HOW DOES TAX UNCERTAINTY INFLUENCE ECONOMIC GROWTH?

Rudolf Macek – Igor Kotlán – Zuzana Machová

Abstract

The issue of uncertainty or volatility of taxation is very often omitted in empirical economic literature. Usually, only the influence of level taxation on economic growth is the influence of level of taxation on economic growth is evaluated. Therefore the aim of the paper is to evaluate the effect of taxation and its volatility on economic growth in OECD countries for the period the period 2000-2010. Relationship between these variables is explored by dynamic panel regression. The taxation is expressed by traditional tax quota and also by the World Tax Index - designed by the authors of the article. From our results, it is obvious that tax uncertainty expressed by tax quota is positively connected to the economic growth which is contradicting to the theoretical assumption. Anyway, the use of the World Tax Index shows the negative impact of tax uncertainty on economic growth in OECD countries. This means that the World Tax Index seems to be more appropriate approximate of the level of taxation.

Key words: Tax Uncertainty, World Tax Index, Economic Growth, Capital Accumulation, Human Capital

JEL Code: H2, H5, O4

Introduction

Currently, almost the all developed countries integrated in OECD are experiencing fiscal changes on a daily basis, significantly affecting the real tax burden. Nowadays, it is necessary to realize that the tax burden uncertainty may even represent a much more problematic factor than the level of taxation. E.g. Macek, Machová and Kotlán (2013a) state, that there is a negative relationship between taxation and economic growth. But it is also obvious that, if there is significant tax uncertainty, it is likely to damage long-term economic growth and living standards more than just a high tax burden. Also a high tax burden may, in cases of the dominance of non-distortionary taxes and the invalidity of the implications of the Laffer curve, lead to higher tax revenues. If these higher tax revenues are used to finance productive government expenditure, there can be sustained a long-term economic growth. This partially

eliminates the potential negative growth effect of high taxation, which does not apply this uncertainty to tax.

Therefore the aim of the paper is to evaluate the effect of taxation and its volatility on economic growth in OECD countries for time interval 2000-2010.

1 Influence of level and volatility of taxation on the economic growth

The size and volatility of taxation affects economic growth through its effects on individual growth variables, in particular on the level of savings and capital accumulation, or the size of the human capital and technology (Macek, Machová, Kotlán, 2013b). In the case of taxation and its effect on growth, economists come to contradictory conclusions. Keuschnigg (2009) argues that investment activities, and thus the growth, are negatively affected in particular by corporate tax, which is very often associated with decisions to place foreign direct investment, and with the taxation of dividends. Labour taxation also leads to reduced investment activities due to the pressure on corporate profits caused by a drop in labour supply (Alesina et al., 1999).

The positive effect of taxation on human capital accumulation is also admitted by Lin (2001) 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, 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 the costs associated with investment in human capital.

Indirect taxes affect economic growth only through their effect on the substitution between leisure time and work, thus leading to a change in the ratio between labour and capital in production, while direct taxes also affect growth through other channels, e.g. those mentioned above. The negative influence of direct taxes on economic growth should thus be greater and their distortionary effects stronger compared to indirect taxes. As shown by Mamatzakis (2005), shifting the tax burden from direct to indirect taxes can lead to the promotion of economic growth while preserving tax revenues for the state budget.

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 (Kotlán, and Machová, 2013). As mentioned above, 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 fewer distortionary effects, their negative effect on growth will be smaller, or even positive.

Tax volatility or uncertainty, similarly as in the case of indirect taxes, affects growth variables primarily through the substitution effect, whether it is substitution between consumption and savings, or substitution between investments in the different types of capital. Its effect is thus particularly relevant in the case of distortionary taxes.

Decisions on the size of household savings are mostly influenced by taxation of labour, which reduces the amount of disposable income, also potentially leading, in the absence of tax uncertainty, to a reduction in the volume of savings and negative effect on growth. The influence of uncertainty on the level of taxation then depends on the elasticity of intertemporal substitution and risk aversion. For agents with high risk aversion, if elasticity is high, higher risk arising from uncertainty regarding labour tax rates will lead to higher substitution and an increase in the savings rate, which will have a positive effect on economic growth (see, e.g. Smith, 1996). The resulting effect of labour taxation on economic growth then depends on which of these effects prevails.

As for the accumulation of capital, the tax reduces the net rate of return from capital after tax, thus having a negative impact on economic growth. If there is uncertainty about future tax rates, economic agents with high risk aversion prefer the type of capital accumulation which is not taxed, which is not subject to uncertainty, or where such uncertainty is at least reduced. For example, if there is greater uncertainty about the tax rate on physical capital, this will lead to a greater accumulation of human capital and vice versa. The substitution effect will thus influence the relationship between physical and human capital in production, which will also affect economic growth (see e.g. Easterly et al., 1991). The resulting effect will depend on the type of capital with more uncertainty about the level of its taxation.

Economic theory implies that the impact of tax uncertainty on economic growth is the result of a number of different effects, and that it depends on which of them prevails. The results of empirical work in this area are unclear; however, it should be noted that they are generally limited to the impact of uncertainty on investment decisions. The negative impact of tax uncertainty on growth is confirmed by El-Shazly (2009). Conversely, Niemann (2011) disproves the negative impact of tax uncertainty on growth and investment, claiming that the effect is not clear, as it depends on many factors, such as risk attitude, interest rate development, the rate of return on investment, etc.

2 Methodology and Data

From a methodological point of view, the empirical analysis in this article is based on a dynamic panel model. Real GDP per capita in purchasing power parity (GDPCAP) is therefore the dependent variable. The independent variables are then standard growth variables, namely capital accumulation, expressed as a share of investment in real GDP in purchasing power parity (INVGDP) and the accumulation of human capital as a proportion of the population in the total population aged 25-64 having completed at least upper secondary education, as classified by ISCED (HUM SC). Other explanatory variables are then fiscal variables, including the level of government expenditure, the volatility of government expenditure, taxation and the size of the tax uncertainty.

The level of government expenditure is expressed as a share of government expenditure in nominal GDP. The volatility of government expenditure is expressed by the deviation of the government's expenditure (share of GDP) in each year from an average level of government expenditure during the reporting period for each country. However, none of the variables concerns total government expenditure, but only productive expenditure, in accordance with the work of Kneller, Bleaney and Gemmell (1999) or Machová and Kotlán (2013b) and according to COFOG classification.

Tax uncertainty, is expressed using deviations of the tax burden in each year from an average level of tax burden for the reporting period for each country. The selection of an indicator to express the tax burden is crucial both to calculate the uncertainty, and to express the level of taxation. As a standard, the tax burden is approximated using a tax quota, i.e. the share of tax revenues in nominal GDP; however, this brings about a whole range of negatives (Kotlán and Machová, 2012). As an alternative to the tax quota, the following analysis therefore also uses another indicator of the tax burden, the World Tax Index (WTI), designed for the purposes of macroeconomic comparisons and other analyses by the authors. It is a measure that combines hard data from internationally recognized sources (the OECD, the World Bank and others) with soft data obtained from an extensive survey carried out annually among tax experts from all OECD countries. The index consists of several parts: (1) Corporate Income Tax (CIT), (2) Personal Income Tax (PIT), (3) Value Added Tax (VAT), (4) Individual Property Taxes (PRO), and (5) Other Taxes on Consumption (OTC). The WTI is not only limited to tax rates, which are reflected, under certain circumstances, in the level of tax revenue and thus the tax rate; it includes other aspects associated with the tax burden, such as taxation progressivity, the administrative costs of taxation, or tax deductibility of expenses.

For more details, see Machová and Kotlán (2013a). The dataset is freely available at www.worldtaxindex.com. Other data mentioned was drawn mainly from the OECD iLibrary Statistics[1], OECD Factbook Statistics[2] and Penn World Table[3].

The method used was panel data regression. Given the relatively small number of countries and the relatively short time series, the combination of time and cross-country data is absolutely essential. This makes the presented statistics more reliable. The software used was E-Views, version (7).

The regressions performed aimed to verify the hypothesis of the existence of the impact of taxation and government expenditure, and particularly tax uncertainty and volatility of government expenditure on long-term economic level and hence economic growth. In the first phase, stationarity tests were performed using a panel unit root tests. Alternatively, four different, standard tests were used for all the variables. In all cases, most of the tests performed confirmed the stationarity (see the attachment), but with regard to further interpretation of the results, the variables were expressed in logarithmic form. Further analysis also confirmed that there exist no correlations between the variables included in the models (see the attachment).

Using a robust estimator in calculating the covariance matrices ensured that the estimation 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 "White Period" and it is made possible by virtue of the econometric software used.

Given that this is a dynamic panel, which includes appropriate delays of the dependent and independent variables, it cannot be reliably estimated by OLS. As the estimation technique, a generalized method of moments (GMM) was used, which included the method of instrumental variables. This method uses the Arellano-Bond estimator. The aforementioned estimation type ensures that the appropriate transformation process and using appropriate instruments eliminates the risk of endogeneity of the lagged values of the dependent variable and the independent variables with a random component. In the analyses below, the lagged values of the dependent variable were used as the instruments, with a lag of (-2). According to the Sargan test, the lagged values of the independent variables were not necessary to use.

The below model includes a lag of one period, as is usual in these types of studies. Alternatively, autoregression analyses with a two- and three-year delay were still carried out,

[1] http://www.oecd-ilibrary.org/statistics;jsessionid=998q2qigk0e50.delta
[2] http://www.oecd-ilibrary.org/economics/data/oecd-factbook-statistics_factbook-data-en
[3] https://pwt.sas.upenn.edu/

with very similar results; however, with regard to the shortness of the time series, it would be impossible to reliably verify their validity from an econometric point of view.

3 Dynamic panel regression – Empirical results

The dynamic panel model of OECD countries for the period 2000-2010 is presented in the following tables 1 and 2. As already indicated, it uses lagged values of the dependent variable and other endogenous variables describing the impact of fiscal policy. This is the level of government spending and the level of taxation as well as the rate of their volatility. Given the focus of the paper, the question of particular importance is the volatility of taxation. Table 1 presents a model which uses ordinary tax rate as the tax burden approximation; table 2 shows the author's own tax burden index – the World Tax Index (WTI), see above.

Tab. 1: Effect of tax uncertainty and volatility expressed by tax quota on economic growth

DEPENDENT VARIABLE	GDP per capita (PPP) (LOG(GDPCAP))
Number of observations	306
Number of instruments	34
J-statistics	32,97
LOG(GDPCAP(-1))	0,595 (21,1263)**
LOG(INVGDP)	0,284 (20,496)**
LOG(HUMSC)	0,304 (4,367)**
LOG(EXPPROD(-1))	0,129 (3,414)**
LOG(V_EXPPROD(-1))	-0,001 (-1,930)*
LOG(V_TQ(-1))	0,001 (2,636)**
LOG(TQ(-1))	-0,135 (-5,351)**

Source: Authors' own calculations

Note: Included in parentheses are t-statistics that are adjusted for heteroskedasticity and autocorrelation; standard deviations are calculated using robust estimates; *, **, *** indicate significance levels of 10 %, 5 %, and 1 %, respectively; Arellano-Bond estimation.

The results presented in both tables show that substantial inertia can be seen for the GDP (GDP (-1)) indicator and a positive effect of the size of GDP in the previous period, as well as a very significant positive impact of the share of human capital (HUMSC) and investment rate (INVGDP), where the effect of percentage change in human capital is quantitatively greater than with the percentage change of physical capital.

Both models also show that there is a substantial positive impact of productive expenditure (EXPPROD(-1)) and also there is the negative impact of government spending volatility (V_EXPPROD) on economic growth.

In both tables there is also visible the negative relationship between taxation (TQ(-1)/WTI(-1) and economic growth. This means that taxation expressed by tax quota and World Tax Index reduces economic growth.

Also it was proved the negative impact of tax uncertainty measured by indicators of effective tax rates WTI (V_WTI(-1)), but a positive impact of tax uncertainty measured by the tax quota (V_TQ(-1)). Although theoretical assumptions about the negative impact of tax uncertainty was thus not confirmed if we use the tax quota, its negative impacts are quite apparent when using this alternative indicator.

Due to the use of logarithms, the effect of these independent variables can be interpreted as the effect of their percentage change on the percentage change in output per worker. When using the tax quota, an adverse effect of the tax burden is shown, where a 10% tax quota increase reduces the GDP per capita in the following period by about 1.35 %. If we use the alternative indicator of the tax burden (WTI), which better describes the effective tax burden, we find that increasing the tax burden (measured by WTI) is reflected in a decline of GDP per capita by 1.44 %, which is a slightly larger counter-growth effect. From the above, one can conclude that using the alternative indicator of the tax burden leads to more negative counter-growth effects of taxation. Another issue is the tax volatility. Tax volatility is estimated as adversely affecting economic growth, but only when using the alternative index (WTI). Taxation and tax uncertainty thus seem to have a significantly more negative impact on economic growth than when taxation is approximated using the tax quota, i.e. using the relative tax revenues.

Tab. 2: Effect of tax uncertainty and volatility expressed by WTI on economic growth

DEPENDENT VARIABLE	GDP per capita (PPP) (LOG(GDPCAP))
Number of observations	306
Number of instruments	34
J-statistics	30,854
LOG(GDPCAP(-1))	0,574 (19,589)**
LOG(INVGDP)	0,265 (21,901)**
LOG(HUMSC)	0,348 (6,529)**
LOG(EXPPROD(-1))	0,102 (3,316)**
LOG(V_EXPPROD(-1))	-0,001 (-2,162)*
LOG(V_WTI(-1))	-0,002 (-6,74)**
LOG(WTI(-1))	-0,144 (-5,037)**

Source: Authors' own calculations

Note: Included in parentheses are t-statistics that are adjusted for heteroskedasticity and autocorrelation; standard deviations are calculated using robust estimates; *, **, *** indicate significance levels of 10 %, 5 %, and 1 %, respectively; Arellano-Bond estimation.

Conclusion

The current economic literature pays considerable attention to the impact of fiscal variables on economic growth. It focuses on the issue of taxation according to different types of taxes, on government expenditure and the size of the government sector, generally considering the effects of taxation to be negative, while seeing the effect of government spending, in the case of productive expenditure, as rather positive. However, studies of this type often neglect the fact that economic growth may be subject to effects other than the actual level of taxation and government expenditure. This is because fiscal variables can affect growth only due to their volatility, although their level has long been relatively low.

As a result, the aim of this paper was to use the dynamic panel model of OECD countries to describe the effect of taxation and government expenditure on long-term economic growth with a special emphasis on the impact of tax uncertainty and volatility of government expenditure.

The paper aims not only to assess the actual impact of the volatility of fiscal variables on economic growth, but in particular the use of the alternative indicator of the tax burden to calculate tax variables – the World Tax Index (WTI), which was designed by the authors and which is used in the empirical analysis in addition to the standard tax quota indicator.

The results of the empirical analysis confirm the economic theory of the negative impact of taxation and the positive effect of productive government spending on economic growth. The negative effect of taxation was demonstrated both when using the tax quota, and when using the WTI.

In compound models, i.e. models using both of these tax burden indicators, assumptions about the negative impact of volatility of government expenditure were also confirmed. However, the models show contradictory results in the case of the impact of tax uncertainty. When using the tax quota, it showed a positive influence on growth, which contradicts the theoretical assumptions, while the use of the WTI led to results consistent with theory and showed that the impact of tax uncertainty on economic growth is negative. From this perspective, the WTI seems to be more suitable to an approximate tax burden, and as such it is applicable not only in order to compare the tax burden for individual countries but also as an indicator of the tax burden in macroeconomic models, particularly in models of long-term economic growth.[4]

[4] Use of the WTI can also modify the conclusions on growth 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 Julio et al., 2013).

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Contact

Igor Kotlán
Ekonomická fakulta, Vysoká škola báňská – Technická univerzita Ostrava
Sokolská třída 33, 701 21 Ostrava 1
igor.kotlan@vsb.cz

Zuzana Machová
Ekonomická fakulta, Vysoká škola báňská – Technická univerzita Ostrava
Sokolská třída 33, 701 21 Ostrava 1
zuzana.machova@vsb.cz

Rudolf Macek
Ekonomická fakulta, Vysoká škola báňská – Technická univerzita Ostrava
Sokolská třída 33, 701 21 Ostrava 1
rudolf.macek@vsb.cz

Attachment

Tab. 1: Panel Unit Root Tests

PANEL UNIT ROOT TEST	
GDPCAP	
Levin, Lin and Chu	-4,69 ***
Im, Pesaran and Shin	-3,25 ***
ADF - Fisher Chi-square	118,54 ***
PP - Fisher Chi-square	144,73 ***
INVGDP	
Levin, Lin and Chu	-4,72***
Im, Pesaran and Shin	-2,25 ***
ADF - Fisher Chi-square	104,52 ***
PP - Fisher Chi-square	69,8
HUMSC	
Levin, Lin and Chu	-3,69 ***
Im, Pesaran and Shin	-3,36 ***
ADF - Fisher Chi-square	119,8 ***
PP - Fisher Chi-square	116,9 ***
EXPROD	
Levin, Lin and Chu	-1,51 **
Im, Pesaran and Shin	-0,94
ADF - Fisher Chi-square	89,30 ***
PP - Fisher Chi-square	82,25 *
TQ	
Levin, Lin and Chu	-4,96 ***
Im, Pesaran and Shin	-1,44 **
ADF - Fisher Chi-square	91,19**
PP - Fisher Chi-square	75,84
WTI	
Levin, Lin and Chu	-2,07 **
Im, Pesaran and Shin	-1,27 **
ADF - Fisher Chi-square	85,34 **
PP - Fisher Chi-square	193,37 ***

Source: Authors' own calculations

Note: *, **, *** indicate significance levels of 10 %, 5 %, and 1 %.

Tab. 2: Correlation Matrix

Correlation	GDPCAP	INVGDP	HUMSC	EXPPROD	TQ	WTI
GDPCAP	1.000000					
INVGDP	0.118625	1.000000				
HUMSC	0.212309	-0.061253	1.000000			
EXPPROD	-0.088426	-0.211696	-0.002099	1.000000		
TQ	0.395881	-0.117359	0.225762	0.310746	1.000000	
WTI	0.096903	-0.106283	-0.150878	0.208419	0.620373	1.000000
t-Statistic	GDPCAP	INVGDP	HUMSC	EXPPROD	TQ	WTI
GDPCAP	-----					
INVGDP	2.304232	-----				
HUMSC	4.190392	-1.183633	-----			
EXPPROD	-1.712197	-4.177741	-0.040491	-----		
TQ	8.314783	-2.279299	4.469728	6.305624	-----	
WTI	1.877828	-2.061587	-2.943734	4.110090	15.25591	-----
Probability	GDPCAP	INVGDP	HUMSC	EXPPROD	TQ	WTI
GDPCAP	-----					
INVGDP	0.0218	-----				
HUMSC	0.0000	0.2373	-----			
EXPPROD	0.0877	0.0000	0.9677	-----		
TQ	0.0000	0.0232	0.0000	0.0000	-----	
WTI	0.0612	0.0399	0.0034	0.0000	0.0000	-----

Source: Authors' own calculations