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DO TAXES MATTER FOR LONG-RUN GROWTH? STILL AN ACTUAL PROBLEM OF FISCAL POLICY*

The aim of this article is to verify the validity of the hypothesis of the negative impact of taxation on economic growth. It focuses not only on the causal relationship of taxation to growth, but also examines the relationship between growth, taxation and government expenditures. From the methodological view point, we use a panel VAR model and the GMM. The greatest contribution of this paper lies in the presentation of an alternative indicator of tax burden, which we call the World Tax Index (WTI). Above all, the results confirm that taxation has a significantly negative impact on economic growth. The analysis also shows that the countries with a high proportion of direct taxes in their tax mix suffer more damage to their economic growth than the countries with the preference for indirect taxes. The positive effect of government spending on economic growth and the persistence of economic growth has also been proven.

Keywords: *taxation; World Tax Index (WTI); tax quota; government expenditures; economic growth; VAR; GMM.*

JEL: C33, H20, H30, O41.

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ВПЛИВ ПОДАТКІВ НА ДОВГОТРИВАЛЕ ЕКОНОМІЧНЕ ЗРОСТАННЯ ЯК АКТУАЛЬНА ПРОБЛЕМА ФІСКАЛЬНОЇ ПОЛІТИКИ

У статті зроблено спробу підтвердити гіпотезу про негативний вплив податків на економічне зростання. Досліджено взаємозалежність між макроекономічними показниками економічного зростання, оподаткування та бюджетних видатків. Для аналізу даних застосовано моделі VAR та GMM. Представлено та описано авторський альтернативний індикатор оцінювання податкового навантаження — Світовий податковий індекс. У цілому, результати аналізу підтверджують негативний вплив податків на економічне зростання. Крім того, доведено, що країни з домінуванням прямих податків страждають від негативного впливу оподаткування більше, ніж країни з пріоритетом для непрямих податків. Окремо доведено сприятливий вплив фактору бюджетних видатків на довготривале та стійке економічне зростання.

Ключові слова: *Світовий податковий індекс; податкові квоти; видатки бюджету; економічне зростання; VAR; GMM.*

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Зузана Махова, Игорь Котлан

ВЛИЯНИЕ НАЛОГОВ НА ДОЛГОСРОЧНЫЙ ЭКОНОМИЧЕСКИЙ РОСТ КАК АКТУАЛЬНАЯ ПРОБЛЕМА ФИСКАЛЬНОЙ ПОЛИТИКИ

В статье сделана попытка подтвердить гипотезу про негативное влияние налогов на экономический рост. Исследована взаимозависимость между макроэкономическими показателями экономического роста, налогообложения и бюджетных расходов. Для анализа данных использованы модели VAR и GMM. Представлен и описан авторский альтернативный индикатор оценки налоговой нагрузки — Мировой налоговый индекс. В целом, результаты анализа подтверждают негативное влияние налогов на экономический рост. Кроме того, доказано, что страны с доминированием прямых налогов страдают от

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негативного влияния налогообложения больше, чем страны с приоритетом для непрямых налогов. Отдельно доказано благоприятное влияние фактора бюджетных расходов на долгосрочный и устойчивый экономический рост.
Ключевые слова: *Мировой налоговый индекс; налоговые квоты; расходы бюджета; экономический рост; VAR; GMM.*

Introduction

Nowadays, many European as well as other developed countries are facing economic, or debt crises (Siskova, 2013; Aiginger, Horvath and Mahringer, 2012). In an effort to achieve primary economic policy objectives, fiscal determinants thus seem essential (Kotlan, 2001). Above all, those include taxation and other government expenditures. The aim of this paper is to verify the effect of effective tax burden and government spending on economic growth and the effect of taxation and economic growth on government spending. In terms of methodology, an ontological approach is used, as described in Kotlan (2008). We use a VAR model to describe the interaction of the mentioned variables on panel data, with dynamization using a generalized method of moments (GMM). In addition, we approximate tax burden not only using traditional tax quota, but also using our own effective tax burden index that we have called, the World Tax Index (WTI). The paper builds on traditionally conducted analyses using the tax quota and growth models described in Kotlan, Machova and Janickova (2011), as well as on a similar type of study which already approximates taxation using the alternative WTI index (Kotlan and Machova, 2012a).

1. Literature review

The studies of Solow (1956), Lucas (1988) or Romer (1986) gave rise to a body of largely empirical work, the aim of which was the best possible explanation of economic growth through the integration of other factors that affect it, including taxation, which is, nevertheless, not desirable to be considered in isolation. Its analysis should primarily include government spending financed by taxes. The analysis of the influence of institutional environment and different methods of governance on the relationship between taxation, government spending and economic growth (Nagy, 2011; Borzel, 2011) also seems important.

Taxation is usually integrated into the growth models through its influence on individual growth variables (Kotlan, Machova and Janickova, 2011; Kotlan and Machova, 2013a,b). This particularly concerns the level of savings, investment and subsequent capital accumulation, and the level of human capital.

Let us consider two sectors – the sector producing goods and the sector producing human capital. In the sector producing goods, the production function has the standard form of a Cobb-Douglas function (Milessi-Ferreti and Roubini, 1998):

$$Y = C + \dot{K} + \delta K = A(vK)^{\alpha}(wH)^{1-\alpha}, \tag{1}$$

and the physical capital accumulation (K) can thus be expressed from (1) as:

$$\dot{K} = A(vK)^{\alpha}(wH)^{1-\alpha} - \delta K - C, \tag{2}$$

where Y is the total output of the economy; C is the private consumption; and δ is the depreciation rate. v or w represent the part of physical (K) or human (H) capital, respectively, which is dedicated to production; A represents the level of technology and coefficient α represents the rate of diminishing returns to physical capital. The sum (α + (1 - α) = 1) then expresses the constant returns to scale which form the basic assumption of the model.

In the sector of goods (*G*), marginal product of physical capital ($MR^G{}_K$) and marginal product of human capital ($MR^G{}_H$) can be expressed using the first derivatives of the production function as:

$$MP_K^G = \alpha A(vK)^{\alpha-1}(wH)^{1-\alpha} = \alpha A\left(\frac{vK}{wH}\right)^{\alpha-1}, \quad (3)$$

$$MP_H^G = A(vK)^{\alpha}(1-\alpha)(wH)^{-\alpha} = (1-\alpha)A\left(\frac{vK}{wH}\right)^{\alpha}, \quad (4)$$

Consistently with Rebelo (1991), human capital is regarded as non-market goods[3] and depreciates at the same rate δ as physical capital. In the sector producing human capital (*H*), assuming that both physical and human capital are used only for the production of goods, or accumulation of human capital[4], and based on the equation (1), the production function has the form of:

$$\dot{H} = B[(1-v)K]^{\beta}[(1-w)H]^{1-\beta} - \delta H, \quad (5)$$

where *H* is the human capital accumulation; *B* is the level of technology and β represents the rate of diminishing returns to physical capital.

In the sector of human capital, we can also express marginal product of both physical and human capital as:

$$MP_K^H = \beta B(1-v)K^{\beta-1}(1-w)H^{1-\alpha} = \beta B\left[\frac{(1-v)K}{(1-w)H}\right]^{\beta-1}, \quad (6)$$

$$MP_H^H = B(1-v)K^{\beta}(1-\alpha)(1-w)H^{-\beta} = (1-\beta)B\left[\frac{(1-v)K}{(1-w)H}\right]^{\beta} \quad (7)$$

In the steady state, economy growths at same rate as private consumption and as the physical and human capital (Barro, 1990; Rebelo, 1991). Consumption growth is determined by the maximization of total utility of households (*U*), which depends mainly on their time preferences in relation to consumption (work). Assuming an infinite time horizon, the following shall apply (Barro, 1990):

$$U = \int_0^{\infty} e^{-\rho t} u(C) dt, \quad (8)$$

where ρ is the time preference rate. Assuming a constant intertemporal elasticity of substitution in consumption ($1/\theta$), the utility function (*u*) of households shall have the following formula:

$$u(C) = \frac{c^{1-\theta} - 1}{1-\theta}. \quad (9)$$

Based on the equations (2) and (5), the model of households optimization can be written using the Hamiltonian expression as (Barro and Sala-i-Martin, 2004):

$$J = u(C)e^{-\rho t} + \mu_1\left[A(vK)^{\alpha}(wH)^{1-\alpha} - \delta K - C\right] + \mu_2\left\{B[(1-v)K]^{\beta}[(1-w)H]^{1-\beta} - \delta H\right\} \quad (10)$$

[3] Alternative approaches and specifications of growth models with regard to the various concepts of human capital are referred to in e.g. Milesi-Ferreti, Roubini (1998).

[4] This means, that if *v* is the part of physical capital dedicated to production, (1 - *v*) is dedicated to human capital accumulation. Analogically, if *w* is the part of human capital dedicated to production, (1 - *w*) is a part dedicated to human capital accumulation.

The solution satisfies the usual first-order conditions, which come from setting the derivatives of J with respect to control variables (C, v and w) to 0, and from the conditions for the state variables: $\mu_1 = -\delta J/\delta K$ and $\mu_2 = -\delta J/\delta K$. In the following equations, we use the expression of marginal product of physical and human capital in different sectors from equations (3), (4), (6) and (7).

From the solution of the optimization, Barro and Sala-i-Martin (2004) come to the expression of the growth rate of consumption and thus economy (γ):

$$\gamma = \frac{\dot{C}}{C} = \frac{1}{\theta}\left(MP_K^G - \delta - \rho\right) \quad (11)$$

The term (MP^G_K - δ) equals the net marginal rate of return of physical capital (r) and we get:

$$\gamma = \frac{1}{\theta}\left(r - \rho\right) \quad (12)$$

If households maximize their utility function, the growth of economy (γ) is thus given by the difference between the net marginal return to physical capital and the rate of time preference adjusted to intertemporal elasticity of substitution in consumption.

Let us now consider the tax rates on capital (τ^K) and labour (τ^H). We can state the following equilibrium conditions for steady state growth:

$$r = \left(1 - \tau^K\right) MP_K^G, \quad (13)$$

$$r = MP_H^H, \quad (14)$$

$$\frac{v}{w} = \frac{\alpha}{1-\alpha}\frac{1-\beta}{\beta}\frac{1-\tau^K}{1-\tau^H}\frac{1-v}{1-w}. \quad (15)$$

Equation (13) determines the net after-tax marginal rate of return of physical capital (r). Equations (14) and (15) reflect arbitrage conditions. The first one (14) equates the rates of return between sectors producing goods and human capital, the second one (15) equates the rates of return on physical and human capital in the two sectors. From the system of equations (3), (7), (13), (14) and (15) we get (Mendoza, Milesi-Ferreti, Asea, 1997; Milesi-Ferreti, Roubini, 1998):

$$\gamma = \frac{1}{\theta}\left\{\left[D\left(1-\tau^K\right)^{\alpha\beta}\left(1-\tau^H\right)^{\beta(1-\alpha)}\right]^{\frac{1}{-\alpha+\beta}} - \rho - \delta\right\}, \quad (16)$$

where

$$D = \left(\alpha A\right)^{\beta}\left[B\left(1-\beta\right)\right]^{1-\alpha}\left[\left(1-\alpha\right)\beta/\alpha\left(1-\beta\right)\right]^{\beta(1-\alpha)}. \quad (17)$$

Capital tax in the above model mainly reduces the net after-tax marginal return on capital, which has a negative influence on economic growth. It also reduces the capital/labour ratio in the production, which positively affects economic growth; however, this effect is not greater than the negative one. On the other hand, labour tax increases the capital/labour ratio in production, thus resulting in a negative impact on growth.

The analysis above does not consider any work/leisure decisions of households. If we abandon this assumption, we find out that all types of taxes, including taxes on consumption, affect economic growth through another very important channel – the substitution between work and leisure of households. The substitution effect ultimately shifts the capital/labour ratio in production, with the resulting effect on economic growth being negative. Taxes on consumption thus affect growth negatively, although only indirectly, through the substitution effect. Summing up all that was mentioned above, we can say that according to economic theory, the resulting effect of taxation on growth through all types of taxes should be negative.

However, Mendoza, Milesi-Ferreti, Asea (1997) and Milesi-Ferreti, Roubini (1998) say that similar models are very detached from real tax mixes in individual economies. Therefore, their authors try to calibrate the model in empirical works so as to be as close to the real world as possible.

The results of empirical analyses show that investment activities, and thus growth, are negatively affected in particular by a corporate tax. Kotlan and Machova (2012a), or Kotlan (2012) empirically describe the ambiguous effects of corporate tax when using the tax quota and alternative taxation indices. Corporate tax effects are very often associated with decisions to place foreign direct investment (Keuschnigg, 2009), or with the taxation of dividends (Santoro and Wei, 2009).

The negative effect of labour tax is confirmed by Erosa and Koreshkova (2007), particularly in case of progressive tax rates, but most of the studies agree on ambiguous effect, which is also the case of capital tax (Lin, 2001; Jacobs, Bovenberg, 2010).

Indirect taxes affect economic growth only through their impact on the substitution between leisure and work, while direct taxes have an effect by other channels. The negative influence of direct taxes on economic growth should thus be greater and their distortionary effects stronger compared to indirect taxes. As evidenced by Mamatzakis (2005), shifting tax burden from direct to indirect taxes can lead to the promotion of economic growth while preserving tax revenues to state budget.

The issue of the distortionary nature of direct and indirect taxes is discussed 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. Where indirect taxes, as compared to direct taxes, have fewer distortionary effects, their negative effect on growth will be smaller or even positive. They also point out that it is necessary to take into account the type of public expenditure that is financed through tax revenues.

Empirical analyses confirm both positive and negative effects of government expenditures on economic growth. Barro (1990) and Schaltegger and Torgler (2004) conclude that the effect is negative in developed, wealthy economies with a large public sector and a greater proportion of non-productive expenditure due to crowding out. In contrast, in less developed countries with a higher share of productive expenditure, the positive effect of increased productivity of the private sector may become dominant, such as positive externalities of public goods provided.

Wagner (1911) and his law of increasing state activity (the Wagner's law) offers a different approach to examining the relationship between economic growth and government spending. He postulates that economic growth and a rise in living standards lead to a growing public sector and therefore government spending. Wagner believes that expenditures on education, health, culture etc. are in fact characterized by a high income elasticity of demand. Therefore, real income growth causes economic growth leading to a more than proportional increase in government spending. Wagner's law thus became the subject of a number of empirical studies, being proven for the OECD countries by Lamartine and Zaghini (2011), but not proven in the case of Machova (2012).

2. Model

In terms of methodology, the study is based on the panel data VAR model. Endogenous variables include real GDP per capita (RGDP), government expenditures to GDP ratio (PEXPGDP) and a variable for taxation approximation. Exogenous variables are real investment to GDP ratio (RINVESTMENT) and human capital approximation (HUMAN, students enrolled to tertiary education). The model also includes a dummy variable (DIS), which, together with the level of tax burden, forms the interaction element expressing the influence of the group of countries with high share of distortionary taxes (see econometric analysis). The model consists of 3 equations using real GDP per capita, government expenditures to GDP ratio, and taxation as dependent variables.

The nature of VAR models clearly suggests that a dynamic panel was used and that a generalized method of moments (GMM)[5] was used for estimation, specifically the Arellano-Bond estimator (Arellano & Bond, 1991). The below VAR model includes a lag of one period, as is usual in such types of studies (Acosta-Ormaechea and Yoo, 2012; Arnold et al., 2011). Given the length of time series, particularly for the WTI index, a lag of higher order is not realistic[6]. Alternatively, autoregressive analyses with two- and three-year lags were also implemented with similar results; nevertheless, with regard to the shortness of time series, from the econometrical point of view, it would not be possible to verify the results reliably.

The tax approximation was gradually implemented in two ways. First, using the standard tax quota (TQ, the share of tax revenues in nominal GDP), second, with regard to the shortcomings brought about by tax quota (Kotlan and Machova, 2012a), using the World Tax Index (WTI) as an alternative to tax quota. It is our own tax burden indicator which combines hard data on taxes available from internationally recognized sources such as the OECD and the World Bank databases, with data expressing qualified expert opinion (QEO). That was gained from a large-scale questionnaire survey conducted among tax specialists from all OECD countries. Unlike TQ, the WTI seeks to produce an evaluation incorporating the maximum number of aspects associated with tax progression, administrative difficulty of tax collection from the perspective of payers, the range of tax exemptions, options concerning tax deductibility of expenses etc. For a more detailed WTI composition, the methods of its construction, and the resulting values for individual countries in the reference years, see Kotlan and Machova (2012b).

The data was drawn from the OECD iLibrary Statistics[7] and OECD Factbook Statistics[8]. In terms of methodology, stationarity tests using the panel unit root according to Levin, Lin and Chu (2002), Im, Pesaran and Shin (2003) or Maddala and Wu (1999) 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(logRGDP). The variable thus speci-

[5] It is appropriate to note that, in the case of a relatively short WTI time series and a rather narrow group of the OECD countries, the use of the GMM method may be problematic. Nevertheless, with regard to similar studies and links to our previous research, that tested the WTI benefits on a dynamic panel (and were also confirmed for the static panel), we can consider its use to be justified.

[6] At present, the WTI index is designed for a relatively short period from 2005 to 2010. A survey and the collection of objective data is currently in progress. For details, see http://www.worldtaxindex.cz. For the new methodology, see Machova and Kotlan (2013a).

[7] http://www.oecd-ilibrary.org/statistics;jsessionid=998q2qigk0e50.delta.

[8] http://www.oecd-ilibrary.org/economics/data/oecd-factbook-statistics_factbook-data-en.

fied then allows examining the impact of independent variables on the GDP growth rate. Using a robust estimator in calculating the covariance matrices ensured that the results of standard deviations of parameters and hypothesis tests were correct with regard to a possible occurrence of autocorrelation and heteroscedasticity. This method is called the "White Period" and it is enabled by the econometric software used. The appropriate formula for its calculation is commonly presented in econometric literature and can also be found in the E-Views (7) manual (Chapter 18, p. 611). For completeness, note that studies commonly published today do not include estimates of covariance matrices, as tests of statistical significance of parameters are already based on those estimates. We 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 cross-sectional units are countries.

3. Analysis

This section describes the estimates of a panel data VAR model using two alternative taxation level approximations, TQ and WTI. With respect to the length of the WTI time series, the reference period is 2005–2010, providing a sufficient number of observations considering the 34 OECD countries used. Previously published studies (Kotlan, Machova and Janickova, 2011; Kotlan and Machova, 2012a) confirm that a relatively shorter period does not substantially modify the results, e.g. as compared with the time series for 1995–2010.

In the analyses below, the investment rate is the exogenous variable; however, the following tables do not include the level of human capital due to its statistical insignificance based on the preliminary analyses of primary regression models. Endogenous variables then include the level of taxation (alternatively TQ/WTI), PEXPGDP and RGDP in logarithmic differences expressing GDP growth rate (d(logRGDP)). As 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. The following description particularly analyses the influence of endogenous variables; given the focus of the study, the impact of exogenous variables is insignificant. All analyses employ the dummy variable (DIS), which enables examining the separate influences of the countries with a significant share of distortionary taxes[9] on the overall taxation measured by TQ or WTI. The dummy variable (DIS) is used to create the interactive member DIS*(TQ(-1)/WTI(-1)).

Table 1 summarizes the results of the first part of the VAR model, which studies the neoclassical growth model. The lagged values of the endogenous variable were used as instruments. They were chosen dynamically from an additional lag of 1 up to an additional lag of 6 (in total, 21 implicit instruments were used). The validity of the instruments was tested using a standard Sargan test (as indicated by J-statistic in the tables). With regard to the number of implicit instruments and on the 5% significance level, it is not possible to reject the hypothesis claiming that the instruments are valid. Our estimation results were thus considered correct.

[9] The criterion for the countries to fall within the high-distortionary tax group is a ratio of direct tax revenue to indirect tax revenue of more than 200%. The group includes Denmark, Finland, Netherlands, United Kingdom, Germany, Sweden, Australia, Austria, Norway, Italy, Luxembourg, Spain, Belgium, France, Canada, Switzerland, Japan, USA - Denmark having the lowest and USA having the highest direct/indirect tax revenue ratio.

Table 1. **GDP panel data model for the OECD countries, 2005–2010, overall taxation**

Dependent variable	d(log RGDP)	d(log RGDP)
Number of observations	140	84
Approximated taxation	Tax quota	WTI
RINVESTMENT	0,01(3,92)***	0,01(0,64)
d(logRGDP(-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)*
J-statistics	9,11	6,54

Source: Authors' calculations.
Note: Included in parentheses are t-statistics adjusted for heteroscedasticity and autocorrelation; standard deviations are calculated using robust estimates, *, **, *** stand for the significance levels of 10%, 5% and 1%, respectively. GMM – Generalized Method of Moments is the method used to estimate the dynamic panel. Although it returns inconsistent parameter estimates, the relevant coefficient of determination can be taken as a relatively reliable measure of the model consistence with the data.

In line with economic theory, the fiscal impact has been proven to be negative. This means that taxation significantly harms economic growth, regardless the method of tax burden approximation (TQ or WTI). If we use the tax quota to express tax burden, the impact of overall taxation in the 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 our alternative indicator of WTI, there is a statistically significant and very noticeable negative effect of taxation on economic growth in the countries with a high proportion of direct (distortionary) taxes. If the proportion of these taxes in a country's tax mix 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 capturing the impact of real taxation on economic growth, as opposed to only a simple proportion of tax revenues (in the case of tax quota), and in the estimated model it allows us capturing 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.

Table 2. **Expenditure panel data model for the OECD countries, 2005–2010, overall taxation**

Dependent variable	PEXPGDP	PEXPGDP
Number of observations	138	83
Approximated taxation	Tax quota	WTI
RINVESTMENT	-0,64(-9,8)***	-0,65(-17,8)***
d(loRGDP(-1))	-19,63(-3,57)***	-32,8(-2,97)***
PEXPGDP(-1)	-0,02(-0,61)	-0,24(-5,37)***
TQ(-1)/WTI(-1)	0,28(5,62)***	-0,20(-1,63)*
DIS* (TQ(-1)/WTI(-1))	-0,08(-0,73)	0,08(2,36)**
J-statistics	14,36	8,12

Source: Authors' calculations.
Note: J-test confirms the correctness of estimates at the 5% significance level.

Table 2 presents the effects of independent variables on the level of government spending (PEXPGDP). When expressed using the tax quota, taxation has a statistically significant positive effect. This effect is negative when using the WTI. We can interpret the above as meaning that, in the case of approximation through tax quota, i.e. de facto through a share of tax revenues, increased tax revenues will reflect an increase in government spending, as described by the Public Choice school economists (Buchanan, 1999).

Using the WTI, which conversely presumes negative impact from an increased tax burden on the level of government spending, is quite interesting, as the index comprises a number of factors affecting tax burden, which may not necessarily lead to an increase in tax revenues upon increasing tax burden; in contrast, they can cause higher tax evasion or significant substitution effects. Raising the effective tax burden can then be accompanied by a reduction in tax revenues, and also lead to a decline in government spending. This finding can be significantly modified by economic decision makers.

The table also shows that in the countries with a large share of distortionary or direct taxes, positive effects of an increased tax quota and thus increased tax revenues to the share of government spending decrease (however statistically insignificant); conversely, negative effects of an increased tax burden (measured by the WTI) are partially eliminated. As suggested by Boadway, Marchand and Pestieau (1992), legal tax evasion is practically possible only in the case of direct taxes. Countries with a relatively high share of direct tax revenues to indirect tax revenues will likely experience tax evasion to a lesser extent and the negative effect of an increased tax burden on government spending, as described above, is moderate.

For completeness, in both cases we have confirmed a statistically significant negative effect of GDP growth on the share of government spending, obviously contradicting the Wagner's law and the earlier conclusions of Zaghini and Lamartine (2011). This can probably be attributed to the restrictive fiscal policy adopted by a large number of countries in the reference period, due to the economic crisis.

The lagged value of the share of government spending is also negative (statistically significant only in the case of the WTI). There is thus no proof of the inertia or persistence of government spending, but rather a negative reaction of government spending in the current period to high government spending in the previous period. This can probably be related to the issue of savings due to the rehabilitation of previous government deficits and debt.

In this paper, the influence of particular types of taxes (corporate income tax, personal income tax, VAT and others) on growth is not examined. For more on individual effects of these types of taxes, see Machova and Kotlan (2013b).

Conclusion

The crucial aspect here was to demonstrate that taxation has a significantly negative impact on economic growth, both when measuring tax burden using tax quota, and when using the alternative WTI tax burden index. Using the alternative WTI index, it was found that the countries with a high proportion of direct taxes in their tax mix suffered more damage to their economic growth than the 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 WTI 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.

Another part of the analysis particularly described the effect of taxation and economic growth on the share of government spending. It was shown that taxation had a statistically significant positive impact on government spending, if we used approximate taxation through tax quota. However, if WTI was used to measure the tax burden, increasing effective taxation was, conversely, reflected in declining government spending. That can be attributed to legal tax evasion or the crowding out effect associated with declining tax revenues within the meaning of the Laffer curve. Moreover, in the countries with a large share of distortionary taxes, the positive effects of increasing tax quota become smaller (statistically insignificantly), and conversely, the negative effects of an increasing real tax burden (WTI) are partially eliminated, since these countries, characterised by high direct tax yields, probably suffer from tax evasion less frequently.

The above clearly suggests that the WTI is a suitable indicator for tax burden approximation and a very important alternative to tax quota. As such, it is applicable not only to compare tax burden in individual countries, but also as a tax burden indicator in macroeconomic models, especially in the models of 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 quantities such as the level of corruption (Kotlanova and Kotlan, 2012; Kasik, 2013).

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