized for last twelve years and suffers from shortages. Among important shortage, there could be found disclosures´ requirements of deferred taxes. In order to improve procedures in deferred tax disclosure regulation, research observed "best practice" procedures used in financial reporting which is represented by accounting information based on IFRS. Research therefore focused on companies listed at PSE. For the purpose of research, paper compares disclosed information from financial statements of listed companies at PSE with requirements on deferred taxes in the Czech Accounting Standard. Paper firstly quantified deferred tax assets and deferred tax liabilities under prudence principle consideration. Then paper analysed data collected from face of the balance sheet and notes to financial statements and determined different deferred tax components of deferred tax assets and liabilities in notes to financial statements in order to recognize most frequent disclosed components.

Based on 13 annual reports of companies listed on PSE, this paper quantified deferred tax assets and deferred tax liabilities under prudence principle consideration and shows that even immaterial amounts of deferred taxes are recognized on face of balance sheet because of important impact of deferred taxes on equity. Further paper analysed collected data either from face of the balance sheet or notes to financial statements and determine different deferred tax components of deferred tax assets and liabilities. Decomposition of data brought view on trends in disclosure of deferred taxes and might become a fundamental for discussion to change the scope of the Czech Accounting Standard No.003, Deferred taxes.

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