

AFFECTS CORPORATE TAXATION ECONOMIC GROWTH? – DYNAMIC APPROACH FOR OECD COUNTRIES

Veronika Nálepová¹

¹ VŠB-Technical University of Ostrava, Czech Republic



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ABSTRACT

This contribution deals with issues of corporate taxation in relation with economic growth. Its main objective is to quantify and analyse the relation of corporate taxation and economic growth using of OECD countries. The corporate tax rate is approximated by effective corporate tax rates such as corporate tax quota, marginal effective and average tax rates as determined by micro-forward looking approach and the alternative approach World Tax Index. The relation of taxation and economic growth is verified using an econometric model based on panel regression methods and tests using a dynamic panel. The model has shown a negative impact on economic growth for all six of the selected corporate tax approximators under the assumed significant level. A quantitatively higher negative impact has been verified in the case of labour taxation.

KEY WORDS

corporate taxation, economic growth, growth models, dynamic panel, effective tax rate, OECD

JEL CODES

C50, H20, H25, O47

1 INTRODUCTION

The global economy experienced sharp growth followed by a decrease caused by the economic (financial) crisis in the last decade. The national economic policy-makers try to handle its consequences until now. Currently, individual countries face mainly debt issues, which were especially caused by fiscal policy, over indebtedness of the private sector and

a decrease in economic activity. The crucial question is – how to set up fiscal systems in a way that would support economic growth and simultaneously follow the budget discipline with focus on decreasing current budget deficits?

The existence of the public sector requires the immediate need for tax collection, but until now the issue of optimal taxation and composition

of tax mix remains in the hands of individual countries. The consolidation of public budgets is realized mainly on the income side (tax policy). The main reason is the high portion of mandatory expenditures on all government expenditure. This leads to the limitation of active expenditure economic policy. The effort to find the optimal level of taxation appears to be inevitable. The above mentioned must also be realized with respect to the dynamic side of economy. Taxation needs to be set up in a way that governments are able to fulfil their targets without any deformation of the economy. Systems, which are correctly set up, can lead to the optimal source of allocation and to higher economic growth.

From a global point of view the possibility of adequate tax system approximation sources for following economic analysis and the conclusion about usage of convenient tax rates can provide a basis for the next studies. The possibility to compare tax systems and their implementation provides, clearly, a new view on the tax system as a whole. The tax system, which also includes taxation of corporations, also presents part of economic policy of the country and the choice of correct indicator of tax burden enables a suitable evaluation of economic environment of the country. Corporate tax is mainly related to capital.

Capital is considered to be a highly mobile factor of productivity. It is necessary to carefully consider individual taxation systems as those are usually very complex and to allocate the capital to the country with the most convenient tax system. The taxation of the corporations influences not only revenues, but also the distribution of the profit. At the same time, capital (physical capital) is the elementary source of economic growth; hence taxation of corporations has an intermediate impact both on capital accumulation and economic growth. The remaining question is how to correctly approximate taxation so that the final

indicator would reflect the economic reality in the best possible way.

The studies which focus on the taxation and economic growth usually use different variables approximating tax burden (tax quota, implicit tax rate). This approach reflects the elementary tax burden but it basically represents the share of the tax revenues to the basic value. It also omits the dynamics of the economic process as it uses only cross sectional data and therefore can lead to a biased conclusion. The presented paper utilizes not only the above mentioned variables (tax quota, implicit tax rate) but also effective marginal and average tax rates. The paper also uses the World Tax Index. All variables are incorporated by dynamic panel regression.

Taxation, on the one hand, presents a burden on economic subjects, on the other hand it also represents significant income for government expenditures.

Studies focusing on taxation and economic growth very often neglect the complexity of the tax systems. Denaux (2007) or Izák (2011) note that it is very important to include government expenditures to the models analysing impact of taxation to the economic growth as they represent one of the aspects of the taxation. With regard to the modern approach to taxation and economic growth (e.g. Kotlán and Machová, 2014a) it is suitable to also include other fiscal variables – other kinds of taxation. Then the evaluation of the tax to the economic growth can be considered as complex.

The aim of the paper is to evaluate the relation between corporate taxation and economic growth. We expect to confirm the negative impact of corporate taxation on economic growth on the sample of OECD member countries. The analysis is based on the neoclassical growth model extended by the human capital. The model also takes into consideration all the main types of taxation and government expenditures.

2 THE IMPACT OF TAXATION ON ECONOMIC GROWTH – CURRENT STATE OF KNOWLEDGE

There are many factors which impact the speed and size of economic growth. These can include climate, education, property rights, savings, access to ports etc. Generally the sources of economic growth can be divided into human and capital. As Frait and Červenka (2002) state, human sources are characterised by the growth of labour productivity and an increase in work effort. Similarly, this situation is valid for the capital which is influenced by the stock of real capital and the technical level of capital goods. Accumulation of those determinants is derived from the motivation of individuals to save and invest which then leads to the changes of economic growth.

The relation of taxes to economic growth can be considered from many aspects. It can be perceived as a feature which burdens economic subjects and their behaviour and therefore influences their willingness to save or invest; or their work efforts. It can be also viewed as an instrument which ensures sources for government expenditures which can lead to the areas supporting economic growth (productive government expenditures, see below). With the respect to the afore-mentioned it is necessary to see taxation in its wider context.

One of the first studies which noted the possible relation between taxation and long-term economic growth was e.g. Barro (1999) or King and Rebelo (1990). The impact of taxation on the total economic growth was studied by Judd (1985), Chamley (1986), Rebelo (1991), Devereux and Love (1994); their papers are based either on the neoclassical growth model with physical capital or the two sector growth model with human and physical capital. Their common conclusion supports the idea that the three most commonly used taxes (consumption, corporate, taxation of labour) have a negative impact on the economic growth within the OECD member countries. They consider corporate taxation followed by income taxes and consumer taxes as the most damaging for economic growth. Similar results for corporation taxation

were also received from Lee and Gordon (2005). On the other side there is also analysis that did not confirm this conclusion; these are more of an exception than the rule. For example

Forbin (2011) analysed the Swedish economy for 1951–2010 period and didn't confirm any significant relation between tax corporation and long-term economic growth. He also admits that if he used marginal effective tax rates the conclusions could be different.

In the case of property and consumer taxes there are countless numbers of studies showing their low distortion effect and nearly no impact on the economic growth (e.g. Arnold, 2010; Johansson et al., 2008 or Widmalm, 2001). To support economic growth, Myles (2009) supports a transition of taxation of income to the consumer. He also adds that taxation of capital is ineffective in the long-term. The new study of Gemmell et al. (2014) explores the merits of macro- and micro-based tax rate measures within an open economy. Their conclusion is that in general, tax effects on GDP operate largely via factor productivity rather than factor accumulation.

Engen and Skinner (1996) define five main channels on how corporate taxation influences economic growth. They are represented by (i) investment discouragement, (ii) impact on the labour offer, (iii) decrease of the productivity growth of corporates, (iv) decreasing marginal productivity of capital, and (v) increase of effective utilization of labour capital. All above mentioned channels are usually connected to corporate and labour taxation. This fact is also confirmed by the knowledge of the distortion effect of taxation which influences behaviour of economic subjects. Cullen and Gordon (2002) conclude that tax policy is the key factor influencing business activity in the sense of its movement between employees and self-employment. Kotlikoff and Summers (1987) support the opinion that the taxation of corporations leads to a lower return on capital which as a result tends to move out of the country.

Kotlán et al. (2011) state that integration of taxation to growth theories can be divided into two main streams. The first one is focusing on the impact on the level of the savings, investments and capital accumulation. The pro-growth effect is notable mainly in the case where countries which haven't reached a steady state. The second stream analysis integration via economic progress and accumulation of human capital; the final effect should be on countries which have already reached the steady state.

The relationship between economic growth, corporate taxation and economic activity of corporations is probably the most important and also commonly discussed in the empirical studies. Many published papers also study the impact of taxation on corporate decision making and their influence not only on the investment decision making but also on dividend policy, organizational structure etc. (e.g. Scholes and Wolfson, 1992; Auerbach and Slemrod, 1997; Shackelford and Shevlin, 2001). The results unambiguously confirmed the impact of corporate taxation on corporate policy. Tax policy has a significant impact on how corporations finance themselves. The capital for new investments can be obtained through their own capital, debt or undivided profit. High tax rates lower the income of the corporations and therefore possibility of the following reinvestment. Simultaneously the international movement of capital allows an easy choice for the investment allocation. For small open economies, which are usually recipients of the investments, the high taxation represents a competitiveness problem. The inflow of foreign investments has its positives, e.g. on the employment level. Harberger (1962) believes that high corporate tax rates discourage investment activity. The inflow of foreign investments has its positive relations also in the case of higher employment. The relation between foreign direct investments and corporate taxation confirmed e.g. Simmons (2003). In his study the index evaluating the attraction of the country based on the corporate taxation was presented. The impact of the tax rates changes on the intensive investments studies also Devereux (2007) or De Mooij and

Ederveen (2003). They conclude that this kind of investment is more sensitive on the tax related law changes and on the average tax rate compared to the standard investments. Analysis of Buettner and Ruf (2007) or Buettner and Wamser (2009) point out that corporate taxation influences both the extent and allocation of the investments. Keuschingg (2008) created a model of monopoly competitive industry with extensive and intensive investments and showed how margin changes of those investments react on the changes of average and marginal rates of corporate taxes. Lanaspá et al. (2008) note that government has the ability to influence localised decisions (in the case of FDI) of the corporates due to the tax rate of capital incomes. They confirm the general conclusion that countries with a lower tax burden are net receivers of FDI. Mutti and Grubert (2004) study the impact of these types of taxes on horizontally integrated international organizations which consider investing in another country. They conclude that investments abroad are very sensitive to the tax rates and this sensitivity is higher in the case of developing countries compared to the developed countries; it also grows in time. Paretto (2007) provides a different view on corporate tax, this work is based on modern Schumpeterian growth theory. He concludes that higher dividend taxation has a positive impact on economic growth as it balances the deficit of government budget.

The investment activities of companies can be influenced by different taxation as well. It is easier to verify the impact of the direct taxes. Brett and Weymark (2008) believe that the immediate effect on capital accumulation and savings creation have also individual pension taxes – lower pension reduces intended savings; and also via lower yield from the savings. Lubian and Zarri (2011) mention the negative and positive impact of pension taxation. The negative impact is represented by (i) the decrease of disposable income and savings (ii) tax evasion in the case of capital incomes. The positive impact is based on the idea of growing work effort with the aim of achieving a particular value of pension before taxation. The pressure on salary growth as a result of

growing labour taxation makes work offer rigid and therefore creates pressure on the decrease of corporate profits and later on the investment decrease. As a result the structure of capital accumulation is disrupted.

Taxation of dividends represents another approach to the investment activity of economic subjects. On a theoretical level there are three approaches. The traditional one views marginal source of investments in the new own capital where the investment yields are used for dividend payments. The new one sees it as the source of investments undivided profit. It can be noted that whereas the traditional approach attributes impact of the dividend taxation on the investment activity, the new approach holds the opposite opinion (e.g. Bradford, 1981; King, 1977; Poterba and Summers, 1985). The third approach applies the theory of tax insignificance. Its supporters claim that investors aren't facing different dividend and capital yields taxation (e.g. Miller and Scholes, 1982; Miller and Modigliany, 1961). Under the assumption of the validity of the theory the change of dividend taxation doesn't influence investment decision making and taxation is considered as non-distorting.

Savings represent the most important factor determining long-term economic growth and based on the above mentioned it is obvious that corporate taxation is, in parallel with labour taxation, a key factor influencing capital accumulation.

In the case of endogenous models of economic growth it is also necessary to mention approaches to the impact of taxation on technological advances and investment in the human capital. The number of studies handling this issue is not so vast. Some papers support the idea of immediate impact of taxation on accumulation both of physical and human capital (Leibfritz et al., 1997; King and Rebelo, 1990). On the level of corporate taxation the conclusions vary and a clear impact has not been confirmed on the empirical level. For example Tremblay (2010) highlights the non-existent neutral relation between corporate taxation and investment to human capital. He shows a negative impact in the case that both

employees and corporations are engaged in the investments to the human capital. On the other hand, if only corporations are involved the impact is positive. But if we analyse the issue from the side of public finances (tax incomes) there is a positive correlation between economic growth and taxation (Lin, 2001). This relation exists mainly if the tax incomes for the accumulation of human capital are used. Myles (2007) or Erosa and Koreshkova (2007) state that mainly personal income tax has an essential impact on the return of investments to human capital and decision making about future education. Tremblay (2010) adds that if the investment in human capital is performed both by employee and corporation, the level of the investment in human capital will increase in the case of higher taxation of personal income; conversely the effect of corporate taxes is opposite.

Zeng and Zhang (2001) study the growth effect of taxes within Howitt's (1999) growth model where the main sources of growth is innovation. They conclude that tax of capital income is harmful for growth as it discourages creation of savings and capital investments. In the case of technologically advanced countries where innovation is key for the long term growth they recommend focussing on consumer and labour taxes instead of investment taxation. The impact of taxes on economic growth is studied mainly in the sense of tax incentives aimed on research and development. The economic literature confirms that short-time incentives in research and development are relatively non-elastic, in the long-term their elasticity is close to one and there is a positive relation between economic growth and tax incentives (Bloom et al., 2002; Hall and Van Reenen, 2000).

For government expenditures two aspects are important – their productivity and their efficiency. To evaluate the impact of government expenditures on economic growth properly it is necessary to perceive the above mentioned aspects and connection between taxation and government expenditures. It can be assumed that growth-supporting effect belongs to government expenditures which are financed by

non-distorted taxes. On the other hand, non-productive government expenditures which are financed by distorted taxes have an anti-growth effect (for more details e.g. Afonso and Furceri, 2008; Agénor, 2010). Devarajan et al. (1996) point out the significance of the difference between productive and non-productive government expenditures. They support the opinion that there is a positive relationship between economic growth and public investment expenditures; the relation between consumer related public expenditures and economic growth is negative. As productive government expenditures are considered mainly investment expenditures and expenditures to the education. Non-productive expenditures are represented by mandatory expenditures (mainly social expenditures). Drobiszová and Machová (2015)

add that government expenditures also indirectly support economic growth by the creation of suitable institutional conditions for private investments. If the private investments were absent or non-realized in the economy it would disturb its functioning.

From the above mentioned literature review it is obvious that the impact of corporate taxation on economic growth is realised within the saving and investment channel; and its impact is negative. The impact on the economic growth within the human capital is rather negative and the impact of technological progress is not clear. For government expenditure their composition is crucial; in the case of productive expenditures the impact is positive, in the case of non-productive negative.

3 METHODOLOGY AND DATA

The presented paper is based on the Mankiw et al. (1992) growth model which represents the basic neoclassical growth model of economic growth extended by human capital. The model also includes other fiscal variables, which together with delayed explained variable characterizing the dynamic of economic relation, modify the whole model.

Economic variables can be perceived as dynamic processes within the time. It can be therefore expected that the current growth rate is determined among others by its delayed value. Integration of taxation to the model needs to be performed complexly. Because of that the model also includes other taxes which exist in the tax systems of the chosen countries. This approach is consistent with the modern approach of economical agents as they are defined by e.g. Kotlán and Machová (2014a). Judd (1987) claims that it is desirable to estimate impact of all taxes on economic growth. Denaux (2007) or Izák (2011) add that it is also necessary to quantify impact of other fiscal variables, mainly government expenditures. Because of that, the model is extended by control of tax variables and government expenditures.

Analysis of the relation between corporate taxation and economic growth is based on the dynamic of panel regression. Panel regression as a statistical-econometric method investigates relations in two dimensional space. Panel data enables the connection of time and cross-section dimension of data and at the same time the statistics are more reliable and robust. With respect to the used data, the estimation is performed under Generalized Method of Moments (GMM) specifically the Arellano-Bond estimator (Arellano and Bond, 1991) which uses instrumental variables. To obtain consistent estimation and to remove possible homogeneity the first differentiations are used; so the special differentiation form of GMM with institutional variables is applied (details in Baltagi, 2010).

Baltagi (2010) states that dynamic relations are usually characterized by delayed variable, so the model can be defined as following (1):

$$y_{it} = \delta y_{i,t-1} + x'_{it}\beta + u_{it}, \quad (1)$$

where $i = 1, 2, \dots, N$, $t = 1, 2, \dots, T$, δ is scalar variable, x'_{it} represents vector of explanatory variables ($1 \times K$), β is vector of regression coefficients ($K \times 1$) and u_{it} is random variable

given by equation (2):

$$u_{it} = \mu_i + \nu_{it}, \quad (2)$$

where μ_i represents individual effects and ν_{it} is idiosyncratic variable; μ_i and ν_{it} are independent on each other.

The above presented model is a model with fixed effects which are commonly used in macroeconomics as the individual effects represent voided variables. It is possible that characteristics for individual entities are correlated with other regressors.

The individual variables are defined below in Tab. 1, the last column states the source of the data. All used data are quantitative and secondary. Their collection was performed in a way to ensure their consistency comparability. A review of descriptive statistic of input data is added in appendix.

With regards on the above mentioned, the mathematical equation of the studied relation is following (3):

$$\begin{aligned} \text{GDP}_{it} = & \delta \text{GDP}_{i,t-1} + \hat{\beta} \text{CAP}_{it} + \\ & + \hat{\beta} \text{HUM}_{it} + \hat{\beta} \text{GOV}_{it} - \\ & - \hat{\beta} \text{TAX}_{it} + u_{it}, \end{aligned} \quad (3)$$

where $i = 1, \dots, 35$ and $t = 2000, \dots, 2014$.

As Kotlán (2010) states, in accordance with Barro and Sala-i-Martin (2004) for the sample of chosen countries it is appropriate to apply homogeneity criteria. This request is fulfilled by the membership of all chosen countries in OECD¹. Time period of the analysis is 2000–2014. Four models are created. These models reflect impact of corporate taxation on economic growth. In the first model the taxation (TAX) is approximated by part of

tax quota representing tax burden of corporations (TQ1200) and control tax variables – taxation of personal income (TQ1100), social insurance (TQ2000), property taxes (TQ4000) consumption taxes (TQ5110) and special consumption taxes (TQ5120). Based on the micro-forward looking approach the corporation taxation is approximated by Effective average tax rate (EATR) and Effective marginal tax rate (EMTR); which represent second and third model. In the case of those taxes there is no equivalent measure considering directly labour, property or consumption taxation which would be based on the same methodology. Taxation of labour and property are considered within the indicators (detailed Spengel et al., 2014). Consumption taxation is reflected by partial tax quota (TQ5110 and TQ5120). Fourth model applies alternative possibility to approximate tax burden by World Tax Index and its sub-index Corporate Income Tax (CIT); control variables are represented by sub-indexes Personal Income Tax (PIT), Value Added Tax (VAT), Individual Property Taxes (PRO) and Other Taxes on Consumption (OTC).

Kotlán and Machová (2014b) point out that fiscal policy horizon and its delay are important for the economic policy efficiency, economic cycle and long-term growth. Therefore it is desirable to reflect dynamic of the model with focus on the possibilities of quantitative methods. Kotlán and Machová (2014b) also note that tax policy efficiency is the most visible with 2–3 years delay. The aim of the following analysis is to reflect fiscal (tax) policy delay and therefore individual fiscal variables will be delayed by 1–4 years. The analysis is performed on E-Views (8).

4 RESULTS AND DISCUSSION

The following part describes the results of the dynamic panel model. To obtain robust estimations of individual's models it is necessary to adjust the data. All time series apart of EATR and EMTR were changed to its logarithmic

form (LOG). It is not possible to transform EATR and EMTR because of the micro-forward looking approach some of their values are negative. Lammersen and Schwager (2005) note that negative values of those indicators are a

¹Currently 35 developed countries.

Tab. 1: Characteristics and sources of input data

Variable	Characteristics	Unit	Source
GDP	The dependent variable is approximated in accordance with the Mankiw et al. (1992) study using a real gross domestic product per capita expressed in absolute terms of real GDP per capita in the purchasing power parity in USD	[USD/per capita]	OECD Revenue Statistics (OECD, 2016)
GDP(-1)	The lagged value of the dependent variable	[USD/per capita]	OECD Revenue Statistics (OECD, 2016)
CAP	Capital accumulation – in accordance with the Mankiw et al. (1992) study, it is approximated by the ratio of real investment to GDP, expressed in purchasing power parity per capita	[%]	Penn World Table version 9.0 (PWT, 2016)
HUM	Human capital approximated by the human capital index based based on the average years of schooling and an assumed rate of return to education	[index]	Penn World Table version 9.0 (PWT, 2016) ^a
GOV	Total government expenditure expressed as a share of government expenditure on GDP	[%]	International Monetary Fund - World Economic Outlook Database (IMF, 2016)
TAX	Tax burden expressed by the Tax quota (TQ), World Tax Index (WTI) and Effective tax rate (ETR)	TQ [%]; WTI [index]; ETR [%]	TQ – OECD Revenue Statistics (OECD, 2016); WTI – World Tax Index (WTI, 2016); ETR – Spengel et al. (2014) ^b

Notes: ^a Index was created by Penn World Table 9.0. It is based on the study by Feenstra et al. (2015). ^b Methodology is based on Devereux and Griffith (1998).

result of lower value of capital costs compared to the real interest rate. This suggests that there is indirect tax support of investments which increases the rate of profit after taxation compared to its value before taxation.

This paper applies the Arelano-Bond estimator which ensures elimination of endogeneity issue as it transforms the variable to its first differentiations and transformed variables do not contain a unit root (so they are stationary). It is convenient to obtain stationary data mainly in first differentiations. Stationarity testing for panel data can be performed due to panel unit root test (Levin et al., 2002; Im et al., 2003) and ADF and PP test (Maddala and Wu, 1999). All those tests have the same null hypothesis which is confirmation of a single root existence. An alternative hypothesis varies. In the case of Levin, Lin and Chu test the alternative hypothesis states that there are no

unit roots. Alternative hypothesis of other tests state that some objects have unit roots (detailed in Novák, 2007 or Baltagi, 2010). The existence of a single root was tested both on levels and on first differentiation. All variables apart of human capital were stationary in the first differentiation so due to applied methodology it wasn't necessary to adjust the time series. Therefore to obtain valid results only HUM was adjusted. Its stochastic instability was removed by the transformation of the variable to its first differentiation. The adjusted variable was again tested for unit roots and results show that the variable is stationary in the case of its second differentiation. The above mentioned follows a study of Xiao et al. (2010) or Kitamura and Phillips (1997) who state that even though a dependent variable is non-stationary the GMM method provides consistent estimates.

Tab. 2: Panel models: Interaction of economic growth and corporate taxation in OECD countries

Model 1 TQ		Model 2 EATR		Model 3 EMTR	
LOG(GDP)		LOG(GDP)		LOG(GDP)	
LOG(GDP(-1))	0.746*** (39.697)	LOG(GDP(-1))	0.616*** (23.963)	LOG(GDP(-1))	0.585*** (18.482)
LOG(CAP)	0.164*** (19.935)	LOG(CAP)	0.238*** (6.345)	LOG(CAP)	0.225*** (6.773)
D(LOG(HUM))	1.242*** (2.837)	D(LOG(HUM))	-1.089 (-0.954)	D(LOG(HUM))	-4.288* (-1.668)
LOG(GOV(-1))	0.157*** (14.776)	LOG(GOV(-1))	0.129*** (3.238)	LOG(GOV(-1))	0.089* (1.776)
LOG(TQ1100(-2))	-0.072*** (-6.943)	EATR(-4)	-0.003*** (-2.499)	EMTR(-3)	-0.005** (-2.434)
LOG(TQ1200(-1))	-0.024*** (-3.714)	LOG(TQ5110(-3))	-0.028*** (-2.868)	LOG(TQ5110(-3))	-0.015** (-2.043)
LOG(TQ2000)	-0.016* (-1.633)	LOG(TQ5120(-3))	0.023** (1.905)	LOG(TQ5120(-4))	0.007 (0.887)
LOG(TQ4000(-2))	0.022** (2.361)				
LOG(TQ5110(-3))	-0.088*** (-3.372)				
LOG(TQ5120(-2))	0.042*** (4.055)				
Sargan-Hansen test	27.947 [0.414]	Sargan-Hansen test	17.518 [0.419]	Sargan-Hansen test	10.656 [0.908]
AB corr. test	-0.005 [0.996]	AB corr. test	-0.001 [0.999]	AB corr. test	-0.008 [0.993]
Instrument rank	37	Instrument rank	24	Instrument rank	25
Total observations	373	Total observations	220	Total observations	220

Source: E-Views (8). Note: *, **, *** represent a significance level of 10%, 5% and 1%.

It was empirically proved (e.g. Kotlán and Machová, 2014b; Matsumoto, 2008; De Cesare and Sportelli, 2012) that tax policy has an impact on economic growth with time delay. This delay varies based on the type of tax and its distortion effects. Different delays is also given by calculation of taxation and length of time series. In summary, the delay of individual taxes can have a quantitative effect on economic growth with different delays. To work with different delays within individual models and different tax approximations is therefore relevant and reasonable. As was mentioned before, Kotlán and Machová (2014b) state that the effect of tax policy is the most visible in the case of a 2–3 year delay. The aim of the following analysis is to reflect the delayed effect of tax policy and because of that the individual fiscal variables are delayed by 1–4 years with respect

to the relevance of econometric and economical point of view. For the individual approximations of tax burden the results which reflect the best economical and econometric sides with the respect to time delay are presented.

As it is usual Tab. 2 represents values of estimated regression coefficients of individual independent variables and t -statistics values – Sargan-Hansen test which verifies the explanatory value of the model and Arellano-Bond test of serial correlation (AB corr. test) which tests the model for the presence of autocorrelation of second order are presented.

The results of Sargan-Hansen test for all four models show that number of instruments is higher than J -statistic and the null hypothesis is not denied. This means that instruments of models are not correlated with residues which confirm correct verification of models. Instru-

mental variables were chosen correctly and removed endogeneity from the models. Based on results of Arellano-Bond test of serial correlation no significant evidence of serial correlation in the first-differenced errors is presented. It is also obvious that all four models are dynamic stable. The stability is supported by high statistical significance of delayed explanatory variables (on 1% significance level). It can be therefore stated that use of dynamic model under GMM method and first differentiation is reasonable.

Relation between economic growth and exogenous variable CAP (physical capital accumulation) confirmed theoretical assumptions. This variable was estimated with expected positive impact on economic growth (on 1% significance level). Contradictory results were received in the case of HUM (human capital). Within the first model which uses TQ and fourth model which uses WTI the HUM is on 1% significance level significant with positive impact on economic growth. But in the case of model 2 using EATR this variable is insignificant. Same result is obtained for model 3 with EMTR where the variable is significant on the border of 10% significance level and estimated impact is negative. Human capital represents variable for which the existence of positive impact on economic growth has been confirmed both on theoretical and empirical level (e.g. Barro, 1999). Its approximation seems to be problematical but as this variable has function of control variable in the model it was decided to leave it in the model to preserve complexity of model.

In the case of fiscal variable there is a conformity between theoretical expectations and obtained results as there is a positive impact on economic growth (on 1% significance level) in the case of all four models. In all cases variable was delayed for 1 year. On the general level it is expected that government expenditures leads to the support of economic growth. Some studies (e.g. Devarajan et al., 1996; Afonso et al., 2005) doubt this statement and point out that it is important to distinguish between productive and non-productive government expenditures. Non-productive government expenditures have

therefore opposite impact on economic growth. Due to lack of available data only the aggregate government expenditures are used. On theoretical level prevailing positive impact of government expenditures is expected; this assumption was confirmed.

Taxation of labour in first model (TQ1100) was verified as significant on 1% significance level and has negative impact on economic growth; variable is delayed 2 years. Corporate tax (TQ1200) was also verified on 1% significance level. The impact of labour tax is higher than impact of corporate taxation. The impact of social insurance, including social insurance covered by employees, was verified on 10% significance level and no delay was used. It can be stated that social insurance has immediate impact on economic growth. The explanation can lay in a fact that social insurance is a tax in a wider meaning and in the case of quasi taxes there are only very limited possibilities to reallocate them mainly in sense of substitution effect as it is in the case of income taxes. It is necessary to consider that tax system represents interconnected systems which influence each other and in the case of change of corporate taxes tax incidence occurs. Tax burden in the form of higher corporations will not only corporations but will be also moved on employees. Fullerton et al. (1980) state that it is obvious that corporations move tax burden but it is very difficult to evaluate real impacts of this phenomenon.

First model haven't confirmed negative impact of property taxes (TQ4000) on economic growth (on 5% significance level). Same result was obtained also for other consumption taxes (TQ5120) on 1% significance level. In this case the results confirm conclusions of other empirical studies which show low distortion effect of those taxes and their negligible impact on economic growth (e.g. Arnold, 2010; Johansson et al., 2008; Widmalm, 2001). On the other side the negative impact of consumption taxes VAT (TQ5110) was confirmed on 1% significance level. The influence of this tax category was out of all tax variables the highest one which indicates that it's increasing bound economic growth within OECD member countries. This

conclusion collides with another empirical papers (e.g. Kotlán et al., 2011; Simionescu and Albu, 2016) which showed either insignificant negative impact or slightly positive impact on economic growth. Ebrill et al. (2001) state that value added tax creates economic deformations which are smaller compared to other taxes as they reflect lower productivity and savings. To obtain optimal economic growth the tax systems should be correctly adjusted. Many empirical papers (e.g. Myles, 2009) advice to move tax burden from direct to indirect taxes and VAT can represent one of the possible solutions as it reduces only consumption and not production or investments. Our results suggest that this shift of tax burden could be inappropriate and could have negative impact on economic growth. It is appropriate to consider characteristics of tax quota. This conclusion can have its reasoning in the efficiencies of tax quota itself (detailed e.g. Baranová and Janíčková, 2012). Because of that it is appropriate to consider also another approximates or tax burden, mainly WTI which have significantly higher explanatory value and are less sensitive on the fluctuations of economy.

Second model presents impact of taxation presented by average effective tax rate on economic growth. As the results show EATR has negative impact on economic growth on 1% significance level and delay 4 years. Control tax variables are represented by consumption taxes and were verified in the case of TQ5110 as a negative on 1% significance level and in the case of TQ5120 as a positive on 5% significance level. The results are in accordance with the results of previous model 1.

In the case of corporate taxation represented by effective tax rate (model 3) the negative impact on economic growth (on 5% significance level) was again confirmed. From the quantitative point of view this impact is not so high. The highest negative impact on the economic growth was verified in the case of control variable presenting general consumption taxation VAT (TQ5100) which was confirmed on 5% significance level and delay 3 years. On

the other hand positive impact was estimated for control variable TQ5120 but this impact is statistically insignificant. To remain complexity of the model the variable wasn't removed.

From the results of model 2 and 3 it is obvious that quantitative effect of corporate taxation within economic growth approximated by effective average and marginal tax rates is relatively weak, compared to the other determinants of economic growth. The reasoning can lie in the aggregation of different data which can have contradictory effect. Effective marginal and average rates were proved to be significant only in the case of investment activity as Janíčková and Baranová (2013) describe.

Based on model 4 results, corporate taxation represented by sub-index CIT has also negative impact on economic growth on 1% significance level and delay 2 years. Compared to impact of personal taxation (PIT) this influence can be considered as relatively low. Personal income taxation shows quantitatively highest negative impact (on 1% significance level) on economic growth. This conclusion is similar with results of model 1 using tax quota. In the case of PRO negative impact is confirmed on the 5% significance level which responds with theoretical assumptions about negative impact of property/direct taxes. This impact wasn't confirmed in the case of model using tax quota.

From the quantitative point of view higher impact compared to corporation taxation is also confirmed. In the case of consumption taxes the positive impact on economic growth was proved both for OTC on 5% significance level and VAT as non-significant. These results dispute with conclusions gained while using tax quota where the impact of VAT was negative and other selective consumption taxes positive on 1% significance level. From above described it can be concluded that impact of indirect taxes is not so obvious as in the case of income taxes. Same conclusion provides e.g. Xu and IMF (1994) or Mendoza et al. (1997) whose studies didn't prove correlation of consumption taxation and economic growth.

5 CONCLUSION

The main objective of the paper was to evaluate the relation between corporate taxation and economic growth on the sample of OECD member countries under a hypothesis of negative impact of corporate taxation on economic growth. Corporate taxation is approximated by the variety of corporate taxation indicators with respect to the dynamic nature of economy.

From the presented empirical evidence, the negative impact of corporation taxation on economic growth was proved, even though as quantitative more significant the impact of labour taxation was determined. This result is probably based on the following explanation. It is necessary to consider fact that tax system is usually very complex its individual taxes interact among themselves. Mainly the existence of substitution effect provides corporations with the possibility to spread their tax burden on different subjects. In the case of personal income taxation the substitution is enabled mainly between work and free time and employee doesn't have many possibilities to distribute his tax burden in a the same way as corporations. Fullerton et al. (1980) point out those corporations obviously shift their tax burden and it is very difficult to evaluate whole impact of this feature. Higher taxation of corporations therefore does not influence only corporations themselves but it can be concluded that changes will affect also employee and price policy of corporations. How much tax burden will be spread depends on many specific features as e.g. size and nature of market, type of product or openness of the economy. It is also important to consider interconnection between corporate taxation and other income taxes. Each change of labour taxation (and also social contributions) has also transferred impact on corporate sector which creates labour demand. Realized changes of personal income taxation will influence chosen marginal values and labour costs for nearly all labour market participants. From the above mentioned it is necessary to perceive both personal and corporate taxes as a complex with functions in synergy in given tax

system. It can be assumed that this synergy is robust mainly within mentioned taxes.

In the case of effective tax rates determined by micro-forward looking approach it was not possible to include other direct taxes to the models (model 2 and 3), as these are already partially aggregated in the indicator. For those models only consumption taxes were added. The effective corporate tax rates are related mainly to the investment decision making. Negative impact on economic growth of those rates was proved although quantitative not very strong. Janíčková and Baranová (2013) conclude that this type of tax rates directly influence mainly size of investment.

For other control variables it is necessary to mention huge ambiguity mainly in the case of consumption and property taxes. VAT approximated by tax quota negative and quantitative significant impact was verified in relation to economic growth. When this variable was represented by World Tax Index its impact was proved as insignificant and positive. For the other selective consumption taxes positive impact was determined. Same positive impact was also evaluated for implicit consumption tax rates but only in a few cases as statistically significant. These findings are similar with papers of e.g. Vráblíková (2016). On the other hand Xu and IMF (1994) or Mendoza et al. (1997) haven't proved any impact of consumption taxes on economic growth. Within individual empirical papers the results considering consumption taxation are ambiguous. Interesting point of view on consumption tax provides Alm and El-Ganainy (2013) who state that indirect taxes have mediated effect on economic growth via investments. They describe the fact that consumption influences investment level as there is substitution effect due to lower consumption and higher savings which finally leads to higher economic growth (as opposite to income taxes).

The contradictory results are in the case of property taxes shown as well. Approximation by tax quota points out on the positive impact on economic growth but PRO sub-index provides

opposite results supporting strong negative impact on the same variable. One of the features of property taxes is their low dynamics which can cause some problems while approximating them. Kotlán (2010) states that higher tax quota doesn't necessarily imply higher tax burden but it can present higher efficiency in the collection processes. On the other side, as the Laffer curve define, lower tax burden can lead to the higher collection of taxes and increase of tax quota. Kotlán (2010) also adds that it is appropriate to extend the analysis for effective tax indicator WTI as well. This indicator is less sensitive to the economy distortion. Different results of the individual models can be therefore also caused by shortcomings of the indicators.

In the case of government expenditures and supplementary variables the positive impact was verified. It can be stated that the positive effect of government expenditures prevails over negative impact, on the sample of OECD

member countries. It can be also assumed that government expenditures financed by non-distort taxes and aiming to productivity part of government expenditures have pro-growth effect. On the other side non-productive government expenditures financed by distortion taxes have anti-growth tendency.

Considering the suitability of used indicators the most convenient appears to be World Tax Index and its sub-index Corporate Income Tax both from economic and econometric point of view. This multi criteria indicator shows the most stable evolution in time and till now it hasn't shown any predisposition to deflections of economy compared to the other indicators.

From the above mentioned it is clear that mainly income taxes have negative impact on economic growth. Therefore it is suitable to shift tax burden to consumption and property taxes if the policy makers want to support economic growth.

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7 ANNEX

Tab. 3: Descriptive statistic of input data

		Mean	Median	Maximum	Minimum	Std. dev.
	GDP	34106.4900	34394.1400	90846.8300	10653.3600	13658.3800
	CAP	25.0208	24.5925	56.3843	11.4257	5.4550
	HUM	3.1419	3.2467	3.7343	1.5210	0.4459
	GOV	41.6564	42.3920	65.2700	16.9550	8.8070
TQ	TQ1100	8.1831	7.6280	26.7800	0.9530	4.3753
	TQ1200	3.0614	2.7710	12.5940	0.5810	1.6276
	TQ2000	8.7412	9.9220	17.0060	0.0000	4.6599
	TQ4000	1.7769	1.6740	4.1400	0.2170	1.0297
	TQ5110	6.7044	6.9930	11.7160	1.9530	2.0436
	TQ5120	3.3599	3.3470	6.5490	0.7260	1.0485
ETR	EATR	24.9533	24.6000	41.7000	9.4000	6.9790
	EMTR	19.2521	17.7000	42.8000	–5.1000	9.0528
WTI	PIT	0.2471	0.2616	0.4182	0.0052	0.1006
	CIT	0.0731	0.0574	0.2077	0.0027	0.0473
	PRO	0.0229	0.0144	0.1401	0.0000	0.0258
	VAT	0.1775	0.1728	0.4982	0.0013	0.1060
	OTC	0.0491	0.0292	0.2543	0.0000	0.0506

AUTHOR'S ADDRESS

Veronika Nálepová, Department of National Economy, Faculty of Economics, VŠB-Technical University of Ostrava, 17. listopadu 15/2172, 708 33 Ostrava, Czech Republic, e-mail: veronika.nalepova@vsb.cz