THE IMPACT OF THE EFFECTIVE TAX BURDEN AND GOVERNMENT SPENDING ON THE ECONOMIC GROWTH

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Abstract

The analysis of the relationships between the taxation measured by the traditional tax quota (TQ) and the economic growth is a subject of a lot of empirical works. Therefore the aim of the article is to verify the impact of the effective tax burden and the government spending on the economic growth in OECD countries in the period of 2005 – 2010. The taxation is expressed by the tax quota and World Tax Index (WTI) - an alternative designed by the authors of the article. From the methodological point of view, we use VAR model and generalized method of moments in the article. Concerning the impact of the taxation on the economic growth, it was not possible to confirm or refuse the theoretical hypothesis due to the statistical insignificance in case of use of the TQ. For the WTI, we find that there is noticeable negative impact of the effective taxation on the economic growth.

Key words: economic growth, effective tax burden, government spending, World Tax Index

JEL Code: H21, H25, O47

Introduction

In the context of primary economic policy objectives, fiscal determinants seem essential.[1] Studies which deal with taxation and government spending however, have taken the form of cross-sectional regression models or time series analysis in a particular country. Sometimes, they use atheoretical VAR models and these studies employ the panel regression method and they often tend to be static. These studies also exclusively utilize the tax quota or implicit tax rates as a variable to approximate the tax burden. However, these indicators may not be very descriptive of the level of the effective tax burden, as they de facto represent a ratio of tax revenues to an underlying variable (GDP or an activity subject to taxation. This article aspires to use VAR models to describe the interaction of taxation, government spending and economic growth on panel data, with dynamization using a generalized method of moments (dynamic panel). The tax burden is approximated using the tax quota and also by using the effective tax burden index of the authors' design – the World Tax Index (WTI). The aim of the

[1] See, e.g. Kotlán (2001).

article is to verify the impact of the effective tax burden and the government spending on the economic growth in OECD countries in the period of 2005 – 2010. In terms of methodology, an ontological approach is used, as described by Kotlán (2008).

1 Taxation in growth theories

The theory of long-term economic growth is based mainly on the original neoclassical Solow model (Solow, 1956) and its further extension toward the endogenisation of technological progress and human capital. These studies gave rise to a body of largely empirical work, whose aim was the best possible explanation of economic growth through the integration of other factors that affect it, including the taxation.

The effect of taxation on economic growth is generally considered to be negative in economic theory. Taxation is usually integrated into growth models through its influence on individual growth variables (e.g. Kotlán, Machová and Janíčková, 2011). This particularly concerns the level of savings, investment, the subsequent capital accumulation and the level of human capital. Investment activities are especially negatively affected by corporate tax, which is very often associated with the decision to place foreign direct investment, and with the taxation of dividends. In the case of corporations, it is also necessary to keep in mind that the tax burden makes just a part of their overall financial burden. Labour taxation also leads to reduced investment activities, due to pressure on corporate profits caused by a drop in the labour supply. In addition, taxation of labour may negatively influence the economic growth through its negative effect on labour market performance (see e.g. Kosi and Bojnec, 2006).

The positive effect of taxation on human capital accumulation is in the case of public investment in education; however, in the case of private investment, most studies agree with the negative impact of taxation, in particular through personal income tax with a progressive tax rate, which reduces the returns from these investments. The negative effect is then amplified when capital income is taxed at lower rates than labour income (Jacobs and Bovenberg, 2010).

The effect of indirect taxation is similar to the taxation of labour. But indirect taxes affect economic growth only through their effect on the substitution between leisure time and productive activities, and thus through changes in the ratio between labour and capital in the production function, while direct taxes also affect growth through other channels (Wiedmer, 2002).

The issue of the distortionary nature of direct and indirect taxes is one of the most debated issues in terms of the influence of taxes on economic growth. This problem is addressed primarily by Kneller, Bleaney and Gemmell (1999), who report that distortionary taxes negatively affect growth, while the effect of non-distortionary taxes is neutral or positive.

2 Methodology of the analysis and data

The study is based on a panel data VAR model and the software used is E-Views, version (7), which allows the making of estimates on panel data, even though not directly constructing panel data VAR models.

The nature of VAR models clearly suggests that a dynamic panel was used and that a generalized method of moments (GMM) was used for estimation, specifically the Arellano-Bond estimator. The below VAR model includes a lag of one period, as is usual in these types of studies. Given the length of the time series, particularly for the WTI index (see below), a lag of higher order is not realistic.[2]

Tab. 1: Dependent and independent variables in the VAR model

Dependent variable	Independent variables	
Real GDP per capita (RGDP)	Rate of real investment	**RINVESTMENT**
	Approximated level of human capital	**HUMAN**
	Lagged value of real GDP per capita	**RGDP(-1)**
	Lagged value of government spending	**PEXPGDP(-1)**
	Lagged value of approximated tax burden	**TQ(-1) / WTI(-1)**
Level of government spending	Rate of real investment	**RINVESTMENT**
	Approximated level of human capital	**HUMAN**
	Lagged value of real GDP per capita	**RGDP(-1)**
	Lagged value of government spending	**PEXPGDP(-1)**
	Lagged value of approximated tax burden	**TQ(-1) / WTI(-1)**
Approximated tax burden (TQ / WTI)	Rate of real investment	**RINVESTMENT**
	Approximated level of human capital	**HUMAN**
	Lagged value of real GDP per capita	**RGDP(-1)**
	Lagged value of government spending	**PEXPGDP(-1)**
	Lagged value of approximated tax burden	**TQ(-1) / WTI(-1)**

Source: own creation

Table (1) describes the estimated VAR model and its equations. Endogenous variables in each equation are used as dependent variables. Lagged values of endogenous variables and

[2] At present, the WTI index is designed for a relatively short period from 2005 to 2010. A survey among respondents and the collection of objective data for 2011 is currently in progress. For details, see http://www.worldtaxindex.cz.

exogenous variables are then used as independent variables. Given the focus of this paper, we are especially interested in the first equation, therefore only the real GDP per capita in USD adjusted for purchasing power parity (RGDP) is the endogenous variable. Exogenous variables used in the models include the real investment rate relative to real GDP (RINVESTMENT), the variable approximating the level of human capital (HUMAN)[3] and the government spending as the % of the GDP (PEXPGDP). It also includes a dummy variable (DIS), which, together with the level of the tax burden, forms the interaction element expressing the influence of the group of countries with highly distortionary taxes (see the econometric analysis). The tax approximation was implemented in two ways. First, using the standard tax quota (TQ, the share of tax revenues in nominal GDP), while also separately studying the effect of individual taxes under OECD classification. They include, in particular, taxes on income and profits (classification 1100) and social security contributions (classification 2000) and corporate taxes on income, profits and capital gains (classification 1200). They further include indirect taxes on goods and services (VAT – classification 5110 and excise taxes – classification 5120). Finally, the influence of taxes on property was studied (classification 4000).

With regard to the shortcomings brought about by the tax quota (Kotlán and Machová, 2012a), the analysis uses the World Tax Index (WTI) as an alternative to the tax quota. It is a tax burden indicator which combines hard data on taxes available from internationally recognized sources such as the OECD and World Bank database, with data expressing Qualified Expert Opinion (QEO). WTI consists of several sub-sub-indices: Corporate Income Tax (CIT), Personal Income Tax (PIT), Value Added Tax (VAT), Individual Property Taxes (PRO) and Other Taxes on Consumption (OTC). For a more detailed WTI composition, the methods of its construction and the resulting values for individual countries in the reference years see Kotlán and Machová (2012b). The constructed econometric models also studied the effect of the WTI as a whole, as well as the separate influence of individual sub-indices.

Most of the data used, especially the level of GDP, government spending, human capital and taxation (the tax burden and its sub-components) was drawn from the OECD iLibrary Statistics[4] and OECD Factbook Statistics[5]. The hard data that was used to construct

[3] It is the number of students enrolled in tertiary education in relation to the total population.
[4] http://www.oecd-ilibrary.org/statistics;jsessionid=998q2qigk0e50.delta
[5] http://www.oecd-ilibrary.org/economics/data/oecd-factbook-statistics_factbook-data-en

the WTI and its sub-indices was obtained from the OECD Tax Database[6] and OECD Tax Statistics[7], additionally also from the World Bank's Doing Business project database[8].

Stationarity tests using the panel unit root were performed first. Only the level of GDP was found to be non-stationary. Its stochastic instability was removed in subsequent analyses by using first differences, or rather logarithmic differences - d (log RGDP). The variable thus specified then allows the examining of the impact of independent variables on the GDP growth rate.[9] With regard to a possible occurrence of autocorrelation and heteroscedasticity was used method "White Period". For completeness, note that essays commonly published today do not include estimates of covariance matrices, as tests of statistical significance of parameters are already based on those estimates. The authors also follow this approach. The estimates employed the model with fixed effects, which is, according to Wooldridge (2009), more suitable in the case of macroeconomic data as well as in a situation where the cross-sectional units are countries.

3 Empirical analysis of panel VAR model for OECD countries

This section describes estimates of a panel data VAR model. With respect to the length of the WTI time series, the reference period is from 2005 to 2010, providing a sufficient number of observations considering the 34 OECD countries used. Previously published studies (Kotlán, Machová and Janíčková, 2011, and Kotlán and Machová, 2012a) confirm that a relatively shorter period does not substantially modify the results.

In all of the analyses, the investment rate is the exogenous variable; unlike in the summary table (1), however, it does not include the level of human capital due to its statistical insignificance. Endogenous variables then include the level of taxation (alternatively TQ/WTI), the level of government spending and the level of GDP in logarithmic differences, representative of GDP growth rate (d (log GDP)). As is usual for VAR models, the below summaries include even statistically insignificant variables, if applicable. The only exception is the aforementioned approximation of the level of human capital.

[6] http://www.oecd.org/ctp/taxdatabase
[7] http://www.oecd-ilibrary.org/taxation/data/revenue-statistics_ctpa-rev-data-en
[8] http://www.doingbusiness.org
[9] The interpretation of the coefficients can be understood as meaning that, if an explanatory variable changes by one, the aforementioned will result in the GDP growth rate changing (decreasing or increasing) by the coefficient.

Tab. 2: GDP panel data model for OECD countries, 2005 – 2010, overall taxation

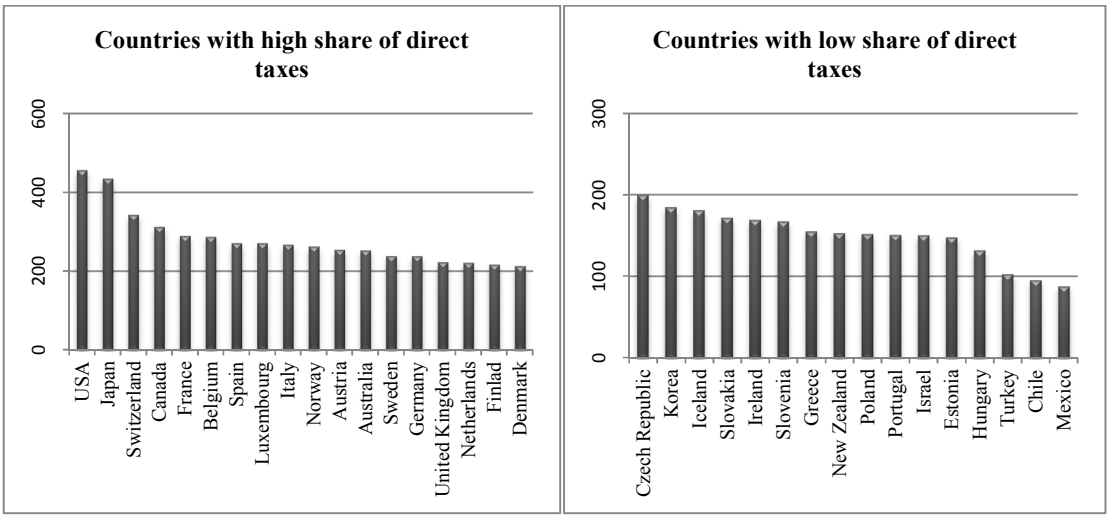
Dependent variable	d(log RGDP)[10]	d(log RGDP)
Approximated taxation	Tax quota	WTI
Number of observations	140	84
RINVESTMENT	0,01(3,92)***	0.01(0.64)
d(log RGDP(-1))	0.30(0.74)	1.42(1.63)*
PEXPGDP(-1)	0.01(1.64)*	0.01(1.99)**
TQ(-1)/WTI(-1)	-0.01(-1.78)*	-0.20(-1.63)*
DIS* (TQ(-1)/WTI(-1))	0.01(0.94)	-0.70(1.64)*
Adj. R^2	0.57	0.53
F-statistic	36.1***	26.7***

Source: own calculations

Note: *, **, *** stand for significance levels of 10%, 5% and 1%. Although the values Adj. R^2 and F-statistic are not detected for dynamic panels in the software used (in case of the generalized method of moments), they were alternatively estimated in the same model using OLS.

In all investigated cases there is the dummy variable (DIS), which enables the examining of the separate influence of countries with a significant share of distortionary taxes[11] on overall taxation, measured by TQ or WTI (Figure (1)). The dummy variable (DIS) is used to create the interactive member DIS*(TQ(-1)/WTI(-1)).

Fig. 1: OECD countries by the ratio of direct to indirect taxation (%), 2010



Source: own creation

[10] In accordance with the definition of d (log RGDP) individual independent variables in tables (2, 3) are construed as impacting the GDP growth rate if they change by one (after being multiplied by a hundred in percentage points). For example, a change in personal income tax including social insurance contributions (1100+2000) by one will result in the GDP growth rate falling by 0.2 percentage points

[11] The criterion for countries to fall within the high-distortionary tax group is a ratio of direct tax revenue to indirect tax revenue of more than 200%.

Table (2) summarizes the results of the first part of the VAR model, which studies the neoclassical growth model. In line with economic theory, the fiscal impact has been proven to be negative. This means that taxation significantly harms economic growth, regardless of the method of tax burden approximation (TQ or WTI). The estimation of the effect of dummy variables is marked in grey. If we use the tax quota to express the tax burden, the impact of overall taxation in countries with a predominant share of distortionary taxes seems to be less negative. However, given the statistical insignificance of the coefficient, this finding is inconclusive. When approximating taxation using the alternative indicator of WTI, there is a statistically significant and very noticeable negative effect of taxation on long-term economic growth in countries with a high proportion of direct (distortionary) taxes. If the proportion of these taxes in a country's tax system is high, the harm to economic growth is quantitatively more significant than in a situation where the country is rather more focused on indirect taxes. Thus, WTI is a significantly better tax burden approximator, as it allows the capture of the impact of real taxation on long-term growth, as opposed to only a simple proportion of tax revenues (in the case of the tax quota), and in the estimated model it allows us to capture the effect of dummy variables expressing the effect of distortionary taxes with statistical significance. In line with economic theory, government spending has a positive impact on economic growth. A positive effect of a lagged GDP value is also expected.

The chapter concludes with the results of the first VAR model equation in a more detailed breakdown (table (3)). It particularly describes the effect of the individual sub-components of taxation on long-term economic growth.

Tab. 3: GDP panel data model for OECD countries, 2005 - 2010, taxation sub-components

Dependent variable	d(log RGDP)	d(log RGDP)
Approximated taxation	Tax quota	WTI
Number of observations	140	84
RINVESTMENT	0.01(1.72)*	0.003(0.66)
d(log RGDP(-1))	-0.01(-0.51)	0.75(1.62)*
PEXPGDP(-1)	0.001(0.88)	0.004(0.45)
1100+2000(-1)/PIT(-1)	-0,04(-2,66)***	-0.66(1.69)*
1200(-1)/CIT(-1)	0,03(2,63)***	-0.26(1.75)*
4000(-1)/PRO(-1)	0.03(1.75)*	0.17(0.68)
5110(-1)/VAT(-1)	-0.06(1.64)*	-0.50(-2.21)**
5120(-1)/OTC(-1)	0.04(0.91)	-3.33 (-1.64)*
Adj. R^2	0.58	0.56
F-statistic	23.2***	16.7***

Source: own calculations

If it is summarized the results concerning the tax components (the effect of government spending is positive but statistically insignificant), it is found that personal income taxes (including social insurance contributions) and VAT-type taxes exhibit a negative impact on economic growth (as measured by both TQ and WTI). Corporate taxes, in the case of TQ, do not uphold the economic theory describing a significant negative impact of corporate taxation on economic growth. However, measuring the tax burden on corporations through the WTI index, the negative effects are already visible. The TQ is then rather inappropriate to describe the tax burden on corporations. There is no direct correlation between the effective tax burden and the share of tax revenues. In the case of corporate taxes, the Laffer curve is likely steeply angled vis-á-vis the axis of tax revenues, with its peak very close to the central axis. For completeness, a statistically significant negative effect of selective tax on consumption has been demonstrated when using the WTI, as well as a statistically significant positive effect of property taxes in the case of approximating through the tax quota.

Conclusion

This article builds on the previous studies of the authors and explores the impact of taxation on economic growth in a group of OECD countries in 2005-2010. To approximate the level of taxation, the tax quota and the WTI are used. There are used the VAR model and the generalized method of moment. This article aimed to prove the hypothesis concerning the impact of the effective tax burden and government spending on economic growth.

The crucial aspect was to demonstrate the fact that taxation has a negative impact on economic growth, both when measuring the tax burden using the tax quota and the WTI. The analysis has also employed the technique of dummy variables and the created interaction member to study the above relationship within two basic groups of countries based on tax distortion criteria. Assuming that those countries with a high ratio of direct to indirect taxes are the countries with larger distortionary effects on economic growth, this should also be reflected in the actual econometric analysis. Using the alternative WTI index seemed particularly conclusive. It has been found that countries with a high proportion of direct taxes in their tax mix suffer more damage to their economic growth than countries with a preference for indirect taxes. As regards the tax quota, these findings could be neither proven nor disproven, due to the statistical insignificance of the coefficients. The alternative WTI index thus seems beneficial. The positive effect of government spending on economic growth and

the persistence of economic growth has also been proven, which is consistent with economic theory. The second part of the analysis aimed to perform a detailed examination of the impact of individual tax sub-components. Particularly noteworthy is the conclusion that corporate taxes, when approximating taxation through the tax quota, do not uphold the theory of significant negative impact of corporate taxation on economic growth. However, measuring the tax burden on corporations through the WTI, the negative effects are already apparent.

The above clearly suggests that the WTI is a suitable indicator for tax burden approximation and an important alternative to the tax quota. As such, it is applicable not only to compare the tax burden in individual countries, but also as a tax burden indicator in macroeconomic models, especially in models of long-term economic growth. The WTI can also modify the conclusions in these as well as other econometric models that examine the influence of institutional and economic variables on key, and currently very frequently used quantities such as the level of corruption (see e.g. Kotlánová and Kotlán, 2012).

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