ASPECTS OF INTERNATIONAL TAX COMPETITION: LITHUANIAN EMPIRICAL EVIDENCE BASED ON SVAR APPROACH

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Abstract. *This paper aims to investigate the effects of tax policy on macroeconomic variables in the context of tax competition issues. Incentives to invest in a country are determined by a prospective rate of return, which is partially determined by the level of capital taxation. However, high labour mobility, which is a particular characteristic of the Lithuanian economy, raises the hypothesis that the analysis of the negative aspects of tax competition is important not only for capital taxes, but also for labour taxation.*

Key words: *tax competition, SVAR model, capital tax, labour taxes, foreign direct investment*

JEL classification: *E62, H25, F21.*

1. Introduction

The compatibility of tax policies is one of the most important aspects of fiscal policy, especially in the context of forming the single European Union market concept. Discussions on the costs and benefits of control of both competition and compatibility are still ongoing. Opponents of compatibility or harmonisation believe that tax harmonisation will result in higher tax rates and excessive taxation, as many of the aims of tax harmonisation are to charge for 'cross-border' activities (Mitchell, 2004). On the other hand, supporters of compatibility of taxes believe that the lack of a compatibility regime will encourage member states to enter the so-called '*race to the bottom*' (RTB)[1]. RTB is one of the most widely cited critiques of the processes of globalisation of economics, claiming that the pressure for convergence arises from the characteristics of capital mobility as well as from the size of the flow rate when the state loses its ability to fight market powers (Drezner, 2006). Therefore, capital will flow into those markets with

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[1] This phenomenon was described by many authors. The review of literature on this issue was published by Daniel W. Drezner (2006), P. Gylys (Ekonomika, 2006) and others.

the highest rates of return, whereas high profit and income taxes, due to higher production costs, reduce returns. This is why the only option available to some member states to prevent capital flight will be to reduce taxes. Furthermore, other negative aspects of tax competition might be observed. Tax cuts in the global arena as a way to compete for effectiveness of, in particular, mobile factors of production (capital) distribution could lead to the appreciation of smaller factors of production mobility (for example, work). Therefore, it is clear that the main side effect of such a race is a decreased sustainability of public finances.

However, the phenomenon of the RTB is not the only strategy the states are forced to choose in order to keep good factors of mobile production. André Fourçans and Thierry Warin have proven in their 2006 study that if countries apply at least a minimal strategy of co-operation, they can avoid the harmful consequences of the *race to the bottom*. In the recent years, the European Commission (as well as all other European institutions) has recommended that member states co-ordinate their actions in the context of tax competition. Such co-ordination could effectively reduce the possible distortions in the single market, as well as reduce the damage from the loss of tax revenue.

Despite the logical theoretical arguments that confirm the benefits of co-ordination (harmonisation) of tax policies, the empirical research in this area does not provide clear answers. The European Commission has offered to radically reform the income tax in the European Union by introducing the so-called Common Consolidated Corporate Tax Base (CCCTB) system. The detailed study by Bettendorf and others (2011) shows that this reform could have both significant positive and negative effects on individual member states, but only a limited aggregated effect on the whole union. According to the CCCTB system, every company would only have to calculate the EU-wide consolidated profit under the definition of the common tax base. This profit would be allocated to member states according to the proportional allocation formula affected by such factors as employment, payroll, property, and sales. However, according to the project, every member state would keep its sovereignty to determine the income tax rate. This study was carried out by conducting microanalysis and a broader analysis of the macroeconomic consequences, modelling the general equilibrium model which includes all 27 member states. As mentioned before, the economic impact in different EU countries would differ. The introduction of the CCCTB would be beneficial to countries whose tax bases would get narrowed, such as Ireland or Spain. This can be explained by the fact that the reduction of the cost of capital increases investment and employment, and this means a higher GDP. On the other hand, for countries such as Belgium, Estonia, Latvia, and Lithuania, the offered tax base would only mean GDP losses. Thus, the objective of this study has been to determine what impact capital and labour taxes have on macroeconomic variables. The main aim of this study was to make a quantitative

evaluation of the impact of tax competition on GDP, employment, and international foreign investment while using SVAR-type models. The tasks set for the study were as follows: (1) to investigate the influence of implicit labour taxes on macroeconomic variables, using the SVAR model; (2) to test the hypothesis that labour or capital can have a greater distorting effect on the economy of Lithuania; (3) to test the hypothesis that it is economically useful for Lithuania, which might be implementing changes to its tax system, to consider the situation in the surrounding markets, especially those where Lithuania competes for foreign direct investment (FDI). In Section 2, we present reviews of some empirical contributions to the literature. Sections 3 and 4 provide an overview of the data and methodology applied. Section 5 outlines the estimation results. The last section contains our conclusions.

2. Literature review

The process of globalisation has raised the problem of national tax systems being dependent on each other. The problem shows itself in various aspects, one of which is the tax competition that might be determined by the so-called *race to the bottom* effect, when one country is willing to attract as many mobile production factors, such as capital or qualified workforce, that it reduces taxation on these and increases taxation on less mobile factors such as natural resources or unskilled labour. Willson (1999) starts his analysis of tax competition literature from the so-called Tiebout theory (Mitchell, 2004) of national states or public sector provision of goods and services, which also describes the theory of tax competition. Tiebout's theory states that tax competition encourages individuals to settle in those lands (states) where the relationship between taxation and public goods is best fit to the needs of an individual. According to this theory, communities try to attract a potential workforce (the taxpayers), but they do this only to a certain level that allows them to minimise the costs of providing public goods.

Once we distance ourselves from the theory of Tiebout, the questions of tax efficiency can be seen through other effects. For example, the increasing local tax rates in one region cause the so-called *positive externalities* effect in the neighbouring region. Because both states ignore this effect, in most cases this determines lower taxes than the optimal social level in both regions. The other type of the so-called *positive externalities* effect is when regions differ in their size, and the 'larger' one may determine prices of production factors in the smaller one. Therefore, tax competition is less favourable to larger regions in comparison to smaller ones. This shows that if the EU had not regulated its tax policy, at least partially, the small economies of the union would have been discriminated against or experienced *negative externalities* from bigger regions.

Finally, the policy of corporate taxation in one country may influence the economies of other countries in different ways. If a country's inner tax burden is large in comparison

to other countries, the tax base might be transferred to the countries that have a more simplified tax system. This could mean that international foreign investment would 'move away' from the country. That could encourage competition while aiming to attract other streams of investment. The level of corporate tax might play an important role as well, especially when multinational companies need to make up their minds where to declare and pay for income. There is a lot of evidence that international companies allocate huge resources to the planning of taxes that are connected to cross-border transactions allowing for the reduction of tax payments. According to the research conducted by Reint and Kostial (2001), OECD countries in which corporate profit taxes are high have experienced losses in two ways: first, by losing the stream of FDI and, second, due to the narrowing of the tax base through decreasing the tax revenue inflow. Based on the microeconomic model and trying to evaluate how the stream of FDI and tax revenue would change if the ratio of the corporate profit tax were harmonised in the whole EU, a simulation of 13 EU countries' examples was carried out. The simulations are based on a three-stage model which relates to: (1) the corporate profit tax rates to FDI; (2) FDI to corporate profits; and (3) corporate profits in turn to the corporate tax revenue.

The results of such modelling show that the harmonisation of corporate profit tax would have the biggest impact on the countries where the gap between a single country and the average of the EU is the greatest. Thus, this rate harmonisation would have a moderate effect on the FDI of most EU countries except Germany, Italy, and Ireland. Therefore, the net position of FDI in Germany, Italy, and Ireland would significantly change if the profit tax were harmonised. If the profit taxation in Italy and Germany were to decrease, the stream of FDI would grow by 1% of the GDP. Ireland, where the corporate profit tax is one of the lowest in the EU, would experience losses of more than 1% of its GDP. Finally, the conclusion about changes of the corporate tax revenue inflow should not come as a surprise: when the tax base has decreased, the tax revenue inflow decreases in the economies even if the tax rate has been increased. Thus, Italy, with the largest reduction in the corporate tax rate, would gain more than 1% of GDP in the corporate tax revenue inflow, while in Ireland the revenue would decline to 1% of its GDP despite a substantial increase in the tax rate.

Bettendorf and others (2011), who adapted the stochastic general equilibrium model, got the same results when researching the consequences of introducing the common corporate profit tax base in the EU. Even though, according to the new directive in planning, the unification of tax rates is not the plan yet, the profit tax base changes *de facto* mean changes of the tax burden, depending on the tax bases of coverage. The introduction of the so-called CCCTB would have a negative impact on the GDP of all the Baltic states. The negative impact would be significant in Estonia (a little more than 1% of GDP), whereas in Lithuania and Latvia it would not be very big (around 0.3%).

Egger and Radulescu's (2008) model shows how both corporate and labour taxes influence the FDI. They split labour taxes levied on employers and employees, arguing that they affect firms' profits through different channels. They found the employee-related labour taxes to influence FDI stocks negatively while the employer part of the tax effects on the FDI is insignificant. Corporate profit tax rates were found to be more important than labour taxes. Hansson and Olofsdottersing (2007), in the case of the 27 EU member countries, covering the period 1997–2007, has found that labour taxes have a negative impact on the FDI (of almost the same magnitude as corporate profit).

The analysis of the distortionary effects of labour taxes on macroeconomic indicators has mostly concentrated on FDI. The reason was related to the fact that in open economies a fall in domestic savings due to distortionary tax effects does not necessarily lead to a fall in investment as countries may be able to import capital. The results also depend on the institutional framework, the wage-bargaining process, and the level of competition in the product market (Leibfritz et al., 1997). Thus, in countries where the labour market is flexible, higher taxes tend to lower wages rather than labour demand, whereas in countries with an inflexible labour market, higher taxes affect producers – at least in the short term – by reducing labour demand. This reduces employment and growth, especially if the substitution effect between labour and capital is small. However, if there is a strong degree of substitutability between labour and capital, a positive shock in labour taxation would not have a negative effect on growth through the labour demand channel. Production levels will remain the same due to a higher production in capital-intensive activities. On the other hand, in some cases, higher labour taxes might adversely affect domestic investment demand, and both labour and capital input might be lower. The latter effect will depend of the elasticity of demand for investment with respect to labour costs (Leibfritz et al., 1997).

3. Data

In our study, we have used the following data: GDP (Y), employment (E), foreign direct investment (I), labour tax revenue (LR), other tax revenue (OTR), the effective labour tax rates (ETL), and comparative effective labour tax rates (CTL). The data are compiled from the Reuters EcoWin and Eurostat databases and defined according to the European System of National Accounts (ESA) 1995. The aggregated fiscal variables are calculated by the author. LR is calculated as the sum of the labour income tax and the social security contributions. OTR is defined as the total tax revenue excluding calculated implicit labour taxes. ETL are defined as the ratio between the sum of the labour income tax and the social security contributions (paid by the employee, and the social security contributions paid by the employer) divided by the gross compensation of employees (wage plus contributions paid by the employer). CTL are calculated as the

difference between the Lithuanian ETL and the simple average of calculated Latvian and Estonian ETL rates. The latter are calculated using the same logic as the Lithuanian ETL. In order to employ Blanchard–Perotti's method, we need to calculate exogenous fiscal elasticities. The elasticities of every single tax revenue group with respect to GDP and employment are obtained from Klyviene and Jakaitiene's (2013) study. In their study, the authors provide the main tax group: corporate profit, labour income tax, indirect taxes, and social insurance contribution elasticities with GDP and employment. The aggregate labour and other tax elasticity to GDP and employment are calculated as a weighted average of the respective tax revenue categories.

TABLE 1. **Elasticity coefficients**

	α_Y^{RL}	α_E^{RL}	α_Y^{OTR}	α_E^{OTR}
Lithuania	0.95	1.0	0.95	0.0

In the case of ETL and CTL elasticities with regard to GDP and employment, we use the method of instrumental variables.

4. Methodology

As already mentioned in the Data section, our VAR model includes the following six variables: Y, E, I, LR, OTR, ELT, and CLT. All variables, with the exception of the effective labour tax rate, are log-transformed. The sample period is from 1997:2 to 2011:4. All fiscal variables are seasonally adjusted and expressed in real terms using the GDP deflator. The standard VAR has the following form:

$$X_t = \Gamma_0 + \sum_{i=1}^{p} \Gamma_i X_{t-i} + U_t, \quad (1)$$

where is a $k \times 1$ vector of endogenous variables, and is a $k \times 1$ vector of constants, U_t is a $k \times 1$ vector of reduced form residuals $(u_t^Y \quad u_t^E \quad u_t^I \quad u_t^{LR} \quad u_t^{OTR} \quad u_t^{ETL})'$, and Γ_i is a $k \times k$ matrix.

The standard VAR estimation cannot unravel the contemporaneous interrelations, and the standard residuals are not pure random shocks to the relevant variables. In order to overcome this, we must use structural VAR (SVAR) estimation methods and impose some restriction. Our identification strategy builds on two approaches: the so-called Cholesky decomposition and Blanchard and Perotti (2002). The Cholesky approach is a purely technical approach, so it does not focus on a precise specification. In the Blanchard and Perotti approach, the fiscal shocks are identified by imposing contemporaneous restrictions on the vector U_t, in order to derive a vector of 'structural' fiscal shocks, orthogonal to each other and to the variables of the model. From this point, an AB model

where a linear relation is assumed to hold between the reduced form residuals and the structural shocks is used:

$$AU_t = B\Psi_t, \tag{2}$$

where B is a 6-dimensional matrix of the structural shock coefficients, and Ψ_t is a 6-dimensional vector of structural shocks $(\varepsilon_t^Y \quad \varepsilon_t^E \quad \varepsilon_t^I \quad \varepsilon_t^{LR} \quad \varepsilon_t^{OTR} \quad \varepsilon_t^{ETL})'$ (see Lütkepohl, 2005).

According to Blanchard and Perotti, the estimation procedure of the SVAR model is divided into four steps. The **first** is the estimation of the VAR, which takes the form of six equations in our case. In the **second** step, we express the reduced form innovations of every fiscal variable as linear combinations of the three types of shocks: (a) the automatic response of the variables to GDP, employment and FDI innovations; (b) the discretionary response of fiscal variables to the latter innovations; and (c) structural shocks that are of the main importance to us.

$$\begin{aligned} u_t^{LR} &= \alpha_Y^{LR} u_t^Y + \alpha_{ETL}^{LR} u_t^{ETL} + \beta_{OTR}^{LR} \varepsilon_t^{OTR} + \beta_{ETL}^{LR} \varepsilon_t^{ETL} + \varepsilon_t^{LR}, \\ u_t^{OTR} &= \alpha_Y^{OTR} u_t^Y + \alpha_E^{OTR} u_t^E + \beta_{LR}^{OTR} \varepsilon_t^{CR} + \beta_{ETL}^{OTR} \varepsilon_t^{ETL} + \varepsilon_t^{OTR}, \\ u_t^{ETL} &= \alpha_Y^{ETL} u_t^Y + \alpha_{LR}^{ETL} u_t^{LR} + \beta_{LR}^{ETL} \varepsilon_t^{LR} + \beta_{OTR}^{ETL} \varepsilon_t^{OTR} + \varepsilon_t^{ETL}. \end{aligned} \tag{3}$$

Based on the Blanchard and Perotti (2002) approach, the coefficients α_i^j capture the elasticity of fiscal variables to the macroeconomic variables (*Y, E, I*). This identification is achieved taking into account information about decision implementation lags in fiscal policy. This means that, fiscal authorities need more than one quarter to change fiscal variables (taxes or expenditure) to achieve macroeconomic developments. Thus, in the **third** step, exogenous elasticities α_i^j are used in order to compute cyclically adjusted residuals for the fiscal variables:

$$\begin{aligned} u_t^{LR\prime} &\equiv u_t^{LR} - \alpha_Y^{LR} u_t^Y - \alpha_{ETL}^{LR} u_t^{ETL} = \beta_{OTR}^{LR} \varepsilon_t^{OTR} + \beta_{ETL}^{LR} \varepsilon_t^{ETL} + \varepsilon_t^{LR}, \\ u_t^{OTR} &\equiv \alpha_Y^{OTR} u_t^Y - \alpha_E^{OTR} u_t^E = \beta_{LR}^{OTR} \varepsilon_t^{LR} + \beta_{ETL}^{OTR} \varepsilon_t^{ETL} + \varepsilon_t^{OTR}, \\ u_t^{ETL\prime} &\equiv u_t^{ETL} - \alpha_Y^{ETL} u_t^Y - \alpha_{LR}^{ETL} u_t^{CR} = \beta_{CR}^{ETL} \varepsilon_t^{CR} + \beta_{TR}^{ETL} \varepsilon_t^{TR} + \varepsilon_t^{ETL}. \end{aligned} \tag{4}$$

Finally, some further assumptions must be made as not all coefficients ???can be identified. Thus, in the **fourth** step, we impose some final restrictions, and (4) becomes

$$\begin{aligned} u_t^{ETL\prime} &= \varepsilon_t^{ETL}, \\ u_t^{OTR\prime} &= \beta_{ETL}^{OTR} \varepsilon_t^{ETL} + \varepsilon_t^{OTR}, \\ u_t^{LR\prime} &= \beta_{OTR}^{LR} \varepsilon_t^{OTR} + \beta_{ETL}^{LR} \varepsilon_t^{ETL} + \varepsilon_t^{LR}. \end{aligned}$$

Under these assumptions, the effective labour tax rate is equal to the cyclically adjusted residuals of the corresponding equation, since we assume that labour tax revenue

shocks cannot alter politicians' decisions with respect to all other taxation. The other two restrictions mean that politicians cannot react within the same period to changes in the collection of tax revenue by adjusting the labour taxes. The estimation of the non-restricted βs is made by a simple OLS regression.

Finally, the coefficients of the equations for real GDP, employment, and FDI may be estimated recursively by means of instrumental variable regressions:

$$u_t^Y = \alpha_E^Y u_t^E + \alpha_I^Y u_t^I + \alpha_{TR}^Y u_t^{LR} + \alpha_{TR}^Y u_t^{TR} + \alpha_{ET}^Y u_t^{ET} + \varepsilon_t^{CR}, \quad (5)$$

$$u_t^E = \alpha_Y^E u_t^Y + \alpha_I^E u_t^I + \alpha_{CR}^E u_t^{CR} + \alpha_{TR}^E u_t^{TR} + \alpha_{ET}^E u_t^{ET} + \varepsilon_t^E, \quad (6)$$

$$u_t^I = \alpha_{CR}^I u_t^{CR} + \alpha_{TR}^I u_t^{TR} + \alpha_{ET}^I u_t^{ET} + \varepsilon_t^I. \quad (7)$$

5. Empirical results

VAR of order 5 was selected for the further SVAR identifications (see Tables 2 and 3). The responses to a one-off shock to fiscal variables are presented in Fig. 1, 2 and Table 4. As a benchmark, a shock of one percentage point (pp) was applied to the effective labour tax and effective comparable labour tax rates. The estimated A and B Blanchard–Perotti matrices in SVAR in the case of ETL and CTL are presented in Table 5.

TABLE 2. **The augmented Dickey–Fuller test results (corporate tax model)**

	Level			First difference		
Variables	none	const.	trend + const.	none	const.	trend + const.
Y	1.90	-0.96	-1.41	-5.84*	-6.78*	-6.91*
E	-0.83	-2.68	-2.65	-2.42**	-2.50	-2.55
FDI	1.46	-0.52	-2.01	-2.48**	-3.29**	-3.66**
I	I	0.07	-1.77	-2.51	-3.96*	-4.11*
CR	-0.68	-1.30	-1.39	-4.35*	-4.31*	-4.27*
OTR1	1.45	-1.73	-0.53	-9.20*	-9.80*	-10.36*
ETC	-1.25	-1.65	-1.71	-4.47*	-4.49*	-4.46*
CTC	-2.18**	-2.23	-2.29	-9.04*	-9.05*	-9.00*
LR	0.04	-1.59	-2.13	-2.34**	-2.35	-2.46
OTR2	0.72	-1.22	-1.62	-6.84*	-7.50*	-7.57*
ETL	-1.90	-3.67*	-2.37	-3.31*	-4.62*	-7.08*
CTL	-3.97*	-4.24*	-3.45	-3.96*	-4.24*	-3.45

Note: * and ** represent the rejection of the null hypothesis at significance levels of 1% and 5%, respectively.

TABLE 3. **Standard VAR lag length selection criteria**

Corporate tax model							
Lag length	1	2	3	4	5	6	7
AIC	16.88	16.18	16.41	16.57	15.19**	13.84	10.20*
HQ	17.48	17.29	18.04	18.72	17.85**	17.01	13.89*
SC	18.44*	19.08	20.64	22.15	22.11**	22.09	19.80

Labour taxes model							
Lag length	1	2	3	4	5	6	7
AIC	12.82	12.86	13.21	12.75	11.57**	10.16*	12.82
HQ	13.43	14.01	14.88	14.95	14.29**	13.41*	13.43
SC	14.44*	15.88	17.61	18.54	18.75**	18.73	14.44*

Note: * represents the best lag length suggested by each criterion;
** represents the ultimate lag length which was selected for estimation.

5.1. The case for the effective labour tax rate

According to SVAR identified by the Cholesky approach, the effects of a positive shock to ETL on GDP is persistently negative; it reaches a peak of -1.43 % after three quarters, but in the long run it converges to 0. The impact on employment is negative only in the short run, while already after one quarter it moves to a positive territory, reaching a peak of 0.49 % after 11 quarters. However, it should be pointed out that the effects are very small and not significantly different from zero, especially in short and medium terms. The impact on FDI is unexpectedly positive, and only the strength of the effect over time weakens significantly. The Blanchard–Perotti approach produces very similar results. The response of GDP is negative; it reaches a peak of -0.97 % already after one quarter, but after the eighth quarter the magnitude of responses decreases significantly and over the long term converges to zero. Employment follows a very similar path; the only difference is that in the seventh period the effect becomes positive, but the extent of responses, as in the GDP, is not significantly different from zero. However, the impact on FDI remains positive like in the Cholesky case.

Klyvienė and Karmelavičius have found that a positive shock to the effective corporate tax rate (ETC) leads to a short-term decrease in real GDP and employment. The peaks of the response of those variables are reached after three quarters (-0.71 %) and after one quarter (-0.32 %), respectively. The impact on FDI is positive in the short run after the first three periods as it was in ETL, but later it converges in the negative zone. The effects of a positive shock to cyclically adjusted fiscal variables in the Blanchard–Perotti approach were quite similar. The differences are mainly related to the magnitude of responses, but not to the signs.

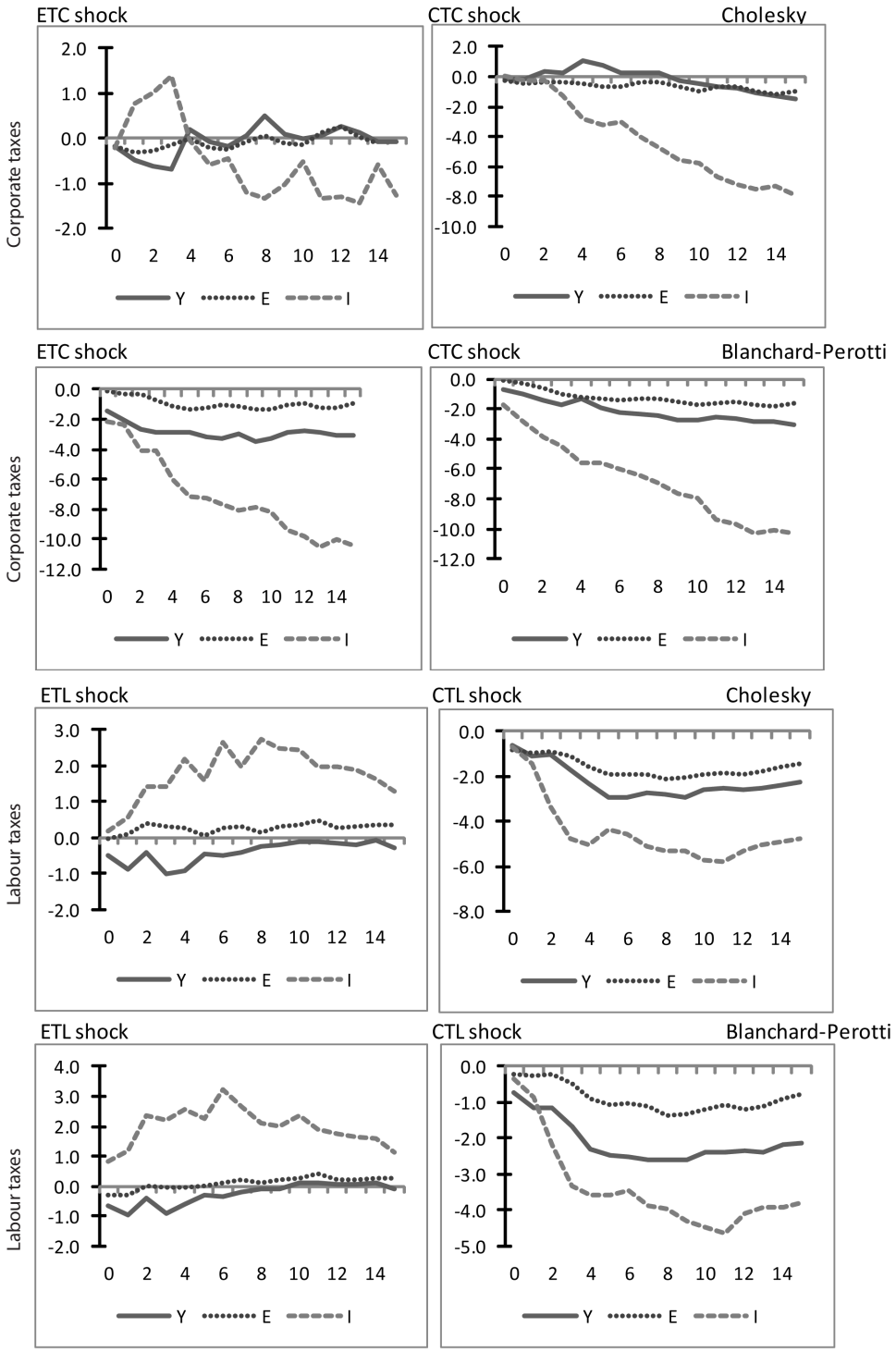

FIG. 1. **Responses to fiscal variables in five SVAR models**

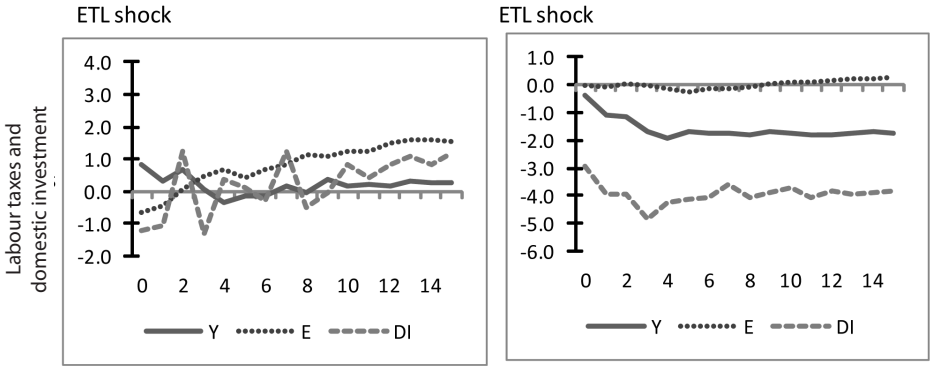

FIG. 2. **Responses to ETL and domestic investment in five SVAR models**

TABLE 4. **Responses to comparative effective rate shocks in 5 SVAR models**

Responses to ETC shock (Cholesky)						
Quarter	0	4	8	12	15	Peak
GDP	-0.17	0.18	0.49	0.26	-0.07	-0.71 (3)
Employment	-0.17	0.00	0.05	0.25	0.10	-0.32 (1)
FDI	-0.21	-0.05	-1.34	-1.29	-1.28	-1.43 (13)
Responses to ETC shock (Blanchard–Perotti)						
Quarter	0	4	8	12	15	Peak
GDP	-1.42	-2.90	-3.01	-2.80	-3.10	-3.45 (9)
Employment	-0.12	-1.16	-1.19	-0.94	-0.97	-1.40 (9)
FDI	-2.21	-6.03	-8.11	-9.79	-10.47	-10.52 (13)
Responses to ETL shock (Cholesky, comparative)						
Quarter	0	4	8	12	15	Peak
GDP	-0.47	-0.43	-0.24	-0.14	-0.07	-1.02 (3)
Employment	-0.10	0.06	0.13	0.20	0.30	0.49 (11)
FDI	0.19	1.59	2.74	1.90	1.20	2.74 (8)
Responses to ETL shock (Blanchard–Perotti, comparative)						
Quarter	0	4	8	12	15	Peak
GDP	-0.64	-0.58	-0.08	0.06	-0.07	-0.97 (1)
Employment	-0.28	-0.05	0.12	0.20	0.20	-0.29 (1)
FDI	0.84	2.54	1.98	1.73	1.15	2.66 (7)

Responses to ETL shock in the case of domestic investment (Cholesky, comparative)						
Quarter	0	4	8	12	15	Peak
GDP	0.84	-0.36	-0.03	0.17	0.26	0.84 (0)
Employment	-0.63	0.66	1.14	1.48	1.53	1.59 (13)
Domestic invest.	-1.20	-1.33	-0.49	0.84	0.82	-1.33 (4)
Responses to ETL shock (Blanchard–Perotti, comparative)						
Quarter	0	4	8	12	15	Peak
GDP	-0.40	-1.94	-1.78	-1.80	-1.77	-1.94 (4)
Employment	-0.05	-0.11	-0.07	0.08	0.20	-0.23 (5)
Domestic invest.	-2.95	-4.27	-4.09	-3.86	-3.83	-4.85 (3)

Responses to CTC shock (Cholesky, comparative)						
Quarter	0	4	8	12	15	Peak
GDP	-0.12	1.03	0.28	-0.82	-1.47	-1.47 (15)
Employment	-0.29	-0.45	-0.36	-0.64	-1.00	-1.15 (14)
FDI	0.04	-2.83	-4.76	-7.23	-7.87	-7.87 (15)
Responses to CTC shock (Blanchard-Perotti, comparative)						
Quarter	0	4	8	12	15	Peak
GDP	-0.69	-1.33	-2.41	-2.66	-3.03	-3.03 (15)
Employment	-0.12	-1.19	-1.28	-1.52	-1.65	-1.81 (14)
FDI	-1.74	-5.62	-6.93	-9.71	-10.25	-10.32 (13)
Responses to CTL shock (Cholesky, comparative)						
Quarter	0	4	8	12	15	Peak
GDP	-0.62	-2.34	-2.83	-2.57	-2.25	-2.96 (9)
Employment	-0.81	-1.55	-2.11	-1.92	-1.47	-2.08 (9)
FDI	-0.67	-5.04	-5.29	-5.29	-4.80	-5.79 (11)
Responses to CTL shock (Blanchard–Perotti, comparative)						
Quarter	0	4	8	12	15	Peak
GDP	-0.72	-2.29	-2.58	-2.36	-2.12	-2.59 (7)
Employment	-0.21	-0.88	-1.36	-1.20	-0.79	-1.36 (8)
FDI	-0.34	-3.57	-3.98	-4.11	-3.77	-4.37 (11)

TABLE 5. **Estimated A and B matrices of the Blanchard–Perotti SVAR**

Estimated A matrix:

	GDP	EMP	FDI	ETL
GDP	1	0.4355	-0.85978	1.59214
Employment	-0.2499	1	-0.00787	0.03317
FDI	0	0	1	2.37822
ETL	-0.1	-1	0	1

Estimated B matrix:

	GDP	EMP	FDI	ELT
GDP	1	0	0	0
Employment	0	1	0	0
FDI	0	0	1	0
ETL	0	0	0	1

Estimated A matrix:

	GDP	EMP	FDI	CTL
GDP	1	-1.243	-0.2087	0.4077
Employment	-0.00985	1	-0.1105	0.1718
FDI	0	0	1	0.7125
CTL	-0.04	-1	0	1

Estimated B matrix:

	GDP	EMP	FDI	CTL
GDP	1	0	0	0
Employment	0	1	0	0
FDI	0	0	1	0
CTL	0	0	0	1

Thus, the effects of a positive shock to both variables, ETC and ETL, on the GDP and employment are consistent with the theory that a higher tax rate leads to a lower economic activity. However, the magnitude of the response is significantly higher in the case of corporate taxes. This might be explained by a higher capital mobility versus labour.

However, the positive impact of ETL on FDI is a bit suspicious, but, if compared with the effective corporate tax rate results, it might be reasonable to conclude that personal income tax rates are less important than profit tax rates in terms of their impact on FDI. Second, higher labour taxes might drive down the demand for domestic rather than foreign investment, as foreign investors might be more concerned about tax rate differentials than the tax rate in the host country. And finally, it might be related to the fact that the effective labour tax rate is not the best indicator for the investigation of factors explaining FDI dynamics in general.

5.2. The case of the effective labour tax rate and domestic investment

Both the theoretical and empirical literature argues that in open economies a fall in domestic savings due to tax effects does not necessarily lead to a fall in investment, because countries may be able to import capital. In addition, the effects depend on other market characteristics. In the model for the effective labour tax rates, we use almost the same specification, the only difference being that FDI is replaced by domestic investment.

Thus, according to SVAR identified by the Cholesky approach, the effect of a positive shock to ETL on GDP when FDI is replaced by domestic investment is positive in a short run. After four quarters, it turns negative while after 12 periods it returns to a positive territory again. The reaction of domestic investment is very similar, except the immediate reaction which is negative (see Table 4 and Fig. 2). The immediate reaction of employment to a shock to ETL is negative, but after the first three periods it turns positive. The Blanchard–Perotti approach generates more consistent results. The impact of an increase in labour taxes on GDP is quite strong and negative; it reaches a peak of -1.94 % after four quarters. Domestic investment follows the same path as GDP, while the impact on employment once again is less consistent than on other macroeconomic variables. It is negative until the ninth period after which it turns positive. Thus, despite some inconsistence in the results, we can draw the conclusion that higher labour costs drive down both capital and labour and, as a consequence, GDP. In Lithuania, the elasticity of demand for investment with respect to labour costs is relatively high. The latter fact might be related to the high level of payroll taxes paid by employers (31% from the gross wages).

5.3. The case of a comparatively effective labour tax rate

In the model of the comparative effective labour tax rates, we use almost the same specification; the only difference is that the ELT was replaced by the CTL. The Blanchard–Perotti identification logic and elasticities remained the same. Thus, the meaning of impulse can be interpreted in two ways: either as a 1% increase in Lithuania's ETC or, alternatively, a 1% decrease in the average respective variable of Latvia and Estonia. In the Cholesky approach, the effect of a shock to the comparative labour tax rate (CTL) produces a strong and permanent decrease in all macroeconomic variables. The effect is rather weak in a short term, but in the long run it becomes stronger. Thus, after nine quarters, the cumulative effects on GDP and employment are -2.96 % and -2.08 %, respectively. After 11 periods, the cumulative effect on FDI is about -5.79 %. The Blanchard–Perotti approach generates very similar responses. The responses of GDP, employment, and FDI are persistently negative, reaching a peak of -2.59 % after seven quarters, -1.36 % after eight and -4.37 % after 11 quarters.

The SVAR model results suggest that comparative labour taxation is an important determinant of FDI. It is clear that the decision to invest is made by assessing not only the country-specific factors, but also the surrounding market tax climate; at least in the SVAR approach, the latter factor is more important. The reason may be the fact that a significant part of FDI to Lithuania comes from economies with a higher labour tax burden.

In their study, Klyvienė and Karmelavičius have found that a shock to the CTC has a depressing effect on the macroeconomic variables in most cases. The impact on GDP, in the Cholesky approach, is less straightforward: the immediate reaction is negative, in the medium term it turns to positive, and again to negative in the long run. When comparing the effects of corporate and labour comparable effectives on FDI, there is quite a significant discrepancy. The CTC effects on FDI are much sharper in comparison with the effects of CTL: the effect of a shock to the CTC on FDI in the Cholesky approach reaches a peak of -10.32 % after 11 quarters and -7.87 % after 15 quarters. This is almost two times stronger as compared with the CTL case and is in line with the results of other empirical studies and economic logic that the taxation of labour income might be less important for FDI relative to profit taxation as capital is a relatively more mobile input that labour.

6. Conclusions

In the empirical part of this paper, three types of problems were investigated. First, it has been shown that in most cases an increase in labour taxes has a negative effect on the GDP, employment, and FDI. Second, the distortionary effect of capital taxes on FDI is higher than labour taxation. However, based on the additional examination, it has been found that labour taxes are more important than FDI for domestic investment. Rise in labour taxation affects the profitability of companies and output by raising unit

costs. The magnitude of this effect is quite strong, and this might be explained by the prevalence of labour-intensive industries in the Lithuanian economy.

Finally, the model results suggest that comparative labour taxation is an important determinant of FDI. It looks like foreign investors are more concerned about tax rate differentials than the tax rate in the host country, and the decision to invest is made by assessing not only the country-specific factors, but also the surrounding market tax climate. The latter factor is more important than just the labour taxation level in the host economy. This may be related to the fact that the significant part of FDI comes to Lithuania from economies with a relatively higher labour tax burden.

Thus, in a regional context, the co-ordination of tax policies is the best solution for a small and very open economy such as Lithuania. In the assessment of labour and capital rates in the neighbouring markets with which Lithuania competes for direct foreign investment, the country may minimise the macroeconomic costs of the tax reform, if compared with the alternative strategy to do nothing at all.

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