The Impact of the Tax Burden on the Living Standard in OECD Countries[1]

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Abstract

In the article, the Instrumental Variables Method (IVM) is used to describe the interaction among taxation and economic growth in the OECD countries. The analysis aims to verify the negative effect, suggested by economic theory, of the effective tax burden on economic growth. Inasmuch as the Tax Quota, that is standardly used to approximate the tax burden, brings some shortcomings that call the results of empirical analyzes into question, the authors also present the WTI – World Tax Index. Above all, the results show that (i) taxation has a significantly negative impact on economic growth, both when measuring the tax burden using the tax quota, and when using the alternative WTI tax burden index; (ii) use of the WTI generally allows to prove more significantly and clearly the negative effect of taxation in case of particular types of taxes, which is not possible using the tax quota.

Keywords: *world tax index, effective tax burden, instrumental variables method, economic growth*

JEL Classification: O40, C20, H50

Introduction

Contemporary economic literature often deals with an issue of economic growth and tries to identify its determinants as precisely as possible. The aim of such studies is to present basic suggestions for economic policy authorities so that they would be able to achieve their goals effectively. As e.g. Kotlán (2001) shows, in an effort to achieve the goals, fiscal determinants seem essential. Above all, those include taxes on one hand and government expenditure on the other. The taxation and its influence on the economic growth is also an object of this paper.

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Empirical studies show ambiguous results concerning the causality or strength of dependence between growth and taxes, but there are no doubts about the existence of the relationship itself. These studies nevertheless almost exclusively utilize the tax quota or implicit tax rates as a variable to approximate the tax burden, which may not be very descriptive of the level of the effective tax burden (see e.g. Kotlán and Machová, 2013).

Thus the primary objective of this paper is to verify the effect of the effective tax burden on economic growth, while the secondary one is to use an alternative tax burden indicator, the World Tax Index (WTI), which is likely to omit the shortcomings of the tax quota (see e.g. Kotlán and Machová, 2012b). From a methodological point of view, an ontological approach is used, as described by Kotlán (2008). In the empirical part of the paper, the Instrumental Variables Method (IVM) is used.

1. Theoretical Background

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, e.g. widely known approaches by Lucas (1988) and Romer (1986). 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. Above all, the factors include fiscal variables, such as the taxation or also the government expenditure as the economic policy instruments that are possible to be directly used by the government.

Although empirical work, especially in the case of different types of taxes, often arrives at contradictory conclusions, 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 and the subsequent physical capital accumulation, and the level of human capital.

In exogenous growth models, the investment and physical capital accumulation influence the transition between steady-states of an economy, while the level of human capital may affect the steady-state growth rate itself. That implies that only taxes influencing the human capital accumulation may also affect the growth in a steady-state.

However, in models of endogenous growth, all the variables are possible to affect the growth through the mechanisms within the models, and thus all taxes influencing the investment behaviour of agents may affect the steady-state

growth – nevertheless both in positive and negative direction. Those are the direct taxes, particularly corporate and property taxes. Indirect taxes influence only the transition between steady states, as they do not directly influence the investment decision-making of agents (Barro and Sala-i-Martin, 2004). Following part of the chapter presents some of the empirical studies and their conclusions with the aim to show various mechanisms that taxes affect the growth variables through.

Investment activities are especially negatively affected by corporate tax (e.g. Kotlán and Machová, 2012a), which is very often associated with the decision to place foreign direct investment (Buettner and Wamser, 2006), and with the taxation of dividends (Santoro and Wei, 2012). 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 (see e.g. Sedláček, 2007).

Labour taxation also leads to reduced investment activities, due to pressure on corporate profits caused by a drop in the labour supply (Alesina et al., 1999). 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 also admitted by Lin (2001) and Capolupo (2000) in the case of public investment in education; however, in the case of private investment, most studies agree on the negative impact of taxation, in particular through personal income tax with a progressive tax rate[1] (Erosa and Koreshkova, 2007), which reduces the returns from these investments.

The negative effect is then amplified when capital income is taxed at lower rates than labour income and if there is an absence of any tax benefits for costs associated with investments in human capital (e.g. Jacobs and Bovenberg, 2010; Jacobs, 2007). The influence of corporate taxation is ambiguous and depends, inter alia, on the extent of employees' participation on the investment in human capital (Tremblay, 2010).

The effect of indirect taxation is similar to the taxation of labour (Salanié, 2003). 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 (see, e.g. Milesi-Ferretti and Roubini, 1998), while direct taxes also affect growth through other channels, e.g. those mentioned above. The influence of direct taxes on economic growth should thus be greater and their distortionary effects stronger compared to indirect taxes (e.g. Harberger, 1964, or Wiedmer, 2002), which is in accordance with the approach of Barro and Sala-i-Martin.

[1] For more on the progressivity of taxation, see e.g. Simonovits (2013).

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. Where indirect taxes, as compared to direct taxes, have less distortionary effects, their negative effect on growth will be smaller, or even positive.

Kneller, Bleaney and Gemmell (1999) also point out that it is necessary to take into account the type of public expenditure that is financed through tax revenues. Pro-growth effects can only result from productive (investment) spending financed through non-distortionary, or indirect, taxes. In contrast, unproductive public (consumption) spending, especially if financed through distortionary taxes, has a negative effect on economic growth (see also Izák, 2011, or Machová and Kotlán, 2013a). Simply, the public sector efficiency is essential for the economic development (Guran and Tosun, 2008).

2. Methodology and Data

In terms of methodology, the study is essentially based on a panel data VAR model (Vector Autoregressive model) that the authors generally use for studying the interaction between fiscal variables and growth also in their other studies (Machová, 2012; Kotlán, 2012). The model traditionally includes both endogenous and exogenous variables. Exogenous variables are standard variables expressing the level of capital accumulation approximated by the investment rate and the level of human capital. Endogenous variables are the fiscal variables being studied, and the third endogenous variable is the level of GDP per capita.

Compared to the cross-sectional analyses, the panel regression has multiple degrees of freedom, with the very important option of including individual effects (i.e. the existence of heterogeneity across cross-sectional units). This makes the presented statistics more credible, given the relatively small number of countries and short time series. The combination of time and cross-sectional data therefore seems essential. The software used was E-Views, version (7).

In this article, the authors focus only on the relationship between taxes and growth and they examine the hypothesis that taxation has a statistically significant negative effect on economic growth. Thus the model includes only one equation (see below) where real GDP per capita in USD adjusted for purchasing power parity (gdp_real) is a dependent variable. Control independent variables are standard neoclassical growth variables, i.e. real investment to GDP ratio (inv_real) and human capital approximation (cap_hum, part of labour force enrolled in

tertiary education), and also government expenditure at current prices in USD adjusted for purchasing power parity relative to nominal GDP (exp_prod). The inclusion of government expenditure follows from the literature review presented in the previous chapter. Based on the approaches above, the data includes just productive expenditures as specified by Kneller, Bleaney and Gemmel (1999), i.e. the investment expenditure, not the consumption expenditure.

The most important independent variable is the approximated level of taxation. The approximation was gradually 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, 2013), the analysis uses the World Tax Index 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). It was determined through an extensive questionnaire survey conducted among tax specialists from all OECD countries in order to obtain the weights of individual sub-indices and their components for further calculations.

Unlike TQ, the WTI seeks to produce an evaluation incorporating the maximum number of aspects associated with, e.g. tax progression, administrative difficulty of tax collection from the perspective of payers, the range of tax exemptions, options concerning the tax deductibility of expenses, etc. Hence, it consists of several sub-sub-indices:

- Corporate Income Tax (CIT),
- Personal Income Tax (PIT),
- Value Added Tax (VAT),
- Individual Property Taxes (PRO),
- Other Taxes on Consumption (OTC).

Each of the individual sub-indices also results from the interaction of several factors; therefore, the sub-indices also further break down into several sub-components. For a more detailed WTI composition, the methods of its construction, and the resulting values for individual countries in the reference years, see Machová and Kotlán (2013b). As in the case of the tax quota, the constructed econometric model studied the effect of the WTI as a whole, as well as the separate influence of individual sub-indices.

All the variables are used in the logarithmic form for better interpretation and comparison of results, as their values are at different scales. The model can thus be expressed as:

$$\log(gdp\_real) = \beta_0 + \beta_1\log(inv\_real) + \beta_2\log(cap\_hum) + \beta_3\log(gdp\_real(-1)) + \\ + \beta_4\log(exp\_prod) + \beta_5\log(TQ(-1))/\log(WTI(-1)) \quad (1)$$

The model includes a lag of one period, as is usual in these types of studies (see e.g. Arnold et al., 2011). Given the length of the time series, particularly for the WTI index (see below), a lag of higher order is not realistic.[2] Alternatively, analysis with two- and three-year lags was also implemented with similar results; nevertheless, with regard to the shortness of the time series, from the econometrical point of view, it would not be possible to verify the results reliably.

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[3] and OECD Factbook Statistics.[4] The hard data that was used to construct the WTI and its sub-indices was obtained from the OECD Tax Database[5] and OECD Tax Statistics,[6] additionally also from the World Bank's Doing Business project database.[7]

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. All the variables were found to be non-stationary, nevertheless, the authors use he logarithmic form as mentioned above. 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 manual (Chapter 18, p. 611). 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.

[2] At present, the WTI index is designed for a relatively short period from 2000 to 2012, and only estimated values are available for 2011 and 2012. For details, see <http://www.worldtaxindex.cz>.

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

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

[5] <http://www.oecd.org/ctp/taxdatabase>.

[6] <http://www.oecd-ilibrary.org/taxation/data/revenue-statistics_ctpa-rev-data-en>.

[7] <http://www.doingbusiness.org>.

3. Empirical Analysis Results

This section describes estimates of a panel data model using two alternative taxation level approximations. These are the tax quota and the WTI. The above index eliminates the shortcomings of the tax quota with regard to the link between taxation rate and tax revenues. With respect to the length of the WTI time series, the reference period is from 2000 to 2010, providing a sufficient number of observations considering the 34 OECD countries used. Previously published studies (Kotlán, Machová and Janíčková, 2011; Kotlán and Machová, 2012a) confirm that a relatively shorter period does not substantially modify the results, e.g. as compared with the time series from 1995 to 2010.

The lagged values of the dependent variable were used as instruments and their validity was tested using a standard Sargan test at the 5% significance level (as indicated by J-statistic in the tables).[8] All the estimation results presented in the tables below were confirmed correct.

The chapter first presents the results of the estimated impact of overall taxation economic growth, then also the influence of individual sub-components of the overall tax burden on economic growth.

T a b l e 1

Estimation Results for the Tax Quota, OECD 2000 – 2010

Dependent variable	log(gdp_real)
log(inv_real)	0.29 (44.11)***
log(cap_hum)	0.32 (8.67)***
log(gdp_real(–1))	0.59 (45.84)***
log(exp_prod(–1))	0.15 (7.32)***
log(TQ(–1))	–0.10 (–4.56)***
Instrument rank	35
J-statistic	33.73
Number of observations	306

Note: t-statistics that are adjusted for heteroscedasticity and autocorrelation are included in parentheses; standard deviations are calculated using robust estimates; *, **, *** stand for significance levels of 10%, 5% and 1%, respectively. Instrumental Variables Method is used to estimate the dynamic panel. J-test confirms the correctness of estimates at the 5% significance level. The same applies to the following tables 2, 3 and 4.

Source: Own calculations.

Tables 1 and 2 summarize the results of the model including the overall tax burden. In line with economic theory, the impact of taxation 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). However, if we approximate the taxation using the WTI, the negative impact is quantitatively more significant than using the tax quota. In other words, effective tax burden indicator postulates more negative effect on growth.

[8] Basically, the model makes a part of a VAR model, as mentioned above.

T a b l e 2

Estimation Results for the WTI, OECD 2000 – 2010

Dependent variable	log(gdp_real)
log(inv_real)	0.27 (30.56)***
log(cap_hum)	0.36 (8.29)***
log(gdp_real(–1))	0.55 (35.64)***
log(exp_prod(–1))	0.10 (4.32)***
log(WTI(–1))	–0.12 (–8.05)***
Instrument rank	35
J-statistic	30.31
Number of observations	306

Source: Own calculations.

In addition and also in line with economic theory, productive government spending has a significant positive impact on economic growth.

The chapter also includes the results of the model in a more detailed breakdown (Table 3 and 4). It particularly describes the effect of the individual sub-components of taxation on economic growth.

T a b l e 3

Estimation Results for the Tax Quota, OECD 2000 – 2010, Taxation Sub-components

Dependent variable	log(gdp_real)
log(inv_real)	0.27 (16.82)***
log(cap_hum)	0.36 (4,96)***
log(gdp_real(–1))	0.55 (13.73)***
log(exp_prod(–1))	0.22 (6.55)***
log(TQ1100+2000(–1))	–0.12 (–3.35)***
log(TQ1200(–1))	0.02 (1.66)*
log(TQ4000(–1))	0.16 (7.85)***
log(TQ5110(–1))	–0.04 (–0.99)
log(TQ5120(–1))	0.01 (0.18)
Instrument rank	34
J-statistic	30.31
Number of observations	306

Source: Own calculations.

If we summarize the results concerning the tax components, we find that personal income taxes (including social insurance contributions) exhibit a negative impact on economic growth (as measured by both TQ and WTI). Corporate taxes, in the case of approximating taxation through the tax quota, 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 alternative WTI index, the negative effects are already visible. The tax quota 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.[10]

T a b l e 4

Estimation Results for the WTI, OECD 2000 – 2010, Taxation Sub-components

Dependent variable	log(gdp_real)
log(inv_real)	0.27 (22.15)***
log(cap_hum)	0.34 (3.83)***
log(gdp_real(–1))	0.51 (10.67)***
log(exp_prod(–1))	0.08 (1.97)**
log(PIT(–1))	–0.08 (–2.14)**
log(CIT(–1))	–0.04 (–2.67)***
log(PRO(–1))	0.04 (3.61)***
log(VAT(–1))	0.03 (2.27)**
log(OTC(–1))	–0.04 (–3.20)***
Instrument rank	34
J-statistic	30.19
Number of observations	306

Source: Own calculations.

On the other hand, statistically significant positive effect of property taxes has also been proven, measured by both TQ and WTI. That is not in accordance with the economic theory that suggests the negative impact of direct taxes. For more, using the WTI, significant positive effect of VAT-type taxes has also been proved, but quantitatively smaller than in case of property taxes. On the other hand, the effect of selective taxes on consumption has been found significantly negative. Using the tax quota, the influence of indirect taxes (both VAT-type and selective taxes) is not statistically significant.

Conclusion

The present 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 2000 – 2010. To approximate the level of taxation, the traditional tax quota and the alternative WTI indicator of the authors' own design are used. Compared to the previous analyses, the study also includes the share of productive government spending as a control variable and examines the effects of taxation and its sub-parts on the economic growth. In terms of methodology, the authors have employed the dynamic panel model and use the Instrumental Variables Method as the key estimation method. This article primarily aimed to prove the hypothesis concerning the impact of the effective tax burden on economic growth, and also to study the effects of the individual sub-components.

In terms of paper focus, the crucial aspect was to demonstrate the fact that taxation has a significantly negative impact on economic growth, both when measuring

[9] Nevertheless, it is well known from the economic policy practice that it is that it is hardly possible to estimate the real peak of the curve.

the tax burden using the tax quota, and when using the alternative WTI tax burden index. In addition, the positive effect of productive government spending on economic growth has also been proven, which is consistent with economic theory.

The second part of the empirical 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 use of the WTI generally allowed the authors to prove more significantly and clearly the negative effect of taxation on the economic growth as it was confirmed for the most of the types of taxes. In case of the TQ, the significant negative effect could have been proven just in case of personal income tax.

The above clearly suggests that the WTI is a suitable indicator for tax burden approximation and a very important alternative to the tax quota, while for some taxes it even offers a substantially better tax burden approximation. 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), or the institutional characteristics of the labour market (e.g. Tvrdoň, 2008).

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