THE IMPACT OF THE TAX BURDEN ON ECONOMIC GROWTH: THE CASE OF EU COUNTRIES

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Abstract. We are aiming to evaluate the impact of the tax burden on economic growth in the EU 28 and also the lagging impact of the tax burden. The analysis is based on the multivariate regression model in the general country group as well as in the group of less developed countries of the EU, assessing the possible differences. The research results confirm the differences in impact in the analyzed country groups – the higher impact of the tax burden on the economic growth is identified in the group of less developed countries compared with the general group of the 28 EU countries.

Keywords: tax burden, economic growth, lagging effect, multivariate regression, European Union.

JEL Classification: H21, O47, O52.

Introduction

Economic growth is a continuous process that creates a basis for stability, the development of technological progress, and the improvement of quality of life. Economic growth in developed countries provides opportunities to achieve a higher standard of living and better economic and social conditions for the economic development. Developing countries aim to reduce the gap between them and developed countries and reduce poverty levels through economic growth. The growth in more developed EU economies (with more than 20 thousand euros of GDP per person on average between 1995–2019) was 1.5 percent, while in other EU countries it was 3.7%. Differences between countries with different levels of economic development also remained stable during the Covid-19 period, the decline in real GDP in more developed EU economies was sharper, it reached 6.1 percent, while in other EU countries it was 4.8 percent.

There were general economic slowdowns not only in the euro area but also worldwide. As the economy grows, the state's capacity to ensure the development increases through revenue collection in the budget. Tax revenue accounts for the largest share of each state's budget revenue: according to the European Commission, the tax burden in 2019 in the most developed countries of the European Union averaged 36 percent. The amount of tax revenue depends on the level of tax efficiency.

Studies have analysed the relationship between individual taxes and economic growth (Gurdal et al., 2021; Siami-Namini et al., 2018; Karlsson, 2020; Baiardi et al., 2019; Dackehag & Hansson, 2012; Worlu & Nkoro, 2012; Romer & Romer, 2010; Karras & Furceri, 2009) as well as how the tax structure affects economic growth rates (Yanikkaya & Turan, 2020; Luo, 2019; Tanchev, 2016; Bernardi, 2013; Canavire-Bacarreza et al., 2013; Szarowska, 2013; Arnold, 2008), and how the amount of tax revenue collected in state budgets affects economic growth (Andrašić et al., 2018; Takumah & Iyke, 2017; Mawejje & Francis Munyambonera, 2016; Paparas & Richter, 2015; Barro & Redlick, 2011). Research has shown that there is a link between the size of the tax burden and economic growth, however the results are ambiguous. Macek (2015), Canavire-Bacarreza et al. (2013), Bernardi (2013), Dackehag and Hasson (2012), Arnold (2008) argue that rising taxes are slowing economic growth. Ogbonna and Ebimobowei (2012), Cural and Çevik (2015), Tanchev

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(2016), Takumah and Iyke (2017), have investigated that rising taxes stimulate economic growth. Research on grouping countries by level of economic development also discusses the effect of the tax burden on economic growth. Victorova et al. (2020), Egbunike et al. (2018), Takumah and Iyke (2017), Sinevičienė (2016) found that the level of the tax burden in developing economies is lower than in developed countries. However, the research results obtained by McNabb and LeMay-Boucher (2014), Celikay (2020) contradict this view. It can be argued that the directionality of the effect of the tax burden on economic growth is a matter of debate.

Based on the studies analysed, our research aims to evaluate the reaction of the EU-28 economic growth on tax burden in the general group and in the group of less developed EU countries. Our research will therefore differ from previous studies as it aims to examine the effect of the tax burden on economic growth because usually the tax burden is usually analysed as a control variable. For in-depth analysis, the study includes the acceleration of the tax burden, which aims to determine how and at what pace the effect of the tax burden on economic growth is changing. It also analyses whether the tax burden has a lagged effect on economic growth. Studies use the lag in the tax burden in terms of economic growth as a general condition for designing the study, which does not seek to examine the magnitude and direction of the delayed effect of the tax burden.

The rest of the paper is organised as follows: Section 1 provides a theoretical background on the impact of tax burden on economic growth and how this impact differs in developed and developing countries. Section 2 presents the model, estimation strategy, and data, Section 3 discusses the main estimation results, and finally, in Section 4, we conclude presenting directions for further research.

1. Literature review

1.1. Tax burden impact on economic growth

In order to maximize the benefits of economic growth and minimize its costs, it is necessary to choose the right combination of growth factors to control and manage the process of economic growth. Researchers analyse the tax burden as one of the drivers of economic growth (Worlu & Nkoro, 2012; Bernardi, 2013; Szarowska, 2013; Canavire-Bacarreza et al., 2013; Paparas & Richter, 2015; Mawejje & Francis Munyambonera, 2016; Tanchev, 2016; Takumah and Iyke (2017). According to Aghion et al. (2018), not only economic but also social processes can be partially regulated through the tax system. Modern tax policies pursue a variety of policy objectives, and taxation not only to raise funds for government spending, but also contributes to income redistribution, economic stabilization, resource allocation, and at the same time promotes economic growth (Stoilova, 2017).

The impact of taxes on economic growth is examined from different perspectives. Laffer (2004) states that the tax burden influences economic growth; also the author discusses the directionality of this effect. Some researchers (Ormaechea & Morozumi, 2019; Elshani & Ahmeti, 2017; Tanchev, 2016; Cural & Çevik, 2015; Macek, 2015; Bernardi, 2013; Arnold, 2008; Widmalm, 2001) analyse the impact of individual taxes on the economy. Others (Egbunike et al., 2018; Takumah & Iyke, 2017; Dackehag & Hasson, 2012) evaluate the effect of the overall tax burden on economic growth. Previous research suggests two main streams of the analysis: (1) rising taxes are slowing economic growth (see Table 1); (2) there is a positive relationship between the tax burden and economic growth (see Table 2).

The analysed studies examined the groups of the EU, OECD, South America and other countries of the

Table 1. The negative impact of the tax burden on economic growth (source: composed by the authors)

Research by	Main results
Kaufmann et al. (2006)	Rising taxes are increasing the shadow economy, slowing the country's economy
Arnold (2008)	Real estate taxes are the least and personal income taxes are the biggest impediment to economic growth
Karras and Furceri (2009)	The impact of the tax increase on real GDP per capita is negative and long-term. Increased social security contributions or taxes on goods and services have a greater negative impact on output per capita than an increase in income tax
Dackehag and Hasson (2012)	Increasing the tax burden slows economic growth
Bernardi (2013)	Indirect taxes do not promote economic growth
Canavire-Bacarreza et al. (2013)	With the growth of the personal income tax burden, a slight slowdown in economic growth was observed
Macek (2015)	The ratio of personal income, corporate taxes, and social security contributions is slowing economic growth. The negative link between real estate tax and value added tax on economic growth has not been confirmed. An examination of the mutual comparison of the absolute effects of taxation on economic growth shows that corporate taxation is the main impediment to economic growth
Baiardi et al. (2019)	There is some evidence of a negative and statistically significant relationship between tax revenue and long-term economic growth

world, as well as individual countries during 1965–2014 period. This group of studies, regardless of the different data from the research, found that rising taxes are slowing economic growth. Kaufmann et al. (2006) indicate the shadow economy as the main reason for the increase in taxes.

Analysis of previous research reveals that the results contradict the findings of the first group of research (see Table 2).

Table 2. The positive impact of the tax burden on economic growth (source: composed by the authors)

Research by	Main results
Lee and Gordon (2005)	Strong inverse relationship between corporate tax rate and economic growth
Owolabi and Okwu (2011)	As the amount of tax revenue collected increases, the rate of economic growth has increased
Takumah and Iyke (2017)	There is a statistically significant positive impact of tax revenues on economic growth
Cural and Çevik (2015)	Rising direct tax rates have boosted economic growth
Tanchev (2016)	A progressive personal income tax system leads to faster economic growth rates
Egbunike et al. (2018)	There is a significant positive effect of tax revenue on the gross domestic product

A study by Szarowska (2013) found that, in the short run, there is a two-way causal link between changes in the indirect consumption tax rates and GDP growth. Empirical studies show that economically countries with higher public expenditure-to-GDP ratios are more successful.

When analysing the reaction of economic growth on the tax burden, the most common indicator of research is the indicator of the total tax burden. Paler et al. (2017) determined the structure and functions of the overall tax burden and, therefore, analysed tax burden as the main source of government revenue. Celikay (2020) points out that increasing public spending is the main reason for the increase in the overall tax burden. The link between the tax burden and economic growth depends on globalization processes, employment and the level of industrial production. The overall tax burden is important in determining the relationship between tax revenue collected and the economic growth, which may also be affected by other macroeconomic factors, as in principle both individual taxes and the overall tax burden are affected by the same macroeconomic factors. When studying the overall impact of taxes on GDP growth, it is appropriate to choose the overall tax burden rather than individual taxes. The overall tax burden indicator makes it possible to compare the tax systems of different countries and determine whether the revenue collected as a source of tax revenue is used optimally. Angelopoulos et al. (2019) show that in the countries analysed, increasing the tax

rates to the optimal level in order to increase the overall welfare of the country, the opposite results were obtained. The established optimal taxes have significantly reduced the average household income. The tax burden paid by low-income households grew the most.

According to the Economic Bulletin of the European Central Bank, the overall fiscal stance in the euro area will still be accommodative and will support economic growth. Over the next two years, the position will remain accommodative, driven mainly by further reductions in direct taxes and social security contributions in many of the largest euro area countries. With the deteriorating economic outlook and the still high risk of slower than expected growth, governments, which have a wider range of fiscal measures, can respond in a timely and effective manner. Governments in countries with high levels of public debt need to pursue prudent policies that allow automatic stabilization measures to operate freely. When evaluating the changing financial needs due to the Covid-19 pandemic, it is likely that the forecast may change in the future, due to the increased costs of managing this pandemic.

1.2. The tax burden in developed and developing countries

In order to investigate the relationship between the factors, the choice of the countries or groups of countries to be analysed is important, as the results obtained depend on the characteristics of the countries included in the present study. EU and OECD countries are the most frequently studied in previous research. Researchers (Victorova et al., 2020; Egbunike et al., 2018; Takumah & Iyke, 2017; Sinevičienė, 2016) analysing impact of the tax burden on economic growth in developed and less developed countries have found that the level of tax burden in developing economies is lower than in developed countries. Aydin and Esen (2019) found that in countries with different economic development, the level of tax burden varies significantly. In developed economies, the overall tax burden is 23 percent, and in developing economies it is 18.5 percent. Klemm and Van Parys (2012) explained this by the fact that developing economies have primitive tax bases (the current tax base is not extended by new taxes, there are no property and environmental taxes), which results in relatively much lower revenue collection than in developed economies (tax-to-GDP ratios range from 10 percent to 20 percent and in the economies of OECD countries it is 30–40 percent).

Çelikay (2018) found that the level of tax burden in countries with faster economic growth and a positive foreign trade balance is growing faster. A study by Ay and Haydanlı (2020) states that the overall tax efficiency and global tax burden of countries around the world are low, while tax systems in developing countries are only partially effective. As a result, governments are unable to collect enough taxes to finance economic development and growth. The level of the tax burden allows determining the level of development of the country (Skačkauskienė

& Valentinovič, 2016). Tax reforms that are expected to stimulate economic growth may have the opposite effect of a behavioural response to these tax reforms. For example, raising the level of personal income tax in developing countries has not led to significant changes in economic growth (McNabb & LeMay-Boucher, 2014). Improving the efficiency of the tax system may be ineffective for developing countries, where taxpayers can easily hide their incomes and operate in the shadow economy. Such a tax shift may lead to a reduction in tax revenues, which reduces the resources available for investment in basic public goods and may reduce overall economic growth (Perret et al., 2016). Ganghof and Genschel (2008) found that higher tax burden is associated with higher economic growth, but there is predominant empirical support for the hypothesis that higher taxes reduce growth (overall probability of 60 percent) when analysing marginal rather than average tax rates.

In summary, economic growth has different reaction on tac burden in developed and developing economies. The level of tax burden in developing economies is lower than in less developed countries (Victorova et al., 2020; Egbunike et al., 2018; Takumah & Iyke, 2017; Sinevičienė, 2016). Çelikay (2018) found that the level of the tax burden is growing faster in countries with faster GDP growth and a positive foreign trade balance, that is, the tax burden is higher in developed economies.

2. Model and data

EU-28 member states were selected for the assessment of the effect of the tax burden on economic growth. After analysing the theoretical aspects and taking into account the fact that two different opinions have been formed on the reaction of economic growth on the tax burden, we evaluate how the changes of the tax burden influence economic growth. To obtain more accurate results, the modelled environment must correspond to the macroeconomic environment, therefore other macroeconomic factors are included in the study (see Table 3). These factors were selected based on the results of the empirical research analysed in the theoretical part, evaluating the relationships between the variables and the economic growth factor identified in the research, and taking into account the availability of data. The model variables, depending on their units of measurement, are modified, i.e. logarithmized or differentiated to ensure homogeneity of regression data analysis. The research is based on Eurostat data of the EU-28 for the period 1995–2019, the period was determined by the availability of statistics. Balanced panel data was used in the study. Panel data contains more information, more variability, and more efficiency than time series data or cross-sectional data but it also has some limitations. One of the disadvantages of using panel data is that dynamic data belonging to the same object can be dependent. The study at least partially solves this problem using differences or log differences of the variables' values.

In our model, the dependent variable is economic growth; the most important independent variable, the effect of which will be investigated, is the tax burden. The model is complemented with control variables: economic openness, inflation, income inequality, foreign direct investment, government expenditure, and household consumption expenditure. In order to investigate how the effect of the tax burden on economic growth changes as the tax burden changes, a square of the tax burden is included in the model. In order to investigate how the impact of the tax burden on economic growth depends on country development level, we grouped EU countries by level of development. Victorova et al. (2020), Egbunike et al. (2018), Takumah and Iyke (2017), Sinevičienė (2016) The stronger impact has been found in less developed countries, and our study examines whether differences in the level of development have an impact of the tax burden on economic growth in the EU. To investigate the impact of the tax burden on EU economies with various economic development levels, we divided countries according to economic development into two groups. The group of more developed countries includes countries with an

Table 3. Model variables (source: composed by the authors)

Determinant	Variable	Units	Notation in model function
Economic growth	Real GDP per capita	EUR	GDP
Tax burden	Tax burden to GDP ratio	%	Tax_burden
Openness of the economy	Ratio of export and import to real GDP	%	Openness
Inflation	Percentage change in the consumer price index	%	Inflation
Income inequality	GINI coefficient	Coefficient	GINI
Foreign direct investment	Inflows of foreign direct investment	EUR	FDI
Public expenditure	Public expenditure	EUR	Public_expenditure
Household consumption	Household consumption	EUR	Consumption
Development level	Dummy variable	0 – countries with higher development level, 1 – countries with lower development level	Development

average GDP per capita in excess of 20 thousand euros in the period of 1995–2019 (Cyprus, Spain, Italy, France, Germany, Belgium, United Kingdom, Finland, Austria, Netherlands, Sweden, Ireland, Denmark, Luxembourg). The group of less developed countries includes countries with an average GDP per capita of less than 20 thousand euros in the period 1995–2019 (Bulgaria, Croatia, Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania, Slovakia, Slovenia).

We included a dummy variable where more developed economies are marked with 0 and less developed countries are marked with 1. The dummy variable will be used in Model 2. It aims to identify the effect of the tax burden on economic growth in a group of less developed economies, compared to more developed countries.

Based on the developed model, it is possible to evaluate the effect of the tax burden on economic growth in all EU-28 countries and in the group of EU economies with lower development level. It will also be assessed whether this effect is lagging behind. Therefore, three econometric models are developed. The first model identifies the reaction of economic growth on tax burden in the EU-28.

$$\Delta \ln GDP_{i,t} = \alpha + \theta_t + \beta_1 \Delta Tax\_burden_{i,t} +$$
$$\beta_2 \Delta Tax\_burden_{i,t}^2 + \beta_3 Inflation_{i,t} +$$
$$\beta_4 \Delta \ln Consumption_{i,t} + \beta_5 \Delta Openness_{i,t} +$$
$$\beta_6 \Delta Public\_\exp enditure_{i,t} +$$
$$\beta_7 \Delta \ln GINI_{i,t} + \beta_8 \Delta \ln FDI_{i,t} + td1997_9 + \ldots +$$
$$td2019_{30} + u_{i,t}. \qquad (1)$$

The second model allows us to measure the reaction of economic growth on tax burden in countries in the EU with lower development level (2 group). The model includes a dummy variable:

$$\Delta \ln GDP_{i,t} = \alpha + \theta_t + \beta_1 \Delta Tax\_burden_{i,t} +$$
$$\beta_2 \Delta Tax\_burden_{i,t}^2 + \beta_3 Inflation_{i,t} +$$
$$\beta_4 \Delta \ln Consumption_{i,t} + \beta_5 \Delta Openness_{i,t} +$$
$$\beta_6 \Delta \ln Public\_\exp enditure_{i,t} + \beta_7 \Delta \ln GINI_{i,t} +$$
$$\beta_8 \Delta \ln FDI_{i,t} + \beta_9 Development_{i,t} +$$
$$td1997_9 + \ldots + td2019_{30} + u_{i,t}. \qquad (2)$$

The third model includes variables that are lagged by one period, in order to examine the lagging effect of the tax burden on economic growth:

$$\Delta \ln GDP_{i,t} = \alpha + \theta_t + \beta_1 \Delta Tax\_burden_{i,t} +$$
$$\beta_2 \Delta Tax\_burden_{i,t-1} + \beta_3 \Delta Tax\_burden_{i,t}^2 + \beta_4 Inflation_{i,t} +$$
$$+ \beta_5 Inflation_{i,t-1} + \beta_6 \Delta \ln Consumption_{i,t} + \beta_7 \Delta \ln Consumption_{i,t-1}$$
$$+ \beta_8 \Delta Openness_{i,t} + \beta_9 \Delta Openness_{i,t-1} +$$
$$\beta_{10} \Delta \ln Public\_\exp enditure_{i,t} + \beta_{11} \Delta \ln Public\_\exp enditure_{i,t-1} +$$
$$\beta_{12} \Delta \ln GINI_{i,t} + \beta_{13} \Delta \ln GINI_{i,t-1} +$$
$$\beta_{14} \Delta \ln FDI_{i,t} + \beta_{15} \Delta \ln FDI_{i,t-1} + td1998_{10} + \ldots + td2019_{30} + u_{i,t}. \qquad (3)$$

By including the square of the tax burden in the model, it is possible to estimate the nonlinear relationship between the tax burden and economic growth. It is also possible to determine the turning point. Lagging variables are used to determine whether the reaction of economic growth occurs not in the same year.

The heteroskedasticity of the model was assessed using the Wald test, collinearity was determined based on SWF indices, and autocorrelation test was performed using the Wooldridge test.
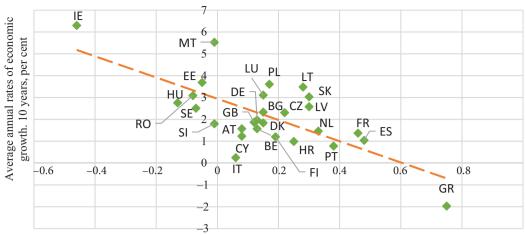
3. Results and discussion

The relationship between the tax burden and economic growth is examined before making calculations according to the developed research equation. The average data of the analysed year eliminates possible exceptions for some years and allows us to identify trends among the analysed factors. Figure 1 shows relationship between tax burden and economic growth in EU countries.

Greece is the only EU country with shrinking average economic growth rates (in a period of 2010–2019). This was due to the economic stagnation of 2010–2013 and 2015–2016 in the country, respectively, in that year the economy shrank by 5.48 %, 9.13 %, 7.30 %, 3.24 %, 0.44 % and 0.19%, reflecting the country's slow recovery after the crisis (in 2008) when Greece's deficit in 2009 reached 15.1% of GDP, Greece's fiscal balance has been steadily improving, and in 2017 it was achieved by 0.7 percent surplus of GDP It is also noted that in 7 EU countries (Ireland, Malta, Estonia, Hungary, Romania, Slovenia and Sweden), the tax burden was declining and they show rapid economic growth. However, with the exception of Ireland, the reduction in the tax burden is not very noticeable, ranging from 0.01 to 0.13%. These trends have been driven by country-wide reforms of tax systems, with a strong reduction in the tax burden in one year but an increase in the tax burden again in the following years. Data for the remaining 20 EU countries show that economic growth is declining and the tax burden increases. In countries where the tax burden has been declining, economic growth has been higher. Observing the general trends of changes in the indicators of the analysed countries, it can be stated that as the tax burden increases, economic growth slows down.

The results of the regression analysis (Equation (1); Equation (2)) are presented in Table 4.

It was found that the change in economic growth depends on the tax burden. The growth of the tax burden slows down the growth rate of the economy. Evaluating the EU-28 group, we found that a 1% increase in the tax burden slows economic growth by 0.61 %. The inclusion of the tax burden square in the model revealed diminishing rate of the tax burden impact on economic growth. With a 1% increase in the tax burden, the economic slowdown is declining by 0.017%. Although the increase in the tax burden slows down economic growth, when assessing the results of the tax square effect, we

Note: Country abbreviations in the Figure: Economies with higher development level (group 1): Cyprus-CY, Spain-ES, Italy-IT, France-FR, Germany-DE, Belgium-BE, Great Britain-GB, Finland-FI, Austria-AT, the Netherlands-NL, Sweden-SE, Ireland-IE, Denmark-DK, Luxembourg-LU; Economies with lower development level (group 2): Bulgaria-BG, Romania-RO, Poland-PL, Latvia-LV, Lithuania-LT, Croatia-HR, Hungary-HU, Estonia-EE, Slovakia-SK, Czech Republic-CZ, Portugal-PT, Malta-MT, Slovenia-SI, Greece-GR (source: composed by the authors).

Figure 1. Average 10-year rates of change in the tax burden compared to economic growth rates, per cent

can say that the slowing effect is becoming less and less pronounced. These results suggest that as the tax burden increases, the rate of economic decline decelerates over the analysed period, the tax burden further slows down, but when the tax burden changes, the change would turn positive and the tax burden would stimulate economic growth. More detailed research is needed to assess the direction in which the tax burden should change. However, based on the available results, it can be stated that the EU-28 has not reached the optimal level of taxation that would stimulate economic growth, but the level of tax burden is very close to the optimal level of taxation.

Evaluating the results in the EU economies with lower development level (2 group), a 1% increase in the tax burden slows economic growth by 0.59%. It can also be argued that, in the EU country group of lower development level economies, the growth of the tax burden has a stronger effect on the pace of economic slowdown, that is, the economy slows down faster. With a 1 percentage point increase in the tax burden, the economic slowdown is reduced by 0.018%. While comparing the data for the EU-28 group as a whole and the group of less developed EU countries, we do not notice a significant difference in the relationship between tax burden and economic growth.

When discussing other model variables, it can be stated that the change in economic growth also depends on household consumption expenditure and public sector expenditure (significant at the 1% level). The change in openness of the economy also leads to a change in economic growth (significant at the 5% level). Based on the results obtained, it can be stated that foreign direct investment, income inequality and inflation do not affect economic growth. A study of the general group of EU countries found that a 1% increase in household consumption expenditure accelerates economic growth by 0.03%. With the openness of the economy increasing by 1% point, economic growth increases slightly (0.04%). With a 1% increase in public spending, economic growth by 0.21%.

Table 4. Results of a multivariate regression analysis of the impact of the tax burden on economic growth (source: authors' calculations)

	EU 28 countries, Equation (1)	EU economies with lower development level, Equation (2)
Const	−0.0054	0.0022
$Tax\_burden_{i,t}$	−0.0061***	−0.0059***
$Tax\_burden^2_{i,t}$	−0.00017***	−0.00016***
$Consumption_{i,t}$	0.7037***	0.7458***
$Openness_{i,t}$	0.0004*	0.00052**
$FDI_{i,t}$	0.0005	0.00016
$Public\_expenditure_{i,t}$	0.2062***	0.2192***
$GINI_{i,t}$	−0.0191	−0.0312
$Inflation_{i,t}$	0.0003	0.0023**
$Development_{i,t}$		−0.00308

Note: *, **, and *** indicate statistically significant at the 10%, 5% and 1% levels, respectively.

In order to investigate whether the effect of the tax burden on economic growth is lagging, a model of multivariate regression analysis is developed, including delays of factors for one period in the model (Table 5).

Table 5. Results of a multivariate regression analysis of the impact of the tax burden on economic growth, including lagging variables (source: authors' calculations)

	EU 28 countries, Equation (3)
Const	0.0006
$Tax\_burden_{i,t}$	−0.0061***
$Tax\_burden_{i,t-1}$	0.0007
$Tax\_burden^2_{i,t}$	−0.00017***
$Consumption_{i,t}$	0.6370***
$Consumption_{i,t-1}$	−0.0939
$Openness_{i,t}$	0.0003
$Openness_{i,t-1}$	0.0003
$FDI_{i,t}$	−0.0002
$FDI_{i,t-1}$	−0.0006
$Public\_expenditure_{i,t}$	0.2375***
$Public\_expenditure_{i,t-1}$	−0.1446**
$GINI_{i,t}$	−0.0469
$GINI_{i,t-1}$	−0.0440
$Inflation_{i,t}$	−0.0008
$Inflation_{i,t-1}$	0.0007

Note: *, **, and *** indicate statistically significant at the 10%, 5% and 1% levels, respectively.

No statistically significant tax burden effect on economic growth has been identified in models that include one-year lag variables. In both cases, the change in economic growth was found to depend on the tax burden over the current period.

The analysis of the control variables revealed that the change in economic growth after one year is reflected in the increase in public expenditure. Inclusion of the one-year lag variable in the model shows that current growth is related to previous growth rates and accelerates by 0.31% annually. No other statistically significant relationship was found between economic growth and controlled variables.

In a more detailed analysis, seeking to determine the lagging effect of the tax burden on economic growth, more period delays were included in the model. The results obtained are presented in Table 6.

Including the delays in the 5-year tax burden, it can be seen that the strongest impact of the tax burden on economic growth occurs after 4 periods, with a 1 percentage point increase in the tax burden economic growth is slowed by 0.4%. The square of the tax burden shows that after 4 periods the rate of economic slowdown decreases by 0.05%. Based on the findings of the research, the lagging effect has been confirmed.

Conclusions

The results of the research confirmed that the growing tax burden is slowing economic growth. The results obtained were confirmed by Kaufmann et al. (2006), Dackehag and Hasson (2012), Canavire-Bacarreza et al. (2013), who prove that the growth of the tax burden slows the rate of economic growth.

The study does not confirm significant differences in impact between the formed groups, so they do not confirm the results of Çelikay (2018), Aydin and Esen (2019) and Ay and Haydanlı (2020). Aydin and Esen (2019) found that the level of tax burden varies significantly between groups of countries with different economic development. No significant differences were found in the groups of analysed countries, due to the slight differences at the level of development in the analysed country groups. Thus, it could be concluded that in the case of the European Union countries, the level of development is insignificant.

The results also confirm the significant lagging effect. The results of the study also coincided with the work of Comunale (2019) and Macek (2015), who identified significant lagging effect on economic growth.

The results of the research are useful in developing efficient tax systems and in shaping the tax policy strategy of countries. The results of the generalized empirical research are important because different data are used

Table 6. Impact of the tax burden on economic growth by including lagging variables (source: authors' calculations)

	Impact in the current year	Delay of 1 period	Delay of 2 periods	Delay of 3 periods	Delay of 4 periods	Delay of 5 periods
$Tax\_burden_{i,t}$	−0.0061***	0.0015	0.0071*	0.8143**	−0.0041***	−0.0018
$Tax\_burden^2_{i,t}$	−0.00017***	−0.00017***	−0.0002**	−0.0005***	−0.0005***	0.0099***

Note: *, **, and *** indicate statistically significant at the 10%, 5% and 1% levels, respectively.

for the analysis (different research period, countries or groups of countries are analysed). The results of the study do not confirm the significant uniqueness of the impact of the tax burden in the formed groups. The obtained results determine the need for work continuity by analysing the following aspects: drawing on factors that could explain the different effects of the tax burden on economic growth (factors determining the multiplier effect); determining the optimal level of tax burden for groups of countries or individual countries; evaluating the impact of the tax burden through its structure; increasing the sample of countries analysed or extending the survey period; performing analysis at the level of different economic sectors (households, business).

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Author contribution

Conceptualization, L. G., K. M., A. M. and D. R.; methodology, A. M. and D. R.; formal analysis, L. G.; resources, K. M.; data collection A. M, theoretical analysis, K. M.; writing – original draft preparation, L. G., K. M., A. M. and D. R.; writing – review and editing, L. G., K. M., A. M. and D. R.; visualization, L. G. and A. M. All authors have read and agreed on the published version of the manuscript.

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