



Tax Revenues in the Context of Economic Determinants

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ABSTRACT

Despite the general recognition that taxes are generally a strong policy tool for assessing the macroeconomic impact of the country's alternative tax policies, taxes are often weakened by restrictions on tax revenue measurement. The aim of the contribution is to quantify the impact of selected macroeconomic indicators (gross domestic product, level of employment, public debt, foreign direct investments, effective tax rate, statutory tax rate) on the total amount of tax revenues, taking into account the tax competitiveness of the 28 EU member states. There was used methods of three models of regression analysis: the pooling model, the fixed effects model and the random effects model. The hypothesis that the gross domestic product has the greatest impact on tax revenue has been tested. In conclusion, the analysis confirmed that the strongest correlation is between tax revenues and employment rate. Followed by foreign direct investment and gross domestic product. Increasing these determinants by 1 mil. € (increase in employment by 1%) would increase tax revenues by 10 072 mil. € at the employment rate, by 383.1 thousand € for gross domestic product and by 434.2 thousand € for foreign direct investment.

INTRODUCTION

Corporate taxes represent the driving force of the economy which makes individual countries more attractive for investment. It helps creating new jobs and ultimately increase welfare in the country and brings sufficient tax revenues to national budgets. However, it is not easy to determine its optimal level. Lower taxes attract investors, but higher taxes bring higher revenues to national budgets. Even when high taxes are linked to tax avoidance. When assessing corporate taxes at European Union level, it has to be said that despite the existence of free trade and the common currency, there are 28 different tax systems with different levels of corporate taxation. Governments have to seriously address the issue of tax harmonization and coordination of EU tax policies to maintain economic progress and stability. There is a contradiction. On the one hand, it is the duty of the Member States to comply with the legal norms and acts in force in the EU. On the other

hand, countries are trying to maintain their current position in the field of tax policy with respect to other countries. It is important that all harmonization measures lead to sufficient tax revenues in each country.

Taxes are in general considered as a relevant policy tool, which significantly influences macro-economic outcomes of tax policies braked by some limits and those are tax rates. Statutory tax rates of corporate taxation are key element within a pack of stimulus and restrictions, which influence and direct economic decisions of investors. Besides that, they are indispensable for development of quantitative applications in theory and help transform theory as a tool for policy making. In theoretical diameter there are vivid discussions about profit of companies, good conditions and optimal taxation (Lucasa, 1991, Cooley and Hansen, 1992, Mendoza and Tesar, 1994), which are depending on characteristics of taxation policies in particular countries. Measurement of tax revenues from the point of macroeconomic models proved to be very difficult because statutory rates of corporate tax, which are by taxation one of the deciding tools, come from big amount of information about given country, its taxation system, taxation policy, taxation stimulus, as well as its investment projects in certain fields (Frenkel et al., 1991, Bulter, 1981, Aschauer and Greenwood, 1985, Pissarides, 1985, Frenkel and Razin, 1986, Greenwood and Huffman, 1991, Rebel, 1991, Baxter et al., 1993).

Kawano and Slemrod (2016) dealt with a correlation that expresses the relationship between corporate tax rates and tax revenues for OECD countries between 1980 and 2004. They found that raising implicit tax rates maximizes corporate profits. Claude (2007), Devereux et al (2002) and Devereux and Griffith (1998) also discussed this dependence. The authors have presented the result of their research is the fact that higher tax rates increase tax revenue. We can observe a negative two-way relationship between the tax rate and tax revenue. The tax rate has a negative dependence on investment. The higher the corporate tax rate is, the more negative the impact on the investment has further increasing. The statutory rate is the easiest and most accessible way to gather information about the country, but certainly not the only criterion.

As reported by Bayer (2012), Gupta (2007) Bird et al. (2008), it is important to monitor the total tax burden that represents the level of corporate taxation or in the other words, the share of tax on the total income or profits of the company in that country. Even though the legislation sets the basic (in some countries a reduced tax rate too), which is the same for all companies, it is necessary to monitor the tax burden in a wider perspective. It is precisely the inappropriateness of using statutory rates as an objective indicator in tracking and then comparing the corporate tax rate to deriving an effective tax rate that has a significantly better disclosure ability, McKenzie et al. (1997) Barrios et al. (2014). The effective tax rate is expressed by the actual tax rate of the income and an increase of this tax rate predicts higher tax revenue.

Lucas (1990, 1991) and Razin et al. (1993) suggested alternative method of taxation, which creates effective tax rates based on data about real tax payments and national accounts. This method takes into consideration effective system of taxation, gross tax charging resulting from primary taxes, and produces measures of tax rates, which are in line with conception of gross tax rates on national level. Consequential tax rates are capable to get close to happenings, which do not disrupt economic decision making in dynamic macroeconomic conditions.

Tax rates are an important segmentation criterion that indirectly affects tax revenues and the economic performance of countries. We express it as a gross domestic product or GDP per capita. Foreign direct investment, inflation rate, unemployment, and public debt are the other criteria. Besides tax rates, the crucial segmental criteria is economic forwardness of the country, in terms of gross domestic product or HDP per capita (Castro and Camarillo 2014, Gupta, 2007, Pessino and Fenochietto, 2010 and Livermore 2004). Stated authors, within the scope of economic analysis, dedicated to examination of dependence between GDP and tax revenues. In their thesis they showed, that increase of profit positively influences the growth of GDP. Within analysis they were counting on model, which assumes unitary elasticity between tax basis (profit of firms) and explain-

ing variable and so nominal GDP. The result of the analysis is the fact that growth of profit in monitored time was direct proportionally equal with tempo of GDP growth.

They conclude that tempo of increase of tax revenue shouldn't significantly overstep the tempo of GDP growth. The influence of GDP on revenue of corporate tax by the means of different analysis examined more authors: Kubátová and Říhová (2009), Bayer (2011), Bánociová and Pavlíková (2013), Simionescu et al. (2016), Karnitis and Karnitis (2017). Through panel regression analysis, the positive bilateral relationship between GDP and tax revenues was claimed.

The research results suggest that demographic change in the EU countries is affecting tax revenues (Goudswaard and van de Kar (1994), Al-Mamun, Entebang, Mansor and Yasser (2014), Hasseldine (1999), Devos (2008), Felix and Watkins (2013). Total tax revenue will increase with the overall population growth in most countries. According to Goudswaard and van de Kar (1994), tax revenues will increase with population growth and an increase of the relatively older workforce. His forecasts indicate that after 2030 revenues will decline as a result of the declining population and the rapidly aging population.

Kennedy, McMillen and Simmons (2015) point to the positive relationship between employment growth and revenues from corporate tax. At the same time, they point out that the high level of unemployment is in a negative correlation with the tax rate, so governments have to stimulate the economy at a time of economic downturn with lower tax rates. Schweltnuss and Arnold (2008) assess the impact of the negative dependence between domestic and foreign investment and the corporate tax rate. This negative dependence was also confirmed at the industrial level. An important role was played by the specific tax rate for corporations.

The higher the corporate tax rate is, the more negative is its impact on the future growth of the investment. A similar view is expressed by Abbabs and Klemm (2012), who note that excessive tax increases, which are linked to the increase in tax revenues, reduce the inflow of foreign investment and vice versa. The lower rates mean the increase the inflow of foreign investment. The state budget and the public debt balance are other macroeconomic indicators that monitor the government's ability to effectively manage state budget resources and have a direct impact on the state's fiscal policy (Dráb and Mihóková, 2013).

Impact on debt, tax systems, primary expenditures and tax competition was given by Krogstrup (2002) as part of the European Central Bank study. He focused on the causality between tax burden and fiscal imbalance. Osterloh and Heinemann (2013) concluded that other socio-economic and geographic factors form the support of the minimum corporate tax at member state level are also important. These factors included political affiliation, individual characteristics and educational level as well as national interests.

1. RESEARCH METHODOLOGY

1.1 Regression Analysis

The aim of the submission is to monitor the influence of macroeconomic determinants on the amount of tax revenues. Conducted analysis quantified the influence of chosen indicators on gross amount of tax revenues for 28 member states of European Union. Data was structured as panel data from Eurostat data base (2015) and analysis was conducted in statistical program SAS Enterprise Guide 7.1 Davis (2007).

Considering the significant differences in macroeconomic markers between the countries, the analysis was conducted specifically for 5 economically most advanced countries (Germany, United Kingdom, France, Italy, Spain) and specially for 23 countries (Belgium, Denmark, Finland, Greece, Netherlands, Ireland, Luxembourg, Portugal, Austria and Sweden. 13 new member states were:

Bulgaria, Cyprus, Czech Republic, Estonia, Croatia, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovakia and Slovenia). Selection of markers was influenced by theoretical scopes of authors Karagöz, (2013), Hansson, Porter and Williams, (2012), Stratil, (2009), Gupta, (2007) and Kubátová and Říhová, (2009), which followed big amount of determinants influencing the volume of tax revenues lapsing to budget.

Degree of impact of these factors differed depending on intensity of relationship between respective variables. In the submission, the analysis was examined by panel regression, which in their thesis were used by Hsiao et al. (2006) and Boubtane et al. (2013), while:

- dependent variable:
 - TR - total tax revenues from direct and indirect taxes at current prices in mil. €,
- independent variables:
 - STR - nominal (statutory) corporation tax rate in %,
 - ETR - effective corporation tax rate in%,
 - GDP - gross domestic product at current prices in mil. €,
 - LoE - employment rate as a share of employees aged 15-64,
 - IN - the rate of inflation, measured on the basis of the harmonized index of consumer prices,
 - PD - public debt as debt-to-GDP ratio in %,
 - FDI - direct foreign investments as the ratio of FDI inflows and outflows at current prices in mil. €.

The general panel model was defined as:

$$y_{it} = \alpha + \beta_{it}^T x_{it} + u_{it} \quad (1)$$

where y_{it} is a dependent variable (total tax revenue), x_{it} is a vector of explanatory variables (HDP, employment rate, inflation rate, public debt, direct foreign investments, a statutory and effective tax rate), $i = 1, \dots, n$ is the index of country in question, $t = 1, \dots, T$ is time index a u_{it} is a model error with a mean value equal to 0.

Three models were used in the analysis: pooling model (PM), fixed effects model (FEM) and random effects model (REM). Pooling model provided an undistorted and effective estimate in the case of statistically insignificant individual errors. If individual errors were correlated with one of the explanatory variables estimates of pooling patterns and random effects were distorted, and it was required to use fixed effects model. The statistical significance of the individual components was tested using the poolability of the F test. For testing of the statistical significance of individual effects and time effects was used Lagrange multiplier test and F test based on comparison of pooling and fixed effects models. To compare the suitability of using two different model specifications and two different estimators during the analysis we have used the Universal Hausman test.

1.2 Finding Dependencies Between Variables

In the first step of analysis, the basic numerous characteristics of variables were found, 60 values were analyzed for every variable (5 countries in 12 years). In this group of countries were average values effective (30,64%) and statutory (31,49%) rate above European average (23%), also above the average of euro area (25,7%). Inflation rate was within the rage of -0,60% (deflation) up to 4,5%. The amount of tax revenues (on average 724 243 m €), and also foreign direct investments (497 457 m €) were above European average since these are economically the most advanced member states of EU.

While observing the correlation of entry variables was found, that strong relationship towards tax revenues was accounted by gross domestic products ($r = 0,93$). Statistically significant correlations were shown by foreign direct investments ($r = 0,72$) and level of employment ($r = 0,55$). Positive dependence was shown in all mentioned cases, meaning that with growth of entry variables, also the output variables value was growing. Very strong indirect dependence was accounted by public debt ($r = -0,74$), inflation rate ($r = -0,23$) and effective tax rate ($r = -0,12$). With the growth of initial variables tax revenues were decreasing. Statutory rate didn't have any influence on tax revenue. Its correlated coefficient was 0,06 (table 1).

Table 1. Correlated coefficient of variables of 5 countries

	<i>TR</i>	<i>GDP</i>	<i>LoE</i>	<i>IR</i>	<i>PD</i>	<i>FDI</i>	<i>ETR</i>	<i>STR</i>
TR	1							
GDP	0,93	1						
LoE	0,55	0,74	1					
HICP	-0,23	-0,20	0,10	1				
PD	-0,74	-0,68	-0,14	0,37	1			
FDI	0,72	0,77	0,73	-0,19	-0,47	1		
ETR	-0,12	-0,29	-0,19	0,11	0,50	-0,21	1	
STR	0,06	-0,16	0,38	0,09	0,17	-0,42	0,73	1

Source: author's own elaboration

Legend: TR: tax revenues, GDP: gross domestic product, LoE: level of employment, PD: public debt, FDI: foreign direct investments, ETR: effective tax rate, STR: statutory tax rate.

The second group was formed as a mix of 10 old (Belgium, Denmark, Finland, Greece, Netherlands, Ireland, Luxembourg, Portugal, Austria and Sweden) and 13 new (Bulgaria, Cyprus, Czech Republic, Estonia, Croatia, Latvia, Lithuania, Hungary, Malta, Poland, Romania, Slovakia and Slovenia) member states. By every variable, 276 observations were analyzed (23 states and 12 years).

The average level of effective (19,70 %) and statutory (21,82 %) tax rate was significantly below European average (23 %), but also below euro area average (25,7 %), since tax rate of these countries was between 10 % (Bulgaria) up to 35 % (Malta). Burden on public finances was 99 557 m €, which is markedly above the limit of Maastricht criteria (60 %).

Tax revenues as well as the amount of foreign direct investments were more than 60 000 m €. Positive in this, and in previous group of countries seems to be the level of employment, which was on average 64,11 %. Opposite negative impact was noticed by inflation rate with 2,5 %.

While analyzing, a strong direct dependency between gross domestic product ($r = 0,98$) and foreign direct investment ($r = 0,85$) was found. Statistically significant was also the level of employment ($r = 0,49$), effective tax rate ($r = 0,38$) and statutory tax rate ($r = 0,41$).

Indirect strong dependency was shown by public debt ($r = -0,85$) and inflation ($r = -0,24$).

The analysis clearly showed, that the higher statutory rate, the lower dependency and weaker influence on total tax revenue (Laffer curve pattern).

Table 2 Correlated coefficients of 23 countries

	TR	GDP	LoE	IR	PD	FDI	ETR	STR
TR	1							
GDP	0,98	1						
LoE	0,49	0,45	1					
IR	-0,24	-0,23	-0,14	1				
PD	-0,85	-0,86	-0,18	0,26	1			
FDI	0,85	0,85	0,50	-0,24	-0,75	1		
ETR	0,38	0,33	0,13	-0,16	-0,38	0,31	1	
STR	0,41	0,34	0,14	-0,15	-0,39	0,34	0,95	1

Source: author's own elaboration in program SAS

Legend: TR: tax revenues, GDP: gross domestic product, LoE: level of employment, IR: inflation rate, PD: public debt, FDI: foreign direct investments, ETR: effective tax rate, STR: statutory tax rate.

1.3 Regression Analysis of Panel Data

In all observations, based on the p-value of Hausman test, the model of random effects was favored. The biggest influence on tax revenues were shown by level of employment, gross domestic product and foreign direct investment. If these determinants would be 1 m € higher (by increase in employment by 1%) it would come to growth of tax revenue by 10 072 m €, in employment by 383,1 thousand € by gross domestic product and 432,2 thousand € by foreign direct investment.

Gupta (2007), Tanzi, (1992), Fjeldstad and Tungodden (2003) point out that there is positive correlation between tax revenue and gross domestic product and negative correlation between tax revenue and state budget balance. Swiston et al. (2007) was observing the influence of factors on tax revenue in American states between 2004 and 2006 and demonstrated, that growth of tax revenue from the percentage of taxes on GDP is only temporary phenomenon. While the growth of company profit and capital profit contribute to 40% increase in percentage of taxes on GDP perpetually.

Table 3 Evaluation of modeling of input variables

<i>Determinant</i>	<i>5 countries</i>		<i>23 countries</i>	
	<i>random effect</i>	<i>fixed effect</i>	<i>random effect</i>	<i>fixed effect</i>
GDP	0,3831**	-	-	0,3524**
LoE	10 072**	-	-	1 483**
IR	3 627	-	-	-23
PD	0,0317	-	-	-0,1806**
FDI	0,4342**	-	-	0,0504**
ETR	2 071	-	-	161
STR	-	-	-	-231

Source: author's own elaboration in program SAS

Legend: TR: tax revenues, GDP: gross domestic product, LoE: level of employment, IR: inflation rate, PD: public debt, FDI: foreign direct investments, ETR: effective tax rate, STR: statutory tax rate.

By monitoring 23 countries, it was found that not all macroeconomic determinants have a positive impact on tax revenues. Government debt, inflation rates and the statutory tax rate were negative. Public debt growth of 1 mil. € would reduce tax revenues by € 23 million. €. The opposite result in its research was achieved by Krogstrup (2002) who found that the results of its regression analysis showed that 1% growth of the debt service variable in relation to GDP provides an increase in tax revenue in the country by an average of 0.2 p.b..

This relationship of the direct dependence between government's fiscal discipline and corporate tax is also dependent on the level of capital mobility. Based on empirical research, high mobility of capital increases the tax asymmetries. A statutory rate is critical for tax but it has negligible impact on our analysis. Increase of statutory rate by 1% would decrease total tax revenue by 231 million. This finding is true for 23 countries, 5 countries were discarded from monitoring. As a result, the higher the statutory rate is, dependence and the impact on the total tax revenue are lower (the lawfulness of the Laffer curve).

Similar findings were made by Bartelsman and Beetsma (2003), who monitored 16 countries in a panel regression for the period 1979-1997, and found that a 1% increase in tax rates would reduce tax revenues by 1.5 pp. Regression analysis in their research was used by Garrett (1995), Quinn (1997), Garrett Mitchell (2001), Bretschger and Hettich (2002), Swank and Steinmo (2002), Slemrod (2004) and Winner (2005) trying to explain the impact of tax rates and other country-specific factors, including capital mobility.

They dealt with an estimate of the reduced form of equations, without any significant theoretical specification. They were distinguished by various methods, including the variables used and the econometric specifications. These documents include, for example, a survey presenting a mixed picture of the impact of capital mobility, all of whom consistently claim that the most commonly used tax rate is the rate of statutory tax, although effective tax rates and tax revenue levels are also important.

Levišauskaitė and Rūškys (2003) point out that, in addition to monitoring the dependence of macroeconomic variables, many other quantitative indicators that affect the development of corporate tax and the total amount of tax revenue must not be forgotten. Such factors, according to the authors, include the geographic location of a state that affects a number of tax-law elements of corporate tax construction, as there is a continental and Anglo-American legal system coexisting within the EU, with several significant differences.

CONCLUSION

In general, it is stated that with the increase in the nominal tax rate we achieve higher tax revenues. However, this is a macroeconomic view that does not apply from a microeconomic point of view. In this view, it is necessary to take into the consideration fact that the higher the nominal tax rate is, the more companies try to reduce the value of the tax paid by adjusting the tax bases. Companies have the ability to reduce the total tax paid through tax optimization systems. Tax management also enables companies to achieve the beneficial difference between effective rates and nominal tax rates. Research shows that the effective rate is rising below the nominal rate. The regression analysis, which was more closely focused on its models of fixed effects, random effects and pooling models on the impact of macroeconomic determinants on the total amount of tax revenues, found that the positive aspect of growth was shown in all the determinants. But the decisive factor was employment rate, gross domestic product and foreign direct investment. What's interesting, the nominal and effective tax rates did not have a relevant impact. In the first group (5 countries), was the nominal tax rate for high correlation dependence eliminated and in the second group (23 countries) it had a negative impact. Although the effective tax rate had a positive impact in both cases, its increase did not generate sufficient tax revenue. In conclusion we can say that,

macroeconomic as well as microeconomic factors are important in the foreign investor's decision about location and extent of his investment.

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