Assessment of Impact of Changes in Indirect Taxes on Macroeconomic Indicators of Lithuania in Context of Other EU Member States

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Abstract

This *article analyzes* the impact of changes in indirect taxes on macroeconomic indicators. In research this impact is elaborated focusing on two groups of products subject to excise duties: 1) alcoholic beverages and tobacco products; 2) liquid fuels. In order to estimate the impact of changes in indirect taxes on macroeconomic indicators the quarterly indexes of changes in indirect taxes on alcoholic beverages and tobacco products and liquid fuels were calculated. In order to reveal the impact of the rates of excise duties on the differences in prices cluster analysis was performed.

The grouping of the EU member states into eight clusters by the excise duty rate applied on four analyzed products and the distribution of countries in these clusters only partially matching the geographical proximity of these countries reflect that the analysed rates of the excise duties have a significant impact on the differences in the prices of products subject to such taxing. The obtained results of the multiple regression analysis show that in Lithuania and in other analysed EU member states the changes in indirect taxes could have a negative impact on the changes in GDP, household consumption expenditure, and import.

Keywords: indirect taxes, value added tax, excise duties, macroeconomic indicators.

Introduction

In most of the EU member states indirect taxes are the main source of budget revenue. In Lithuania income from the value added tax (VAT) and excise duties accounts for more than 50% of all taxes that are collected. Efforts to compensate for the effects of the global financial crisis on the EU member states, which started in 2008, by taking special taxing measures in relation with the increase in or cut of the VAT or excise duty rates reveal that indirect taxes are important tools regulating cyclical economic fluctuations. However, notwithstanding that the increase in the VAT or excise duty rates has a significant influence on the revenues generated in national budgets, the impact of such increase in the rates on the increase in unemployment, on the *stability of prices, on the* decrease in country's output level and on other negative changes in macroeconomic indicators has been also distinguished in scientific literature (Madsen, Damania, 1996; Henry, Karakitsos, 2001; Al-Eyd, Barrell, 2005; Kulawczuk, Bak, Szczesniak, 2005).

Researchers from Lithuania and other countries (e. g. Madsen, Damania, 1996; Kalinauskas, Tamosiunas, 2000; Henry, Karakitsos, 2001; Celov, Vilkas, Grinderslev, Andersen, 2003; Kulawczuk, Bak, Szczesniak, 2005) have performed lots of empirical researches assessing the impact of the changes in indirect taxes on various macroeconomic indicators; however the extent of such impact in different countries is not the same. Furthermore, the impact of the changes in indirect taxes on macroeconomic indicators differs within short and long term. In scientific literature (e. g., Madsen, Damania, 1996; Lipinska, Thadden, 2009; Martinez-Vazquez, Vulovic, Liu, 2009) the impact of changes in indirect taxes is usually analysed together with changes in direct taxes by performing researches on macroeconomic effects of the switching from direct to indirect taxes, i.e. decreasing the rates of direct and increasing those of indirect taxes. The impact of the increase in rates of indirect taxes on GDP is based on the developed models of two directions. On the basis of the orthodox tax models, the increase in rates of indirect taxes does not have an impact on the country's output (when reducing direct taxes at the same time). Meanwhile according to the New Keynesian macroeconomic models the increase in rates of indirect taxes causes the decrease in GDP.

In the article, in order to estimate the impact of changes in indirect taxes on macroeconomic indicators, this impact is elaborated focusing on two groups of products subject to excise duties: 1) alcoholic beverages and tobacco products; 2) liquid fuels. Whereas changing of the excise duty rates has an influence on the prices of products subject to such taxing, the assessment of the rates convergence level in the EU member states is performed by applying the method of cluster analysis in the research.

The aim of the research is to analyse the impact of changes in indirect taxes on macroeconomic indicators from the theoretical aspect and to estimate this impact on macroeconomic indicators of Lithuania in the context of other EU member states.

The objectives are:
1. To reveal the impact of changes in indirect taxes on macroeconomic indicators.
2. To analyse the impact of excise duty rates on the differences in the prices of products subject to such taxing in the EU member states.
3. To assess the influence of changes in indirect taxes on macroeconomic indicators of Lithuania in 2001–2011 in the context of other EU member states.

The methods of the research are: scientific literature analysis, **synthesis,** abstraction, comparison, grouping, cluster analysis, multiple regression analysis.

The results of the research. The results of cluster analysis show that the grouping of the EU member states in clusters by the applied excise duty rate on cigarettes (specific and ad valorem elements), unleaded petrol, diesel fuels, and ethyl alcohol is rather inconsistent with geographical proximity of these countries, whereas there are countries in separate regions where the excise duty rates differ significantly. A rather big number of clusters reflects that the analysed excise duty rates have a significant impact on the differences in prices of products subject to such taxing. The obtained results of the multiple regression analysis demonstrate that in Lithuania and in other analysed EU member states the changes in indirect taxes, which were described in the calculated quarterly indexes of changes in indirect taxes by two product groups subject to taxing by excise duties, could have a negative impact on the changes in GDP, household consumption expenditure, and import.

The results of empirical researches assessing the impact of changes in indirect taxes on macroeconomic indicators

In scientific literature the impact of the increase in rates of indirect taxes is assessed on the basis of the models of two directions. On the basis of the orthodox tax models, the following impact of the increase in rates of indirect taxes is distinguished: the increase in rates of indirect taxes causes *a rise* in market prices, which increases the demand for nominal money balances. With the money supply assumed to be fixed, money market equilibrium can only be restored by lowering producer prices. A reduction in producer prices raises the real wage, which lowers demand by firms for labour. If country's output level is to be unaffected by the changes in taxes, as predicted by orthodox tax theory, then nominal wages must decline so as to restore real wages to their original levels. In that case, if all prices and wages are flexible, then the increase in rates of indirect taxes and the reduction in direct taxes have no impact on GDP and employment. Meanwhile, according to the New Keynesian macroeconomic models (see Taylor, 1980), in which wages are assumed to be rigid in the short run, with nominal wages assumed to be fixed employment must fall, and it follows that GDP declines (Madsen, Damania, 1996).

In theoretical works, presented conclusions ambiguous due to the direction and extent of the effect of indirect taxes conditioned the rise of new empirical researches assessing the impact of the changes in indirect taxes on various macroeconomic indicators. For example, having performed the research, Kulawczuk et al. (2005) found that the harmonization of indirect taxes in four Central European countries (Poland, Czech Republic, Hungary and Slovakia) in the EU pre-accession period significantly increased prices of harmonized products and inflation in general. The results received by the authors by using multiple regression allowed the justification of the raised hypothesis on the negative impact of the increase in rates of indirect taxes on macroeconomic indicators like GDP, consumption expenditure, gross capital formation, exports and positive impact on import. Having adapted a new microsimulation model to investigate indirect taxes in France, Ruiz, Trannoy (2006) notice that the indirect taxes have a significant impact on household incomes. This impact accounts for 12.5% of household income. *According* to Al-Eyd, Barrell (2005), the increase in rates of indirect taxes reduces the real value of wealth in terms of the units of consumer goods that can be purchased and this directly reduces consumption.

Madsen, Damania (1996) have analysed data of 22 member states of the OECD and found that the impact of a switch from direct to indirect taxes (decreasing the rates of direct and increasing the ones of indirect taxes) is different in the short and long run. The results of this empirical research suggest that this switch from direct to indirect taxes has led to an increase in output levels in the short run, but that for most countries there has been no enduring long run impact. In recent empirical researches (e.g., *European Commission, 2006; Johansson, Heady, Arnold, Brys, Vartia, 2008;* Tenhofen, Wolff, Heppke-Falk, 2010) on the impact of indirect taxes on macroeconomic indicators quite different results are presented. A study by the European Commission (2006) indicates that according to the results of the QUEST model in 15 EU countries the increase in indirect taxes (e.g. VAT) by 1 percentage point would offset a

corresponding cut in the tax rate on labour. Such a change would yield an increase of 0.54% in employment in the long run and of 0.30% in GDP. Meanwhile, having analysed the effects of changes in tax structure on GDP per capita for 21 OECD countries over the period of 1970 to 2005, *Johansson et al. (2008)* indicate that indirect taxes have a significantly less adverse effect on GDP per capita than direct taxes have. Having performed the research according to the quarterly data of 1974–2008 in Germany, Tenhofen *et al.* (2010) present that changes in indirect taxes that comprise special excises and VAT have very little impact on GDP. According to these scholars, such research results may be explained by the fact that indirect taxes have less distorting impact on a labour market and capital in comparison with direct taxes.

However, when assessing the impact of the changes in indirect taxes, one of the problems of scientific researches, as Kulawczuk et al. (2005) state, is isolation of the changes in prices caused by the change in rates of indirect taxes and the impact caused by price and supply shocks (e.g. in the liquid fuel market). Such isolation could be done if, for example, exploring the impact of the changes in indirect taxes in Central European countries it is accepted that price shocks influenced simultaneously in the same size and manner the inflation in Central European countries and in the old EU member states (EU-15). In that case, if an assumption is accepted that the relatively fixed element (general increase in prices) and the variable element depending on price shocks are taken away from the general change in prices in the particular product group, to which rates are increased, in the remaining part of price changes the dominant factor would make the change in indirect taxes. Additionally, in some researches (e. g. Henry, Karakitsos, 2001) a problem is raised whether the reduction of rates of indirect taxes is desired in the aspect of inflation and unemployment. A cut in the rates of indirect taxes reduces market prices and, assuming a wage cost spiral, temporarily lowers inflation. A *decrease* in *inflation* causes *an* increase *in* real disposable income, hence demand and consequently employment. Therefore, the authors also raise a question whether indirect taxes should be continuously lowered if inflation and unemployment are considered to be the most important objectives of a government's economic policy. The results of empirical research by Henry, Karakitsos (2001) suggest that the decrease in rates of indirect taxes has significant effects on both inflation and output for a period as long as seven years.

The impact of the changes in indirect taxes on the changes in macroeconomic indicators was ana-lysed in Lithuania, too. For example, pursuing to assess the effect of the change in the VAT rate Kalinauskas, Tamosiunas (2000) performed a research on the effects of the macroeconomic equilibrium of a fiscal policy, where the effects of a macroeconomic general equilibrium included the changes in the household and government consumption, deficit of current account and fiscal deficit, and the changes in amounts of investments. The research results are presented as changes in the comparative parts of GDP by the latter indicators. *The authors estimated that* the increase in the VAT rate by 2 percentage points results in the increase in the share of the deficit of the budget and current account, and investment in GDP, the decrease in the share of the consumption expenditure of government and households in GDP, and the total summary effect is equal to the decrease of 1.9 percentage points. Meanwhile, the reduction of the VAT rate by 2 percentage points conditions the increase in the total summary effect by 1.9 percentage points.

On the basis of the developed *macroeconometric* model of Lithuania (in the model, the VAT rate is applied only to products, therefore it does not completely properly elaborate the effect of the reduction of the VAT rate), Celov et al. (2003) analyzed the effect of the VAT rate being permanently decreased by 1 percentage point and indicate that the direct effect of the reduction of the VAT rate manifests in two directions. The reduction of the VAT rate by 1 percentage point in the developed model results in 1% reduction of governmental VAT revenue and 1% reduction of inflation. When the inflation decreases by 1%, the private consumption in the long run increases by 0.8–0.9% meaning that the consumption expenditure is almost unchanged. The direct effect from the private consumption is that import increases (largely by 0.45%). If there is full compensation in the wage equation for price changes, then wages decrease as much as inflation. Due to lower wages, production costs decrease and demand for labour force increases. However, due to a minor decrease in the unemployment rate, the wage does not decrease as much as the inflation, so the real wage increases. The results of the model show that country's output increases only by 0.1% since the increased private consumption is mainly covered by an increasing import.

It has been found that the increase in the rates of the excise duties does not have excessively negative impact on the output, whereas demand for the products subject to such taxing is usually not elastic, i.e. the percentage change in consumption will be smaller than the percentage change in price (McCarten, Stotsky, 1995; Staciokas, Rimas, 2004; Buskeviciute, 2007). However, the efficiency of the increase in the excise duty rates may be reduced by increased

cross-border shopping. The increasing extents of cross-border shopping may increase the elasticity of the demand for the products subject to taxing by excise duties, and such increased elasticity may result in the change of the relation between the rates of excise duties and tax revenues as well as in the decrease of the potential tax revenue (Crawford, Tanner, 1995; Aasness, Nygard, 2009). Therefore, according to Nygard (2009), the impact of cross-border shopping should be considered when setting the rates of excise duties.

Methodology of assessment of impact of changes in indirect taxes on macroeconomic indicators

Whereas the excise duty rates have an impact on the prices of the products subject to such taxing, first of all, the assessment of the rates convergence level in the EU member states shall be performed by applying the method of cluster analysis in the research. The most recent data (1 July 2011) on the excise duties presented by the European Commission are used for the cluster analysis.

The impact of changes in indirect taxes on macroeconomic indicators is assessed in two stages. In the first stage, the assessment of the impact of changes in indirect taxes on changes in prices is performed. The impact of changes in indirect taxes on changes in prices is subject to assessment calculating the net index of the changes in indirect taxes, which in case of some certain products, e. g. liquid fuels, acquires the following mathematical expression (Kulawczuk et al., 2005):

$$NCI_{LF(LT)} = \frac{HICP_{LF(LT)} / HICP_{(LT)}}{HICP_{LF(EU\text{-}15)} / HICP_{(EU\text{-}15)}} \cdot 100 \qquad (1)$$

where: $NCI_{LF(LT)}$ – impact of the changes in indirect taxes on the changes in prices due to the increased VAT and excise duty rates on liquid fuels in Lithuania; $HICP_{LF(LT)}$ – harmonized index of consumer prices (HICP) of liquid fuels in Lithuania; $HICP_{(LT)}$ – HICP of all groups of consumer goods and services in Lithuania; $HICP_{LF(EU\text{-}15)}$ – HICP of liquid fuels in the 15 old EU member states (EU-15); $HICP_{(EU\text{-}15)}$ – HICP of all groups of consumer goods and services in the 15 old EU member states (EU-15). In Lithuania and respectively in other EU member states distinguished by using the method of cluster analysis, the net index of the changes in indirect taxes is calculated also for the group of alcoholic beverages and tobacco products by applying formula (1). In the second stage, the impact of the changes in indirect taxes on macroeconomic indicators is investigated ac-

cording to the developed models of multiple regression. Assessing the impact of indirect taxes according to the methodology of calculation adapted by Welfe (2009); Kulawczuk et al. (2005), the main elements of the aggregate expenditure equation supplemented with the calculated indexes describing the effect of the changes in VAT and excise duties are used as a starting point.

In order to estimate the impact of the changes in indirect taxes on macroeconomic indicators more accurately, the quarterly data of the investigated variables of 2001–2011 were used in the research. Due to the non-stationarity characteristic to the variables, which may lead to inaccurate results of the regression analysis, the variables were transformed by calculating the quarterly changes in the variable logarithms. Data outliers were established by using three methods: standardized residual, leverage, and Cook's distance. Fisher's and Stjudent's criteria were applied in order to get statistical conclusions about model coefficients. Autocorrelation and heteroscedasticity diagnostics were performed by using Durbin-Watson and Goldfield-Quandt tests, respectively. In order to estimate whether the problem of multicollinearity was characteristic to the variables, the VIF statistics was applied.

Assessment of the impact of excise duty rates on the prices of analysed products in the EU member states

In order to reveal the impact of excise duty rates on the differences in prices of the analysed products, the cluster analysis of excise duty rates in the EU member states was performed. Use of the cluster analysis was aimed to group the EU member states by applicable excise duty rates in such a way that the differences within the clusters are minimal, and between the clusters – maximal. According to the excise duty rates applied in the EU member states, placing in clusters was performed by using Centroid method, where distance d (U, V) between two clusters U and V is measured by using metric: (Cekanavicius, Murauskas, 2004): $d(U,V) = d(\overline{U}, \overline{V})$, where: $\overline{U}, \overline{V}$ are the averages of the vectors of the characteristics of objects forming the clusters. For the analysed variables (for the excise duty rates) a distance metric – the squared Euclidean distance – was used. Whereas the measurement units of the analysed excise duty rates were different, the excise duty rates applied in the EU member states were standardised, i. e. changed to z-values when clustering. If z-value becomes negative, then the excise duty rate applied in EU member states is lower than the average. If it is higher than zero, it means that the excise duty rate

applied in EU member states is higher than the average. The optimal number of clusters was determined on the basis of the distances between the connected clusters, having determined the step of clustering, where the distances between the connected clusters get the biggest change.

After application of the hierarchical method of the cluster analysis in accordance with the rates of the excise duties applied in the EU member states since 1 July 2011 to four products subject to taxing by excise duties (cigarettes, unleaded petrol, diesel fuels, and ethyl alcohol) the model of eight clusters was formed at first (see the axis of distances in the interval from 0 to 5). The obtained grouping of the EU member states by the excise duty rate applied to cigarettes (specific and ad valorem elements), unleaded petrol, diesel fuels, and ethyl alcohol is reflected by the dendrogram presented in Figure 1.
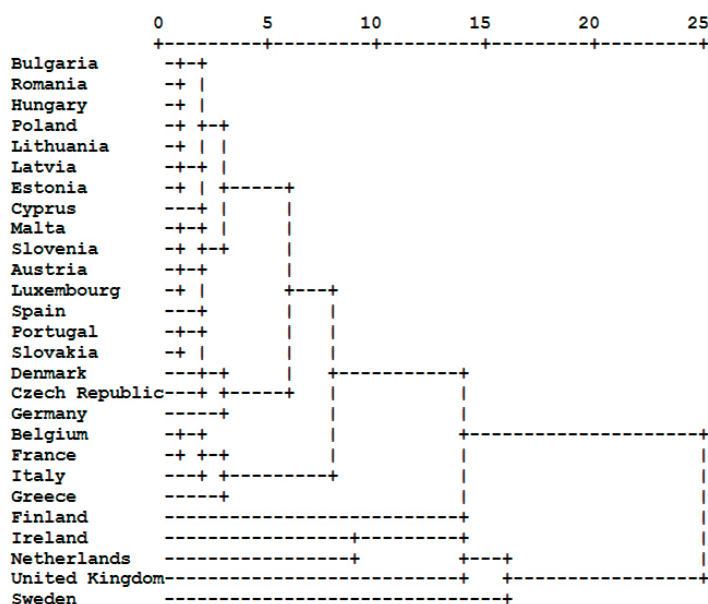
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                      0         5        10        15        20        25
                      +---------+---------+---------+---------+---------+
        Bulgaria      -+-+
        Romania       -+ |
        Hungary       -+ |
        Poland        -+ +-+
        Lithuania     -+ | |
        Latvia        -+-+ |
        Estonia       -+ | +-----+
        Cyprus        ---+ |     |
        Malta         -+-+ |     |
        Slovenia      -+ +-+     |
        Austria       -+-+       |
        Luxembourg    -+ |       +---+
        Spain         ---+       |   |
        Portugal      -+-+       |   |
        Slovakia      -+ |       |   |
        Denmark       ---+-+     |   +-----------+
        Czech Republic---+ +-----+   |           |
        Germany       -----+         |           |
        Belgium       -+-+           |           +--------------------+
        France        -+ +-+         |           |                    |
        Italy         ---+ +---------+           |                    |
        Greece        -----+                     |                    |
        Finland       -------------------------+ |                    |
        Ireland       ----------------+--------+ |                    |
        Netherlands   ----------------+         +---+                 |
        United Kingdom-------------------------+   +-----------------+
        Sweden        -----------------------------+
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Fig. 1. Model of eight clusters based on the excise duty rate applied to cigarettes, unleaded petrol, diesel fuels, and ethyl alcohol since 1 July 2011
Source: composed by the authors with reference to European Commission (2011). Excise Duty tables.

On the basis of the data presented in Figure 1 and in consideration of the clustering step where the distances between the connected clusters get the highest jump, the optimal number of clusters is received and it is eight. Five countries: Sweden (Cluster 1), the United Kingdom (Cluster 2), the Netherlands (Cluster 3), Ireland (Cluster 4), and Finland (Cluster 5), which could be considered to be outliers, fall in different clusters and it demonstrates that in these states the excise duty rates applied to the four analysed products differ significantly from the ones applied in other EU member states. Greece, Italy, France and Belgium get into the sixth cluster; Germany, the Czech Republic, Denmark, Slovakia and Portugal get into the seventh cluster, and Lithuania together with thirteen remaining EU member-states (with 10 new member states and three old member states) get into the eighth cluster. In Sweden, the United Kingdom, the Netherlands, Ireland and Finland the analyzed excise duty rates in absolute terms are the highest, however, as it can be seen in the model of eight clusters formed at the beginning, rather big differences exist in these countries as well.

Looking at the standard deviation in the calculated excise duty rates in the countries included in clusters 6, 7 and 8, we can say that the differences in the analysed excise duty rates are rather significant. In the countries in the sixth cluster the excise duty on unleaded petrol ranges from 568.29 to 657.02 EUR per 1000 litres (15.6%), on diesel fuels – from 403.54 to 428.36 EUR per 1000 litres (6.2%), on ethyl alcohol – from 948.60 to 2309.76 EUR per hectolitre of pure alcohol (143.5%), the specific and ad valorem (calculated as percentage on the retail sale price) elements applied on cigarettes vary from 10.08 to 21.35 EUR (111.8%) and from 51.93 to 56.28 percent (4.4 percentage points) per 1000 cigarettes respectively. Significant differences were also found in the countries placed in the seventh cluster: the excise duty on unleaded petrol ranges from 521.42 to 630.42 EUR per 1000 litres (20.9%), on diesel fuels – from 365.95 to 449.20 EUR per 1000 litres (22.7%), on ethyl alcohol – from 917.51 to 1720.27 EUR per hectolitre of pure alcohol (87.5%), the specific element applied on cigarettes – from 49.10 to 90.89

EUR (85.1%) per 1000 cigarettes, the ad valorem element applied on cigarettes – from 20.94 to 26.10 percent (5.2 percentage points) per 1000 cigarettes. In the eighth cluster (which includes mostly the new member states of the EU) the excise duty on unleaded petrol fluctuates from 379.85 to 475.56 EUR per 1000 litres (25.2%), on diesel fuels – from 303.24 to 376.97 EUR per 1000 litres (24.3%), on ethyl alcohol – from 746.93 to 1302.49 EUR per hectolitre of pure alcohol (74.4%), the specific element applied on cigarettes – from 22.15 to 45.96 EUR (107.5%) per 1000 cigarettes, the ad valorem element applied on cigarettes – from 25.56 to 47.48 percent (21.92 percentage points) per 1000 cigarettes.

The obtained results of the cluster analysis show that the grouping of the EU member states in clusters is rather different from the geographical proximity of the countries, whereas they include countries in separate regions where excise duty rates differ significantly. A rather big number of clusters and the distribution of countries in these clusters being rather different from the geographical proximity of these countries reflect that the analysed rates of excise duties have a significant impact on the differences in prices of products subject to such taxing. The lower level of convergence of the excise duty rates may lead to the growth of cross-border shopping, which results in loss of potential tax revenue. Whereas performing the cluster analysis, Cyprus, Estonia, Latvia, Poland, Hungary, Romania and Bulgaria first of all got into the eighth cluster together with Lithuania (later grouped with the remaining five EU member states), some part of these countries was included in the research as interrelated countries in order to estimate a possible impact of the changes in indirect taxes on macroeconomic indicators.

Assessment of the impact of the changes in indirect taxes on GDP, *household consumption expenditure,* import, and investments in Lithuania and other EU member states

Considering that the impact of the changes in indirect taxes on GDP, import, and investments is usually assessed in empirical researches, the latter indicators were selected. In scientific literature the impact of the changes in indirect taxes on GDP is based on the models of two directions, therefore the research pursued to estimate which impact of the changes in indirect taxes on GDP is confirmed in 2001–2011 in Lithuania and in other EU member states selected on the basis of the results of the cluster analysis (investigating quarterly data). This impact on GDP (like on *household consumption expenditure and* import) is elaborated focusing on two groups of products subject to excise duties: 1) alcoholic beverages and tobacco products; 2) liquid fuels. The impact of the changes in indirect taxes on changes in GDP in Lithuania and in other analysed EU countries is estimated according to the following developed models of the dependence of the changes in GDP (Y) on changes in the indexes of changes in indirect taxes on alcoholic beverages and tobacco products (X_4) and liquid fuels (X_5) and based on such major elements of the aggregate expenditure equation: changes in final consumption expenditure (X_1), investment expenditure (X_2), and exports (X_3) (see Table 1). It must be emphasised that the main attention in the research was paid to the assessment of the impact of the changes in indirect taxes on macroeconomic indicators, therefore other received models values were not analysed in greater detail. Furthermore, in order to avoid significant changes in quarterly data due to the impact of seasons, the research used the seasonally adjusted data and data adjusted in consideration of working days.

Table 1

Assessment of impact of changes in indirect taxes on changes in GDP in 5 EU member states based on developed models

		In Lithuania	In Estonia	In Latvia	In Poland	In Hungary
ln constant/ constant	b_0	-0.003/0.997	0.010/1.01	-0.002/0.998	0.001/1.00	0.008/1.008
ln FC/FC (X_1)	b_1	0.64/1.90 *(7.185)*	0.58/1.79 *(5.052)*	0.74/2.09 *(8.955)*	0.86/2.37 *(25.431)*	Not included in the model
ln GCF/GCF (X_2)	b_2	0.12/1.13 *(6.800)*	0.06/1.06 *(3.719)*	0.13/1.13 *(5.653)*	0.13/1.14 *(4.876)*	0.14/1.15 *(3.202)*
ln Ex/Ex (X_3)	b_3	0.17/1.19 *(4.667)*	Eliminated from the model	0.20/1.22 *(3.177)*	Eliminated from the model	Not included in the model
ln NCI$_{AT}$/NCI$_{AT}$ (X_4)	b_4	-0.11/0.90 *(-1.066)*	-0.36/0.69 *(-2.150)*	0.002/1.00 *(0.019)*	0.03/1.03 *(0.535)*	0.67/1.96 *(1.617)*
ln NCI$_{LF}$/NCI$_{LF}$ (X_5)	b_5	-0.13/0.88 *(-0.899)*	-0.02/0.98 *(-0.180)*	-0.21/0.81 *(-2.001)*	-0.02/0.98 *(-0.456)*	-1.004/0.37 *(-4.817)*
t statistics critical value		2.032	2.037	2.035	2.032	2.023

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ln NCI_{AT} and ln NCI_{LF}	n	-0.239	n	n	n
standardized coefficients	n	n	n	n	-0.573
$\bar{R}^2$; DW	0.756; 1.916	0.657; 2.209	0.868; 1.823	0.980; 1.781	0.462; 2.111
Sample size without outliers	N40	N37	N39	N39	N43

where: FC – final consumption expenditure; GCF – gross capital formation; Ex – exports; NCI_{AT} and NCI_{LF} – the indexes of changes in indirect taxes on alcoholic beverages and tobacco products and liquid fuels; DW – Durbin-Watson statistics; n – statistically significant impact was not found; t statistics are in parentheses; significance level – 0.05.

Source: composed by the authors with reference to Eurostat data.

According to the estimates of the developed models presented in Table 1, it can be stated that relationships between the changes in indirect taxes, which were described in the calculated quarterly indexes of changes in indirect taxes for two product groups subject to taxing by excise duties, and growth rates of GDP in analysed EU member states are different. In Lithuania, like in Latvia and Poland, the results of the developed models do not allow to confirm that the increase in VAT and excise duty rates has a negative impact on the growth rates of GDP. The absence of statistically significant relationship between the quarterly indexes of changes in indirect taxes and changes in GDP also justifies the conclusion stated in the orthodox tax theory that the increase in indirect taxes (thus reducing direct taxes) does not have an impact on change in GDP. Statistically significant relationships in the examined period from 2001 to 2011 between the quarterly indexes of the changes in indirect taxes and changes in GDP are observed in Estonia and Hungary only (t statistics values exceed the critical value of Stjudent's distribution). In Estonia the statistically significant relationship between the indexes of changes in indirect taxes on alcoholic beverages and tobacco products (NCI_{AT}) and changes in GDP, and in Hungary – between the indexes of changes in indirect taxes on liquid fuels and changes in GDP is recorded. In Hungary the determined negative relationship between the increase in rates of indirect taxes on liquid fuels (ln NCI_{AT}) and the growth rates of GDP (ln BVP) is more than twice stronger than the negative relationship between the increase in rates of indirect taxes on alcoholic beverages and tobacco products and the growth rates of GDP in Estonia, whereas the standardized coefficients are -0.573 and -0.239 respectively.

On the basis of the estimates of the multiple regression, the increase in the VAT and excise duty rates on alcoholic beverages and tobacco products in Estonia exceeding by 1 percentage point the average of 15 member-states of the EU could result in the decrease in the quarterly growth rates of GDP by 31%, and in Hungary the impact of the increase in such taxes rates on liquid fuels on the reduction of the growth rates

of GDP could be 2 times stronger. According to the obtained results of the analysis, it can be stated that in Hungary such significant fluctuations in quarterly growth rates of GDP could be determined by the significant changes in the standard VAT rate within the investigated period: the decrease from 25% to 20% in 2006, and the increase from 20 to 25% in 2009 (European Commission, 2011b). It is necessary to emphasise that in Hungary, the variables of final consumption expenditure and exports were not included in the model, whereas the assumptions of the regression model were not satisfied with the latter variables. Furthermore, in Hungary, the value of adjusted coefficient of determination ($\bar{R}^2 = 0.462$) of the model describing changes in GDP is lower than in other analysed EU countries. The export variable was eliminated from the models developed for Estonia and Poland as statistically insignificant, whereas the value of t criterion of this variable is lower than the respective critical value of Stjudent's distribution.

Another significant indicator distinguished in empirical researches, which could be influenced by the changes in VAT or excise duty rates, is household consumption expenditure. The possible impact of the changes in VAT and excise duty rates on the changes in household consumption expenditure in Lithuania and in other new member states of the EU according to the following developed models of the dependence of the changes in household consumption expenditure (Y) on the changes in the indexes of changes in indirect taxes on alcoholic beverages and tobacco products (X_4), liquid fuels (X_5) and major elements of the aggregate expenditure equation (changes in GDP (X_1), investment expenditure (X_2), and exports (X_3)) is presented in Table 2. It shall be noticed that less goods can be supplied to the internal market due to the growth of exports, therefore the prices of such goods may increase inside the country thus reducing consumption. However, the variable of exports was eliminated from the models in all countries (except for Estonia) as statistically insignificant, whereas the value of t criterion of this variable is lower than the respective critical value of Stjudent's distribution. Therefore it can be stated that the changes in house-

hold consumption expenditure were not significantly dependent on the changes in exports. It is necessary to emphasise that in Estonia, the variables of investment expenditure and exports were not included in the model, whereas all analysed independent variables having been included in the model, the assumptions of the regression model were not satisfied.

Assessment of impact of changes in indirect taxes on changes in household consumption expenditure in 5 EU member states based on developed models

		In Lithuania	In Estonia	In Latvia	In Poland	In Hungary
ln constant/ constant	b_0	0.010/1.01	0.001/1.00	0.001/1.00	0.001/1.00	0.002/1.00
ln GDP/GDP (X_1)	b_1	0.69/2.00 *(5.298)*	0.860/2.36 *(4.651)*	0.915/2.50 *(10.996)*	1.10/3.01 *(19.868)*	0.83/2.29 *(9.831)*
ln GCF/GCF (X_2)	b_2	-0.07/0.93 *(-2.922)*	Not included in the model	Eliminated from the model	-0.11/0.90 *(-2.549)*	-0.09/0.91 *(-4.614)*
ln Ex/Ex (X_3)	b_3	Eliminated from the model	Not included in the model	Eliminated from the model	Eliminated from the model	Eliminated from the model
ln NCI_{AT}/NCI_{AT} (X_4)	b_4	-0.36/0.70 *(-1.745)*	0.061/1.06 *(0.230)*	-0.09/0.91 *(-0.650)*	-0.04/0.96 *(-0.507)*	0.29/1.33 *(1.654)*
ln NCI_{LF}/NCI_{LF} (X_5)	b_5	-0.10/0.90 *(-0.686)*	0.012/1.01 *(0.098)*	-0.01/0.99 *(-0.057)*	-0.03/0.97 *(-0.659)*	-0.29/0.75 *(-2.317)*
t statistics critical value		2.030	2.032	2.037	2.030	2.030
ln NCI_{AT} and ln NCI_{LF} standardized coefficients		-0.206* n	n n	n n	n n	n -0.195
$\overline{R}^2$; DW		0.558; 2.175	0.474; 2.314	0.786; 2.336	0.959; 2.047	0.839; 2.234
Sample size without outliers		N40	N38	N36	N40	N40

where: GCF – gross capital formation; Ex – exports; NCI_{AT} and NCI_{LF} – indexes of changes in indirect taxes on alcoholic beverages and tobacco products and liquid fuels; DW – Durbin-Watson statistics; n – statistically significant impact was not found; t – statistics are in parentheses, significance level – 0.05; * – significance level – 0.1.

Source: composed by the authors with reference to Eurostat data.

The estimates of the multiple regression presented in Table 2 show that in Lithuania like in Estonia, Latvia and Poland, the values of t coefficients with a 95% *significance level* of both indexes of the changes in indirect taxes would not allow considering that these variables are statistically significant. In Lithuania, with a slightly lower (90%) *significance level* (t statistics critical value of Stjudent's distribution is equal to 1.690) it can be stated that there is a negative relationship between quarterly indexes of the changes in indirect taxes in alcoholic beverages and tobacco products group (according to the following developed model of the dependence of the changes in household consumption expenditure (Y) on changes in GDP (X_1), investment expenditure (X_2), the indexes of changes in indirect taxes on alcoholic beverages and tobacco products (X_4), liquid fuels (X_5)). Such absence of the negative relationship between the latter variables may be explained by the fact that the increase in the excise duty rates on alcoholic beverages and tobacco products could have caused the growth in the extents of smuggling of such goods and cross-border shopping, which determined the lower local consumption of such goods and the decrease in the

growth rates of household consumption expenditure. In Hungary a negative relationship between quarterly indexes of the changes in indirect taxes on liquid fuels and the changes in household consumption expenditure is also recorded. Therefore it can be stated that the increase in rates of indirect taxes on liquid fuels could be related to the decreasing quarterly growth rates of household consumption expenditure. This impact was 5.64% weaker than in the case of the group of alcoholic beverages and tobacco products in Lithuania.

According to the obtained estimates of the models, in Lithuania and Hungary a negative relationship between quarterly indexes of the changes in indirect taxes and the growth rates of household consumption expenditure can be seen, which shows that the increase in the rates of indirect taxes may be considered to be one of the factors reducing the growth rates of household consumption expenditure. Whereas in Lithuania the VAT and excise duty rates on alcoholic beverages and tobacco products exceed the average of 15 member-states of the EU by 1 percentage point, the possible 30% (b_4= 0.70) slowdown of quarterly growth rates of household consumption expen-

diture is observed. And in Hungary in case of liquid fuels such a slowdown is 25% (b_5= 0.75). It is necessary to emphasise that higher fluctuations of the dependent variable due to the increase in the VAT and excise duty rates are found, whereas changes not in annual but in quarterly rate are investigated.

Empirical studies also emphasise that the increase in the VAT or excise duty rates could have an influence on the reduction of consumption, and the slowed consumption could reduce the growth of import of goods and services. In Lithuania and in other analysed EU member states the results of models estimating the dependence of the changes in import (Y) on changes in the indexes of changes in indirect taxes on alcoholic beverages and tobacco products (X_4), liquid fuels (X_5) and major elements of the aggregate expenditure equation: changes in GDP (X_1), final consumption expenditure (X_2), investment expenditure (X_3), are presented in Table 3.

Table 3

Assessment of impact of changes in indirect taxes on changes in import in 5 EU member states based on developed models

		In Lithuania	In Estonia	In Latvia	In Poland	In Hungary
ln constant/ constant	b_0	0.014/1.01	0.004/1.00	0.011/1.01	0.022/1.02	0.012/1.01
ln GDP/GDP *(X₁)* *(additionally included)*	b_1	–	0.89/2.42 *(5.454)*	–	–	–
ln FC/FC *(X₂)*	b_2	0.607/1.83 *(5.821)*	Not included in the model	0.32/1.37 *(2.845)*	Eliminated from the model	Not included in the model
ln GCF/GCF *(X₃)*	b_3	0.197/1.22 *(5.331)*	0.11/1.11 *(2.346)*	0.33/1.39 *(7.220)*	0.11/1.12 *(6.341)*	0.12/1.12 *(5.337)*
ln NCI$_{AT}$/NCI$_{AT}$ *(X₄)*	b_4	-0.046/0.96 *(-0.065)*	0.67/1.96 *(0.946)*	-0.64/0.53 *(-2.050)*	-0.52/0.59 *(-0.849)*	1.02/2.78 *(1.510)*
ln NCI$_{LF}$/NCI$_{LF}$ *(X₅)*	b_5	0.504/1.66 *(1.053)*	0.77/2.16 *(2.027)*	0.19/1.21 *(0.578)*	-0.92/0.40 *(-3.708)*	-0.75/0.47 *(-2.390)*
t statistics critical value		2.028	2.032	2.028	2.028	2.023
ln NCI$_{AT}$ and ln NCI$_{LF}$ standardized coefficients		n n	n 0.226*	-0.132 n	n -0.440	n -0.273
$\bar{R}^2$; DW		0.705; 2.131	0.550; 1.779	0.841; 1.784	0.527; 2.131	0.492; 2.179
Sample size without outliers		N41	N39	N41	N40	N43

where: FC – final consumption expenditure; GCF – gross capital formation; NCI$_{AT}$ and NCI$_{LF}$ – the indexes of changes in indirect taxes on alcoholic beverages and tobacco products and liquid fuels; DW – Durbin-Watson statistics; n – statistically significant impact was not found; t statistics are in parentheses, significance level – 0.05; * – significance level – 0.06.

Source: composed by the authors with reference to Eurostat data.

The estimates of the developed models presented in Table 3 show that Lithuania was exceptional in the context of other new member states of the EU, whereas the increase in the VAT and excise duty rates in two product groups subject to taxing by excise duties did not have an impact on changes in import. In Lithuania according to the following developed model of the dependence of the changes in import (Y) on changes in the final consumption expenditure (X_2), investment expenditure (X_3), indexes of changes in indirect taxes on alcoholic beverages and tobacco products (X_4) and liquid fuels (X_5) (in consideration of adjusted coefficient of determination ($\bar{R}^2$= 0.705) the model describes the changes in the analyzed indicator rather well) the values of t coefficients with a 95% *significance level* of both indexes of the changes in indirect taxes would not allow considering that these variables are statistically significant. Therefore the results of the models do not allow to confirm the theoretical assumptions that in Lithuania the increase in the VAT and excise duty rates could have had an impact on changes in import (according to the quarterly data of 2001–2011).

In Latvia a negative relationship between the quarterly indexes of the changes in indirect taxes in alcoholic beverages and tobacco products group and the changes in import is observed. In Poland and Hungary (the models developed for these countries together with the indexes of the changes in indirect taxes included only the variable of investment expenditure, whereas the changes in the investment expenditure best described the changes in import within the investigated period) a negative relationship between the increase in rates of indirect taxes on liquid fuels and changes in import is found. In Poland this negative impact is 1.6 times stronger than in Hungary,

whereas the standardized coefficients are -0.440 and -0.273 respectively.

In Estonia, with a bit less *(*94%) *significance level* (t statistics critical value of Stjudent's distribution is equal to 1.95) it can be stated that the increase of the VAT and excise duty rates had a positive impact on changes in import. It is necessary to emphasise that analyzing the impact of the changes in indirect taxes on changes in import in Estonia, the GDP indicator was included into the model instead of the final consumption expenditure variable, whereas changes in GDP reflected better the changes in the dependent variable within the investigated period (in the countries that generate higher GDP the growth of the import demand for investment goods as a related production factor manifested accordingly). However, in that country the relationship between the quarterly indexes on liquid fuels describing the changes in VAT and excise duty rates and changes in import is positive. The presence of such a positive relationship may be explained by higher demand for liquid fuels in that country. According to the estimates of the developed models, the extent of the impact of the changes in indirect taxes on changes in import may depend also on the volume of the indicators. In the countries where the analyzed volumes of indicators are higher (for example, in Poland and Hungary) a possible negative impact on the growth of import due to the increase in rates of indirect taxes is established, and in the countries where the volumes of the indicators are lower (like in Lithuania), the effect may not manifest or, like in Estonia or Latvia, may be weaker.

Empirical studies show that changes in the rates of indirect taxes may also have an impact on change in the investment expenditure. VAT is levied both on consumer and investment goods, therefore the application of higher VAT rate when acquiring investment assets may cause negative impact of changes in rates of indirect taxes on investments. Some products subject to taxing by excise duties (for example, fuel) are significant elements in production processes. In such case higher fuel prices caused by the increased VAT and excise duty rates are respectively related to higher fuel costs for enterprises. Accordingly, the share of profit of such enterprises designated to investments may decrease due to the incurred higher fuel costs.

Therefore the impact of the changes in indirect taxes was also estimated on the investment indicator in the research. Whereas the growth of fuel prices due to the increase in the rates of VAT and excise duties has been identified as one of the significant factors able to make an indirect effect on investments, such effect was elaborated only according to the calculated quarterly indexes of the changes in indirect taxes for liquid fuels when analysing the impact of the changes in indirect taxes on investments.

In Lithuania and in other new member states of the EU the results of the models estimating the dependence of changes in the gross fixed capital formation (Y) on changes in the indexes of changes in indirect taxes on liquid fuels (X_4) and major elements of the aggregate expenditure equation (changes in GDP (X_1), household consumption expenditure (X_2), and exports (X_3)) are presented in Table 4. It must be emphasised that the data of indicators with the influence of a season and workdays were used only when analyzing the impact of the changes in indirect taxes on changes in gross fixed capital formation, whereas using seasonally adjusted data did not satisfy the assumptions of the regression model. Therefore, higher fluctuations in models estimates are possible. It shall be noticed that the variable of exports was eliminated from the models in all countries (except for Poland) as statistically insignificant, whereas the value of t criterion of this variable was lower than the respective critical value of Stjudent's distribution. Therefore it can be stated that the changes in gross fixed capital formation were not significantly dependent on the changes in exports. Whereas in the models developed for Lithuania and Latvia the variables of GDP and household consumption expenditure were too multicollinear (VIF>4), in consideration of the value change of the adjusted coefficient of determination (i.e. whether it did not decrease too much) the variable of household consumption expenditure was eliminated. With elimination of the variable of household consumption expenditure, the problem of multicollinearity was avoided in these models. In case of Estonia and Hungary, the variable of household consumption expenditure was also eliminated in consideration of the respective critical value of Stjudent's distribution.

Assessment of impact of changes in indirect taxes on changes in gross fixed capital formation in 5 EU member states based on developed models

		In Lithuania	In Estonia	In Latvia	In Poland	In Hungary
ln constant/ constant	b_0	-0.018/0.982	-0.004/0.996	-0.023/0.977	-0.037/0.964	-0.024/0.976
ln GDP/GDP (X_1)	b_1	2.38/10.84 (12.389)	1.41/4.10 (5.564)	2.35/10.45 (10.754)	4.24/69.13 (18.085)	3.99/53.95 (18.673)
ln PC/PC (X_2)	b_2	Eliminated from the model	Eliminated from the model	Eliminated from the model	-3.05/0.05 (-8.653)	Eliminated from the model
ln Ex/Ex (X_3)	b_3	Eliminated from the model	Eliminated from the model	Eliminated from the model	0.87/2.40 (2.349)	Eliminated from the model
ln NCI_{LF}/NCI_{LF} (X_4)	b_4	0.41/1.51 (0.452)	0.769/2.16 (1.364)	1.74/5.70 (1.690)	0.96/2.61 (1.420)	3.04/20.86 (3.056)
t statistics critical value		2.028	2.023	2.024	2.028	2.028
ln NCI_{LF} standardized coefficients		n	n	n	n	0.153
$\overline{R}^2$; DW		0.796; 1.999	0.416; 2.115	0.760; 2.267	0.960; 2.208	0.904; 2.096
Sample size without outliers		N40	N42	N41	N41	N39

where: PC – household consumption expenditure; Ex – exports; NCI_{LF} –indexes of changes in indirect taxes on liquid fuels; DW – Durbin-Watson statistics; n – statistically significant impact was not found; t statistics are in parentheses, significance level – 0.05.

Source: composed by the authors with reference to Eurostat data.

According to the estimates of the developed models presented in Table 4, in all analyzed countries (except for Hungary) the values of t coefficients with a 95% significance level of the indexes of changes in indirect taxes on liquid fuels would not allow considering that this variable is statistically significant. Therefore the estimates of the models do not allow to state that the increase of the VAT and excise duty rates in the latter countries in 2001–2011 (according to the quarterly data) for liquid fuels has made an impact on changes in gross fixed capital formation. Meanwhile, in Hungary a positive relationship between indexes of the changes in indirect taxes on liquid fuels and the changes in gross fixed capital formation is recorded. This positive relationship in Hungary shows that in case of liquid fuels the increase of the VAT and excise duty rates has a positive impact on the growth rates of investments. With reference to the calculated logarithmic model estimates (which also demonstrate the value of the elasticity coefficient), it can be stated that in Hungary growth of 1% in the quarterly index of the changes in indirect taxes on liquid fuels caused an increase by 3.04% in the quarterly growth rates of investments (ln NCI_{LF}). However, the increase of the VAT and excise duty rates in case of liquid fuels did not have a negative impact, but had a positive impact on growth rates of investments. It could be determined by higher investments in alternative types of fuel, higher investments pursuing to save fuel and generally increasing investments in the gross capital formation.

Conclusions

The impact of the increase in rates of indirect taxes on GDP is based on the models of two directions. On the basis of the orthodox tax models, the increase in rates of indirect taxes does not have an impact on the country's output (when reducing direct taxes at the same time). Meanwhile according to the New Keynesian macroeconomic models the increase in rates of indirect taxes causes the decrease in GDP. Empirical studies on the direction and extent of the impact of indirect taxes on other macroeconomic indicators also do not present unambiguous conclusions.

The results of cluster analysis show that the grouping of the EU member states in clusters by the applied excise duty rate on cigarettes (specific and ad valorem elements), unleaded petrol, diesel fuels and ethyl alcohol is rather inconsistent with geographical proximity of these countries. A rather big number of clusters and the distribution of countries in these clusters only partially matching the geographical proximity of these countries reflect that the analysed rates of the excise duties have a significant impact on the differences in prices of products subject to such taxing.

According to the following developed models of the dependence of the changes in GDP on the calculated indexes of changes in indirect taxes on alcoholic beverages and tobacco products, liquid fuels, and major elements of the aggregate expenditure equation, in Lithuania, like in Latvia and Poland, the

determined estimates of the models do not allow to confirm that the increase in VAT and excise duty rates could have a negative impact on the growth rates of GDP. The absence of statistically significant relationship between the indexes of changes in indirect taxes and the changes in GDP also justifies the conclusion stated in the orthodox tax theory that the increase in indirect taxes (when reducing direct taxes at the same time) does not have an impact on the change in GDP. Meanwhile, in Hungary the determined negative relationship between the increase in rates of indirect taxes on liquid fuels and the growth rates of GDP is more than twice stronger than in Estonia.

In Lithuania and Hungary a negative relationship between quarterly indexes of the changes in indirect taxes and the growth rates of household consumption expenditure can be seen, which shows that the increase in rates of indirect taxes may be considered to be one of the factors reducing the growth rates of household consumption expenditure. In Lithuania the negative relationship between the latter variables may be explained by the fact that the increase in the excise duty rates on alcoholic beverages and tobacco products could have caused the growth in the extents of smuggling of such goods and cross-border shopping, which has led to the lower local consumption of such goods and the decrease in the growth rates of household consumption expenditure. Therefore, a possible negative impact on growth rates of household consumption expenditure should be assessed before increasing the rates of the VAT or excise duties.

The estimates of the developed models show that Lithuania was exceptional in the context of other new member states of the EU, whereas the increase in the VAT and excise duty rates in two product groups subject to taxing by excise duties did not have an impact on changes in import. Meanwhile in Estonia, Latvia, Poland and Hungary stronger or weaker effect on changes in import was recorded and it shows that the increase in the VAT or excise duty rates could have an influence on the reduction of consumption, and the slowed consumption could reduce the growth of import of goods and services.

Assessing the impact of the changes in indirect taxes on changes in investments, the estimates of the models do not allow to state that in case of liquid fuels the increase in the VAT and excise duty rates in all analyzed countries except for Hungary had an impact on growth rates of investments.

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Netiesioginių mokesčių pokyčių poveikio Lietuvos makroekonominiams rodikliams vertinimas kitų ES šalių kontekste

Santrauka

Daugelyje ES šalių netiesioginiai mokesčiai yra pagrindinis biudžeto pajamų formavimo šaltinis. Lietuvoje pajamos iš pridėtinės vertės mokesčio (PVM) ir akcizo mokesčių sudaro daugiau nei 50 proc. mokestinių pajamų. Tačiau nepaisant to, kad PVM ar akcizo mokesčių tarifų padidinimas turi reikšmingą poveikį valstybių biudžetuose sugeneruojamoms pajamoms, mokslinėje literatūroje taip pat išskiriamas tokio tarifų padidinimo poveikis kainų stabilumui, nedarbo didėjimui, šalies gamybos apimties lygio sumažėjimui ir kitų makroekonominių rodiklių neigiamiems pasikeitimams.

Netiesioginių mokesčių tarifų padidinimo poveikis BVP grindžiamas dviejų krypčių modeliais. Remiantis pagrindiniais apmokestinimo modeliais, netiesioginių mokesčių tarifų padidinimas neturi poveikio šalies gamybos apimčiai (mažinant ir tiesioginius mokesčius). Tuo tarpu pagal šiuolaikinių Keinso pasekėjų makroekonominius modelius netiesioginių mokesčių tarifų padidinimas sukelia BVP mažėjimą. Empiriniuose tyrimuose dėl netiesioginių mokesčių poveikio krypties ir masto kitiems makroekonominiams rodikliams irgi nėra pateikiama vienareikšmių išvadų.

Tyrimo tikslas – išanalizuoti netiesioginių mokesčių pokyčių poveikį makroekonominiams rodikliams teoriniu aspektu ir įvertinti šį poveikį Lietuvos makroekonominiams rodikliams kitų ES šalių kontekste. Straipsnyje, siekiant įvertinti netiesioginių mokesčių pokyčių poveikį makroekonominiams rodikliams, šis poveikis detalizuojamas pagal dvi akcizo mokesčiais apmokestinamas produktų grupes: 1) alkoholinius gėrimus ir tabako gaminius; 2) skystąjį kurą. Kadangi akcizo mokesčių tarifų keitimas daro poveikį jais apmokestinamų produktų kainoms, tyrime, pritaikius klasterinės analizės metodą, atliekamas ir akcizo mokesčių tarifų konvergencijos lygio ES šalyse vertinimas.

Remiantis atliktos klasterinės analizės rezultatais nustatyta, kad ES šalių susigrupavimas klasteriuose pagal taikomą akcizo mokesčio tarifą cigaretėms (specifinį ir vertybinį elementus), bešviniam variklių benzinui, dyzeliniams degalams ir etilo alkoholiui nėra labai artimas geografiniam šalių išsidėstymui. Pakankamai didelis klasterių skaičius, pačiuose klasteriuose esančių šalių tik iš dalies artimas geografiniam išsidėstymui pasiskirstymas atspindi, kad analizuojami akcizo mokesčio tarifų dydžiai turi reikšmingos įtakos jais apmokestinamų produktų kainų skirtumams. Mažesnis akcizo mokesčių tarifų konvergencijos lygis atitinkamai gali lemti pasienio apsipirkimų išaugimą, dėl kurio prarandamos potencialios mokestinės pajamos.

Vertinant pagal sudarytus BVP pokyčių priklausomybės nuo apskaičiuotų netiesioginių mokesčių pokyčių indeksų alkoholiniams gėrimams ir tabako gaminiams bei skystajam kurui ir pagrindinių išlaidų lygties elementų modelius, nustatyti modelių įverčiai neleidžia patvirtinti, kad Lietuvoje, kaip ir Latvijoje bei Lenkijoje, netiesioginių mokesčių tarifų padidinimas galėjo turėti neigiamą poveikį BVP augimo tempams. Statistiškai reikšmingo ryšio tarp ketvirtinių netiesioginių mokesčių pokyčių indeksų ir BVP pokyčių nebuvimas taip pat pagrindžia pagrindinėje apmokestinimo teorijoje konstatuojamą išvadą, kad netiesioginių mokesčių tarifų padidinimas neturi poveikio BVP pasikeitimui. Vengrijoje nustatytas neigiamas netiesioginių mokesčių tarifų padidinimo skystajam kurui poveikis BVP augimo tempams yra daugiau nei du kartus stipresnis nei Estijoje.

Lietuvoje ir Vengrijoje tarp ketvirtinių netiesioginių mokesčių pokyčių indeksų ir namų ūkių vartojimo išlaidų pokyčių nustatytas statistiškai reikšmingas atvirkštinis ryšys rodo, kad netiesioginių mokesčių tarifų padidinimą galima laikyti vienu iš namų ūkių vartojimo išlaidų augimo tempus mažinančių veiksnių. Lietuvoje neigiamas netiesioginių mokesčių poveikis gali būti aiškinamas tuo, kad akcizo mokesčių tarifų padidinimas alkoholiniams gėrimams ir tabako gaminiams galėjo lemti šių prekių kontrabandos mastą, pasienio apsipirkimų išaugimą, kuris atitinkamai lėmė mažesnį šių prekių vietinį vartojimą ir namų ūkių vartojimo išlaidų augimo tempų mažėjimą. Todėl, didinant PVM ar akcizo mokesčių tarifus turėtų būti įvertinamas ir galimas neigiamas šių mokesčių tarifų padidinimo poveikis namų ūkių vartojimo išlaidų augimo tempams.

Sudarytų modelių įverčiai rodo, kad Lietuva išsiskyrė iš kitų analizuojamų naujųjų ES šalių konteksto, nes PVM ir akcizo mokesčių tarifų padidinimas dvejose akcizo mokesčiais apmokestinamose produktų grupėse neturėjo poveikio importo pokyčiams. Tačiau Estijoje, Latvijoje, Lenkijoje ir Vengrijoje fiksuojamas stipresnis ar silpnesnis netiesioginių mokesčių poveikis importo pokyčiams atspindi, kad PVM ar akcizo mokesčių tarifų padidinimas gali turėti įtakos vartojimo mažėjimui, o lėtėjantis varto-

jimas – mažinti prekių ir paslaugų importo augimą. Vertinant netiesioginių mokesčių pokyčių poveikį investicijų pokyčiams, modelių įverčių dydžiai neleidžia teigti, jog PVM ir akcizo mokesčių tarifų padidinimas skystojo kuro atveju visose analizuojamose ES šalyse, išskyrus Vengriją, turėjo poveikį investicijų augimo tempams.

Gauti daugialypės regresinės analizės rezultatai rodo, kad Lietuvoje ir kitose analizuojamose ES šalyse netie-sioginių mokesčių pokyčiai, kuriuos aprašo apskaičiuoti ketvirtiniai netiesioginių mokesčių pokyčių indeksai dviem akcizo mokesčiais apmokestinamoms produktų grupėms, galėjo turėti neigiamos įtakos BVP, namų ūkių vartojimo išlaidų, importo pokyčiams.