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Macroeconomic Determinants of Effective Corporate Tax Rates: The Case of the Slovak Republic

Alena Andrejovská [1,2] and Jozef Glova [2,3,*]

[1] Department of Finance, Faculty of Economics, Technical University of Kosice, Nemcovej 32, 042 00 Kosice, Slovakia; alena.andrejovska@tuke.sk
[2] Department of Marketing, The Faculty of Management, Rzeszow University of Technology, al. Powstancow Warszawy 10, 35 959 Rzeszow, Poland
[3] Department of Banking and Investment, Faculty of Economics, Technical University of Kosice, Nemcovej 32, 042 00 Kosice, Slovakia
* Correspondence: jozef.glova@tuke.sk; Tel.: +421-55-602-32-78

Abstract: The effective corporate tax rate is a critical measure reflecting a nation's fiscal policy and its attractiveness to foreign investment. This study investigates the relationship between macroeconomic determinants and effective corporate tax rates, focusing on Slovakia's competitiveness within the European Union from 2004 to 2022. Using a panel regression model, the research identifies significant correlations between nominal tax rates, unemployment, government debt, and effective tax rates. Our findings reveal a consistent downward trend in both nominal and effective tax rates across EU member states, with Slovakia maintaining relatively lower effective tax rates compared to older EU members, thus enhancing its fiscal competitiveness. However, discrepancies persist among member states, influenced by differences in tax policies, enforcement, and exemptions. The study underscores the complex interplay between fiscal policies and macroeconomic conditions, highlighting the importance of aligning effective tax rates with broader economic goals. Policymakers are advised to consider reforms that balance tax competitiveness with fiscal sustainability, ensuring that effective tax rates reflect intended policy outcomes. This analysis offers valuable insights into tax policy dynamics within the EU and provides a framework for designing strategies to attract investment while maintaining economic stability.

Keywords: effective tax rates; tax competitiveness; macroeconomic determinants; foreign investors

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1. Introduction

The effective corporate tax rate is a crucial factor influencing the decision-making of foreign investors when selecting business locations, as it reflects the actual tax burden, encompassing depreciation policies, tax credits, and other incentives. Despite a shift in recent years from direct to indirect taxation, the effective corporate tax rate remains central to the overall tax burden on corporations. Adjustments to this rate can profoundly affect the business environment, potentially leading companies to relocate or adjust their operations. While reducing tax rates can enhance fairness and limit losses, excessive reductions may undermine the benefits of tax credits for specific companies.

In January 2024, a new EU regulation established a minimum effective tax rate of 15% for multinational corporations operating within its member states. This reform aims to modernize tax structures, ensuring fairness and stability while adapting to the demands

of a globalized and digital economy. Slovakia's geographical location, combined with its economic and political stability, labor productivity, EU membership, and the use of the Euro, makes it an attractive destination for foreign investors (Šikulová, 2015). However, questions remain regarding Slovakia's tax competitiveness compared to other EU countries. This study seeks to address this gap by examining the role of the effective corporate tax rate in shaping Slovakia's fiscal competitiveness.

This paper is organized as follows: Section 2 reviews the literature on tax competitiveness and its impact on investment decisions, emphasizing both nominal and effective tax rates in the EU. Section 3 outlines the methodology, detailing the panel data regression model used to analyze Slovakia's tax competitiveness from 2004 to 2022. Section 4 presents the analysis results, comparing Slovakia's effective tax rates with those of other EU countries. Section 5 discusses the implications of these findings for tax policy and investment strategies. Finally, Section 6 concludes with a summary of the study's insights and potential avenues for future research.

2. Literature Review

International tax competition is significantly influenced by the high mobility of capital globally. Foreign investors make decisions about where to locate their investments based on the tax environment, pressuring countries to reduce taxes on investment returns to maximize profits. This competition is primarily reflected in decreasing corporate tax rates as countries compete to attract foreign capital (OECD Data, 2022). Podviezko et al. (2019) claim that the increased tax competitiveness among EU member countries resulted from a decrease in tax rates following the entry of new member states (EU-13). Higher tax burdens may lead to the transfer of investments to countries offering more favorable tax environments (Asen & Bunn, 2019; Müller et al., 2020). Foreign investors often seek to relocate tax bases to jurisdictions with lower tax burdens, minimizing or even avoiding tax liabilities, while countries respond by gradually reducing rates to remain competitive.

Tax competitiveness can influence the investment environment, making it a critical factor in attracting foreign investors (Clausing, 2011; Glova, 2013; Víghová et al., 2023). Haufler and Stähler (2013) argue, however, that excessively low tax burdens do not always lead to favorable capital placement within a country. Conversely, without tax competitiveness, countries might excessively increase tax rates (Zeng & Peng, 2021). Some effects of tax competition, such as an improved economic efficiency, can be beneficial for the economy (Szarowská, 2012). Tax competitiveness is often linked to reduced effective tax rates, which countries use to attract foreign investors. According to Krogstrup (2004), international tax competition can only occur without political or technical restrictions on the cross-border movement of capital, as is the case in the enlarged EU, where capital moves freely.

The limitations of nominal tax rates as objective indicators for monitoring corporate taxation have led to the development of effective tax rates, which offer a better measure of the actual tax burden. Baker and McKenzie (1999) and Barrios et al. (2014) highlight the importance of effective tax rates, defined as the share of corporate tax liability divided by taxable income. Effective tax rates have become a crucial fiscal policy tool, sparking debates about their role in coordination and competition, as well as their impact on investment and economic growth (Delgado et al., 2018; Mihokova et al., 2018; Andrejovská et al., 2015). Research has shown that effective tax rates significantly affect investment strategies, resource allocation, and international tax competition (Bachas et al., 2023; Bicekova et al., 2015; Dyreng et al., 2017; Agarwal & Chakraborty, 2019). These studies emphasize that effective tax rates are pivotal in shaping corporate investment decisions and minimizing tax burdens.

The role of effective tax rates in tax competition is particularly evident in the EU, where lower statutory tax rates often attract substantial foreign investment, especially from non-EU investors. However, as Giannini and Maggiulli (2002) argue, the attractiveness to foreign investors is determined less by lower statutory rates and more by effective rates that realistically reflect the tax burden. Studies by Pomerleau and Cole (2017), Dhaliwal et al. (2015), and Davies et al. (2018) show that macroeconomic indicators, such as inflation, GDP, and unemployment, significantly influence corporate tax rates.

Previous research has extensively analyzed the relationship between tax rates and investment behavior, but few studies have specifically focused on Slovakia's fiscal competitiveness in the context of effective tax rates. This paper bridges that gap by providing a detailed analysis of the macroeconomic determinants of effective corporate tax rates in Slovakia, offering comparative insights from other EU member states. Unlike previous studies, which predominantly explore nominal rates, this research emphasizes the practical implications of effective tax rates and their nuanced impact on investment decisions. By employing a panel regression model and using data from 2004 to 2022, this study uniquely captures the evolving dynamics of tax competitiveness in Slovakia. Additionally, it provides policy recommendations tailored to the Slovak economic context, addressing both short-term investment incentives and long-term fiscal sustainability. This approach enhances the literature by offering actionable insights that policymakers and businesses can utilize to improve Slovakia's standing in the competitive EU tax landscape.

3. Methodology

The study aims to identify and evaluate the impact of selected determinants on the effective corporate tax rate and evaluate the Slovak Republic's tax competitiveness among EU member states. In the context of these goals, hypotheses were defined that serve as a starting point for empirical investigation. The paper is based on the following research question: Is the Slovak Republic fiscally competitive among EU member countries in the context of an effective corporate tax rate?

To address this research question, we propose the following three working subquestions:

- How have nominal and effective corporate tax rates in Slovakia evolved since 2004, and do they exhibit a downward trend?
- To what extent does the nominal tax rate serve as the most significant determinant in calculating the effective corporate tax rate?
- Is there a positive relationship between Slovakia's nominal corporate tax rate and its effective corporate tax rate?

Our analysis is based on a comprehensive set of annual data from the EU27 countries for the period 2004–2022. The countries under scrutiny are current EU member countries, including Austria (AT), Belgium (BE), Bulgaria (BG), Cyprus (CY), the Czech Republic (CZ), Germany (DE), Estonia (EE), Greece (EL), Spain (ES), Finland (FI), France (FR), Croatia (HR), Hungary (HU), Ireland (IE), Italy (IT), Lithuania (LT), Luxembourg (LU), Latvia (LV), Malta (MT), Netherlands (NL), Poland (PL), Portugal (PT), Romania (RO), Sweden (SE), Slovenia (SI), and Slovakia (SK). The data were meticulously drawn from the OECD, Eurostat, European Commission, ZEW, and the World Bank databases.

Our study builds on a number of empirical studies that have investigated the factors influencing effective tax rates in EU countries. The choice of indicators for our analysis was carefully considered, guided by the works of Andrejovská (2019), Dabla-Norris and Lima (2023), Puliková (2019), Saibu and Olatunbosun (2013), Wahyuningsih and Setyowaty (2020), Barro and Furman (2018), and Andrejovská and Andrejkovičova (2024).

These studies have analyzed the impact of macroeconomic determinants on effective tax rates, a crucial aspect of our research. They have shown that effective tax rates are

influenced by both the statutory level and macroeconomic indicators, thereby affecting the overall investment environment.

A regression model for the panel data was used to analyze the impact of selected factors on the effective tax rate. The estimated model's explained variable is the effective average tax rate (ETR) calculated by the Devereux/Griffith methodology in percentage terms (ZEW, 2022). Table 1 shows the explanatory variables' expected impact on the effective tax rate.

Table 1. Description and overview of variables.

Variable	Unit	Marking	Source	Description	Expected Impact
Response Variable					
Effective rate	%	ETR	European Commission, ZEW	Effective average tax rates of large corporations in the non-financial sector calculated using the Devereux/Griffith methodology.	x
Explanatory Variable					
Nominal rate	%	NOMIN	European Commission	The highest legal corporate income tax rates (including surcharges).	+
Corporate tax revenue	% HDP	REV	Eurostat, OECD	Taxes on corporate income or profits, including capital gains (as a percentage of GDP).	-
Gross Domestic Product per capita	Euros per inhabitant	GDP	Eurostat	The ratio of real GDP to the average population in a specific year at constant prices (year 2010).	-
Harmonized index of consumer prices	%	INF	World Bank	The harmonized index of consumer prices, intended for international comparison of consumer price inflation, is expressed as an annual average index and rate of change.	-
The level of government debt	% HDP	DEBT	World Bank	Government debt of a given country is expressed as a ratio to GDP.	+
Unemployment rate	%	UNEM	World Bank	Annual unemployment rate by gender (male and female) and age (15–74 years), measured as a percentage of the population in the labor force.	+

Source: own elaboration.

The estimated model, a key component of our research, was rigorously tested to ensure it met the basic assumptions applicable to this type of model. We tested the normality of residuals (Jarque–Bera test, Shapiro–Wilk test, Shapiro–Francia test), heteroskedasticity (Breusch–Pagan test), autocorrelation (Breusch-Godfrey test, Box–Ljung test, and Box–Pierce test), multicollinearity (VIF factor), and model specification (Ramsey RESET test). A variance–covariance matrix was used to eliminate the shortcomings of the estimated model. This thorough testing process was performed in the environment of the

RStudio program, ensuring the validity of our findings. The formulation of the model is as follows:

$$ETR_{i,t} = \beta_0 + \beta_1 NOMIN_{i,t} + \beta_2 GDP_{i,t} + \beta_3 INFL_{i,t} + \beta_4 REV_{i,t} + \beta_5 UNEM_{i,t} + \beta_6 DEBT_{i,t} + \varepsilon_{i,t}$$

where

β_0 is an intercept; $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6$ are regression coefficients; $\varepsilon_{i,t}$ is a random component; t is the period; and i is cross-sectional units (countries). The explained variable is the $ETR_{i,t}$, or average of the average effective tax rate of member country i in year t. Among the explanatory variables are *NOMIN* or the average nominal or statutory tax rate of member country i in year t; the variable *GDP* means the average gross domestic product of member country i in year t; *INF* is the inflation rate of member country i in year t; $REV_{i,t}$ represents the average corporate tax revenues of member country i in year t; *UNEM* is the average unemployment rate of member country i in year t; and *DEBT* is the level of government debt of member country i in year.

The selection of explanatory variables is grounded in established theoretical frameworks and empirical evidence to ensure the robustness of the analysis. The nominal tax rate (NOMIN) is a fundamental variable, as it directly impacts the effective tax rate and reflects the statutory fiscal policy, serving as a primary determinant of corporate tax burdens. The inclusion of the inflation rate (INF) is justified by its potential to influence the real value of corporate income and tax liabilities, which in turn affects the effective tax rate. Similarly, GDP per capita (GDP) is a critical indicator of a country's overall economic conditions, which can shape tax policy decisions and alter the effective tax burden. Additional variables, such as the unemployment rate (UNEM) and government debt (DEBT), are included based on their demonstrated significance in prior studies, which highlight their influence on fiscal policy and corporate tax strategies.

In this study, the β coefficients for the panel regression model were calculated using the RStudio 2024.04.01 Build 748 software, which provides robust tools for statistical analysis. The methodology, mathematical assumptions, and data processing were rigorously carried out to ensure validity. RStudio, a widely used integrated development environment for R, was employed for all statistical computations and data visualization, utilizing key R packages such as plm for panel data regression, lmtest for diagnostic tests, and sandwich for robust standard errors. The regression model was built on the assumptions of linearity, the independence of errors, homoscedasticity, the presence of no perfect multicollinearity, and the normality of residuals. Annual data from 2004 to 2022 for the EU-27 countries were sourced from reputable databases, including OECD, Eurostat, and the World Bank. Data were cleaned, imputed where feasible, and standardized to improve their interpretability. Panel data were structured into a balanced format, with each country representing a cross-sectional unit observed over multiple years. The fixed effects model, selected based on the Hausman test, was constructed. Diagnostic tests, including the Jarque–Bera and Shapiro–Wilk for normality, Breusch–Pagan and White for heteroskedasticity, Durbin–Watson and Breusch–Godfrey for autocorrelation, VIF for multicollinearity, and Ramsey RESET for model specification, confirmed the robustness of the model. The β coefficients were interpreted to assess the strength and direction of the relationship between explanatory variables and the effective tax rate, with robust standard errors enhancing reliability. This comprehensive methodology provides a clear framework for the calculation of β coefficients, ensuring the scientific rigor and credibility of the study's results.

The selection of variables in this study is grounded in their established impact on effective tax rates and their relevance to the broader research objective, which is to assess Slovakia's tax competitiveness in the context of EU member states. Nominal Tax Rate (NOMIN): The nominal tax rate is a key variable because it represents the statutory tax rate

that directly influences the effective tax rate. The relationship between the nominal and effective tax rates is often linear, as changes in the statutory tax rate can have an immediate impact on the tax burden faced by businesses. Previous studies have shown that nominal rates provide the baseline from which effective rates are derived, and thus any change in the nominal rate has significant implications for tax competitiveness. Gross Domestic Product per Capita (GDP): GDP per capita is included because it reflects the overall economic activity and prosperity of a country, which can influence tax policy decisions. Countries with a higher GDP per capita may have more sophisticated tax systems and can afford lower effective tax rates to attract investment. On the other hand, countries with a lower GDP per capita might rely on higher effective tax rates to generate necessary public revenues. Inflation Rate (INF): Inflation impacts the purchasing power of money and can indirectly affect corporate profitability and tax liabilities. High inflation may erode the real value of tax deductions and credits, thereby increasing the effective tax rate. Conversely, low inflation could stabilize or reduce the real tax burden on corporations.

Corporate Tax Revenue as a Percentage of GDP (REV): This variable reflects the share of corporate tax revenue in relation to the economy's size, indicating the economic burden of corporate taxes. A higher REV suggests a higher effective tax rate. Unemployment Rate (UNEM): The unemployment rate reflects economic conditions affecting the tax base. High unemployment can lead to lower economic activity and tax revenues, prompting governments to adjust effective tax rates to attract investment and stimulate growth. Government Debt as a Percentage of GDP (DEBT): Government debt impacts fiscal flexibility. Higher debt levels may require maintaining or increasing effective tax rates to service obligations, while lower debt allows for more competitive tax policies to attract foreign investment.

4. Regression Analysis of the Relationship Between ETR and the Investigated Determinants

The model selection was determined using the Hausman test, which compares the random effects and fixed effects models. The fixed effects model was selected based on the results, as it was more appropriate for the data at hand. The fixed effects approach assumes that individual country characteristics play a crucial role and must be accounted for to distinguish between the unique effects specific to each country. This method allows for controlling unobservable factors that vary across countries but remain constant over time. Additionally, the model incorporates the financial crisis as a fixed effect, enabling a more precise isolation and examination of its impact on the variables being analyzed.

After selecting the fixed effects model, it was subjected to several diagnostic tests to ensure its robustness and compliance with the assumptions of linear regression. These tests included the Jarque–Bera test to verify the normality of residuals, the Breusch–Pagan test to check for heteroskedasticity, the Durbin–Watson test to detect autocorrelation, the VIF (Variance Inflation Factor) to assess multicollinearity, and the Ramsey RESET test for model specification. The results of these tests are summarized in Table 2, confirming the validity and reliability of the model for further analysis. As we see in Table 2, the VIF level is moderate but may still be acceptable. We have checked correlation matrix and have considered the weak correlation with tax revenues (0.24), which suggests a limited but non-negligible relationship between nominal tax rates and tax revenue generation. However, other correlations, such as those with inflation (−0.16) and GDP growth (−0.087), indicate inverse and weak relationships, implying that higher nominal tax rates may not significantly hinder these economic indicators. Additionally, the correlations with unemployment (0.096) and country debt (0.17) are weak and suggest minimal direct influence of nominal rates on these macroeconomic variables.

Table 2. Results of diagnostic tests.

Test	Result	Interpretation
Durbin–Watson statistics	2.089267	Minimal presence of residual autocorrelation
Breusch–Pagan test	86.90 with p-value 9.73×10^{-7}	The presence of heteroscedasticity
Jarque–Bera test	p-value 2.20×10^{-16}	The data are not normally distributed
F-statistics	103.2752 with p-value 3.9×10^{-225}	Statistical significance of the model
Within R-squared	0.924265	Reliability of analytical findings
VIF factor		
Inflation rate	1.82	
Corporate tax revenue	6.61	
Nominal tax rate	9.29	
Unemployment rate	3.58	
Govern. Debt	4.53	
GDP	1.33	
Country	1.18	
Crisis	1.07	

Source: own elaboration.

The result of the Durbin–Watson statistic reached a value of 2.089267. This value is very close to the value of 2, which implies the minimal presence of autocorrelations with the residuals and underscores the robustness of our results. Furthermore, the F-statistic reaches a value of 103.2752 with an extremely low p-value of 3.9×10^{-225}, confirming our regression model's statistical significance. The model seems to be statistically significant (Within R-squared equals 0.924265) and adequately explains a significant part of the variability in the dependent variable, which greatly strengthens the credibility and relevance of our analytical findings. As can be seen, there was a heteroscedasticity problem in the estimated model (the p-value of the Breusch–Pagan test is less than 0.05).

The variation–covariance matrix with the White 1 argument was used to remove the model's shortcomings. After removing the model's imperfections one receives estimates of the regression model's results, which are visible in Table 3. The estimated model using the variation–covariance matrix can be considered to be robust.

Table 3. Panel regression outputs—effective tax rate.

	Coefficient	Std. Error	t-Ratio	p-Value	
Intercept	20.5746	0.66515	30.93	<0.0001	***
Inflation rate	0.04290	0.04566	0.9395	0.3480	
Corporate tax revenue	−0.00512	0.01804	−0.2835	0.7769	
Nominal tax rate	0.86110	0.01486	57.96	<0.0001	***
Unemployment rate	0.08491	0.03217	2.639	0.0086	***
Government debt	−0.02271	0.00337	−6.744	<0.0001	***
GDP	−0.00306	0.03546	−0.08638	0.9312	

Table 3. *Cont.*

	Coefficient	Std. Error	t-Ratio	*p*-Value	
Country					
AT	1.99221	0.58097	2.174	0.0302	**
BE	1.20685	0.62087	0.7690	0.4423	
BG	−3.23782	0.64810	−6.121	<0.0001	***
CY	−0.87488	0.58394	−2.747	0.0062	***
CZ	−0.51738	0.66505	−1.875	0.0615	*
DE	1.83916	0.58986	1.881	0.0606	*
DK	5.32946	0.55397	8.304	<0.0001	***
HR	−2.69745	0.54426	−6.296	<0.0001	***
EE	9.55852	0.55706	15.85	<0.0001	***
ES	8.08170	0.66210	11.10	<0.0001	***
FI	2.25082	0.50000	3.043	0.0025	***
FR	2.12508	0.53372	2.615	0.0092	***
GR	−2.39598	0.78714	−3.971	<0.0001	***
HU	−0.63791	0.58904	−2.321	0.0207	**
IT	1.29821	0.61426	0.9260	0.3549	
IE	−0.17633	0.60738	−0.9105	0.3630	
LV	−1.71810	0.53821	−4.547	<0.0001	***
LU	−2.13194	0.52537	−5.446	<0.0001	***
LT	2.77824	0.50148	4.086	<0.0001	***
ML	3.34313	0.55087	4.745	<0.0001	***
NL	1.90874	0.47799	2.467	0.0140	**
PO	−0.31110	0.51565	−2.018	0.0442	**
PT	−0.53768	0.55935	−0.3427	0.7320	
RO	−1.06096	0.55188	−3.244	0.0013	***
SE	0.72938	0.50876	−1.434	0.1524	
SI	−0.40222	0.49443	−2.289	0.0226	**
SK	Reference country				
Crisis					
Crisis (no)	0.25024	0.34836	0.7183	0.4729	
Crisis (yes)					

Source: own elaboration.

Table 3 contains the outputs of the panel regression for the period 2004–2022. The results show that the nominal tax rate, unemployment rate, and government debt have a statistically significant impact on the effective average tax rate.

An increase in the nominal rate is associated with an increase in the effective tax rate. Thus, the regression analysis provides empirical evidence of a direct and positively correlated effect of changes in the nominal rate on the effective tax rate, which confirms the hypothesis of a significant linear relationship between these two tax indicators.

The unemployment rate is associated with an increase in the effective tax rate. That correlation value confirms the assumption that a positive and statistically significant linear relationship exists between unemployment and effective tax rates. This empirical evidence suggests that economic conditions such as unemployment directly impact tax burdens, which has important implications for tax policy and economic planning.

The results also suggest that the accumulation of government debt tends to be associated with a decline in the effective tax rate, suggesting that government borrowing may have a complex effect on tax revenue and tax policy. This result is important for formulating tax policy because it suggests a negative linear relationship between the amount of government debt and the effective tax rate.

The variables inflation rate, corporate tax revenue, and GDP recorded *p*-values below the significance level, indicating their impact on the effective average tax rate is insignificant.

The estimated model was subsequently tested to see if it meets the basic assumptions for this type of model. The result of the Durbin–Watson statistic reached a value of 2.089267. This value is very close to the value of 2, which implies the minimal presence of an autocorrelation in the residuals and indicates the robustness of our results. Furthermore, the F-statistic reaches a value of 103.2752 with an extremely low p-value of 3.9×10^{-225}, confirming our regression model's statistical significance. The coefficient of determination Within R-squared, which reaches a value of 0.924265, effectively demonstrates that our model adequately explains a significant part of the variability of the dependent variable, which greatly strengthens the credibility and relevance of our analytical findings.

Based on the results of the panel analysis, it can be concluded that the countries with a higher effective tax rate compared to Slovakia include Austria (1.992209), Belgium (1.206854), Germany (1.839159), Denmark (5.329459), Estonia (9.558519), Finland (2.250819), France (2.125079), Italy (1.298214), Netherlands (1.908739), Lithuania (2.778239), Malta (3.343129), Sweden (0.729379), and Spain (8.081699). On average, these countries have a higher effective tax rate than Slovakia, with the coefficients indicating differences ranging from 1.298214 (Italy) to 9.558519 (Estonia). The statistical significance ($p < 0.05$) of these differences indicates that the effective tax rates are significantly higher in these countries than in Slovakia. The exceptions are Germany and the Netherlands, where the p-values are close to the statistical significance threshold, indicating the possible variability of these findings.

Significantly, when compared to Slovakia, countries such as Bulgaria (3.237821), Cyprus (0.874881), Czech Republic (0.517381), Croatia (2.697451), Greece (2.395981), Hungary (0.637911), Ireland (0.176333), and Latvia show a lower effective tax rate (1.718101), Luxembourg (2.131941), Poland (0.311091), Portugal (0.53768), Romania (1.060961), and Slovenia (0.402221) have a lower effective tax rate than Slovakia, with coefficients ranging from -0.176333 (Ireland) to -3.237821 (Bulgaria). The significant p-values ($p < 0.05$) confirm that these differences are statistically significant, meaning that these countries have significantly lower effective tax rates than Slovakia. However, the Czech Republic and Poland are on the border of statistical significance.

The results also point to countries whose average effective tax rate does not differ statistically significantly from Slovakia's. These countries include Belgium, Italy, Ireland, and Portugal, representing countries where the differences in effective tax rates compared to Slovakia are not statistically significant. Even though there are certain differences in the levels of the tax burden, these differences do not exceed the threshold of statistical significance. Given that the statistical analysis did not confirm the significance of the differences, this may indicate similarities in the economic structures or tax bases of these countries in relation to Slovakia. This insight is crucial for formulating tax or economic policies, as it underscores the potential implications for economic strategies and the importance of considering that observed differences do not necessarily reflect fundamental differences in tax systems, thereby emphasizing the necessity of careful policy formulation.

Furthermore, Estonia and Spain show significantly higher effective tax rates than Slovakia, which may indicate specific tax policies or economic conditions that lead to a higher tax burden on corporations. Bulgaria and Greece, on the other hand, are countries with significantly lower effective tax rates. We can attribute this to tax incentives or lower tax rates from targeted tax measures or the broader fiscal framework. These differences may also reflect the different economic strategies these countries apply to promote economic growth, investment and competitiveness in the international market. In the case of Bulgaria and Greece, these lower effective tax rates could reflect efforts to attract foreign investment or support domestic businesses through tax breaks and incentives. Conversely, the high effective tax rates in Estonia and Spain point to a potentially higher tax burden on corpo-

rations, which may be motivated by efforts to secure sufficient public revenue to finance state services and infrastructure. These differences in the tax burden reflect the complex interaction between tax policies, economic objectives, and socioeconomic conditions in individual EU member states and their potential impact on the competitiveness of the international market.

5. Results and Discussion

In this section, we summarize the key trends in the nominal and effective tax rates across the EU from 2004 to 2022, focusing on significant patterns rather than individual country rates. A notable trend is the gradual convergence of tax policies within the EU, where several countries have reduced nominal rates while broadening the tax base. This has narrowed the gap between the nominal and effective tax rates in many member states, though differences persist, particularly between Western and Central/Eastern European countries. These variations stem from differences in enforcement and the application of deductions. Figure 1 illustrates the development of nominal and effective corporate tax rates in EU countries over this period, highlighting the systematic decrease in the average nominal tax rates from 26.5% to 21.4% and in the effective tax rates from 24.5% to 19.4%, where each of the plots shows a line chart representing mean value and error bars representing the range (min. and max. values). This downward trend, characterized by minor fluctuations, reflects efforts to enhance tax competitiveness and support economic activity. Additionally, the narrowing gap between nominal and effective rates suggests greater tax system efficiency, with implications for tax planning and policy formulation.

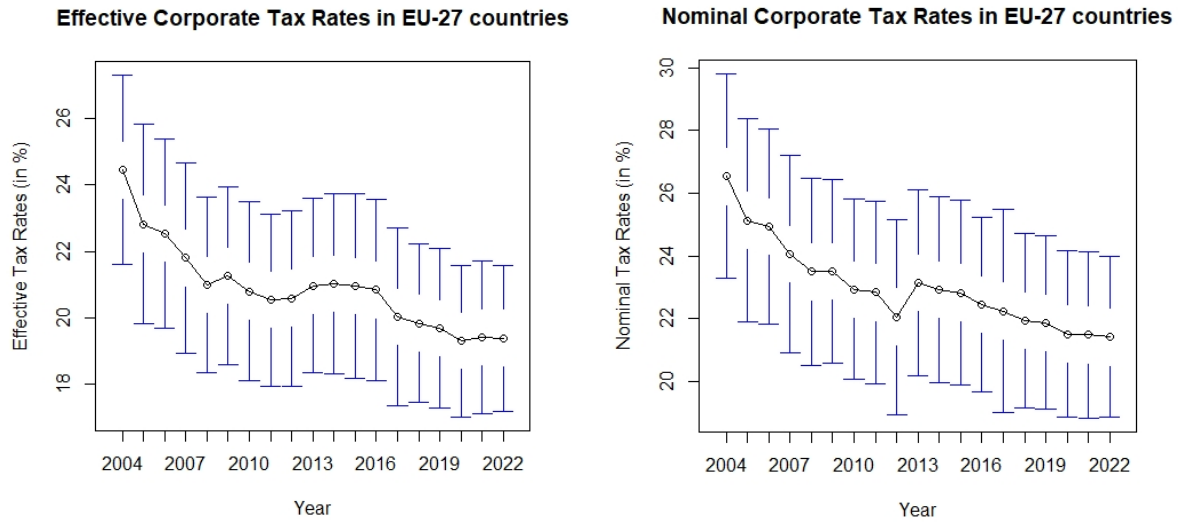

Figure 1. Effective corporate tax rates (**left**) and nominal corporate tax rates (**right**) in EU-27 countries in the period 2004–2022. Source: own elaboration.

One of the countries that has had an unchanged statutory tax rate since the beginning of the monitored period is Malta. The level of the rate is 35%, and is the highest rate compared to Poland and Ireland, which also did not change their tax rates during the monitored years. Other countries that can be included in the group with a long-term stable nominal tax rate are Austria, whose rate has been 25% since 2005, and Romania, whose rate was also changed in 2005 from 25% to 16%. Hungary has the lowest statutory tax rate of all of the European Union countries at 9%. This change occurred in 2017 when it was reduced by over 50% from the original rate of 19% to the 9% mentioned above. The reason for such a change was the Hungarian government's efforts to improve the business sector and motivate foreign investors. The second country with the lowest nominal tax rate is

Bulgaria, namely 10%. Cyprus is another country that we can classify in the group with lower tax rates compared to other countries. Until the end of 2012, it had a 10% tax rate, but from 2013, it changed to 12.5%.

On the contrary, France has the highest statutory tax rate. Its rate has been above 30% since 2004, and it had the highest tax rate of all the countries we selected, up to 44.4% in 2017. In countries such as Germany, France, Belgium, Spain, Italy, and Luxembourg, nominal tax rates ranged up to 35%, which have reduced to below 30% over the years. Portugal, which we include among the countries with high rates, kept them the same over the years. In the case of the Slovak Republic, since joining the European Union, there have been several changes in nominal tax rates. A significant jump from 19% to 23% occurred in 2013; then, in the years 2014 to 2016, the rate remained at the level of 22%, and since 2017, the rate has remained at 19%. During the monitored period for the Czech Republic, we can see a downward trend in the development of the nominal tax. In 2004, the rate was 28%; the next year, it fell to 26% and gradually to 24%. Since 2010, the rate has been stabilized at the current level of 19%. As mentioned earlier, the reduction in tax rates was supposed to lead to a reduction in tax evasion in the country and to attract new investors, which was supposed to lead to an improvement in the business environment.

Greece has undergone various changes in their statutory tax rates since the beginning of the monitored period, which we have set as 2004 for the purpose of this analysis. In 2004, its rate was 35%; for the last three years, the country has maintained its statutory tax rate for corporate taxation at 24%.

Most EU countries had a downward trend in their nominal tax rates between 2004 and 2022, except four countries such as Cyprus, Lithuania, Portugal, and Slovakia, of which Lithuania only increased the long-term 15% rate by 5 p.p. in 2018 to the level of 20%.

The largest difference between the nominal and effective tax rates was recorded in Greece with a difference of up to 13.2%, and in France in 2017, of 11 percentage points. The country with the third largest difference between these rates is Portugal, where the effective rate is lower than the nominal rate by 10.1 percentage points. The smallest differences were recorded in Belgium, Finland, and Hungary. The countries whose effective tax rate increased during the monitored period were the Slovak Republic and Lithuania. From the average of the European Union member countries, this rate has been decreasing since 2004. The analysis of effective corporate tax rates in Slovakia compared to the average of the European Union member countries from 2004 to 2022 reveals several key trends. Slovakia shows significant stability in its effective tax rates. After a small increase between 2013 and 2016, the tax rates returned to the level of previous years and remained stable at 18.7%. Compared to the average tax rates of EU member countries, the Slovak rates consistently lag behind the average. This difference may indicate that Slovakia has relatively more competitive tax conditions, attracting businesses and investors looking for more favorable tax regimes. The analysis shows that Slovakia maintains its tax attractiveness thanks to having lower rates than other EU member states, which can contribute to the inflow of foreign investments. This tax policy can be a significant factor in deciding the location for new businesses or expanding existing businesses.

Interestingly, in some cases, the effective tax rates were lower than the nominal rates, with the exceptions being countries such as Spain, Hungary, Cyprus, and Ireland. All member states' average effective tax rate fell from 24.5% in 2004 to 19.4% in 2022, which indicates a gradual reduction in corporate taxation within the European Union. This analysis points to the gradual reduction in differences between the old and new member states, signaling the convergence of tax policies and the harmonization of economic strategies within the European Union. The trend towards reducing effective corporate tax rates aligns with global trends aimed at increasing competitiveness and attracting foreign

investment. Slovakia is included among the new member countries, which, as already said, are characterized by a lower tax burden and are therefore more tax competitive than the old member countries (Kubátová, 2011; Crabbé & Vandenbussche, 2009; Mihokova et al., 2016). Based on this, we assume Slovakia will be an interesting country for investors to place capital, particularly those from old member countries. Arachi and Biagi (2005), Arulampalam et al. (2012), Schwellnus and Arnold (2008), and Arnold et al. (2011) state that large countries, i.e., old member countries such as Germany, Spain, or France, maintain significantly higher effective tax rates, which negatively reflects on their competitiveness. Even though the analysis carried out by us speaks of the shrinking differences between the old and new member states, it indicates a more effective integration and coordination of tax policies at the EU level, which thus contribute to creating equal conditions for businesses within the single market. The development of effective corporate tax rates in the member states of the European Union thus reflects broader economic and political trends, which will be the basis for future decisions on tax policy. The urgency and necessity of adaptability and strategic planning in tax regimes are underscored, as these will be key to maintaining the EU's economic vitality and competitiveness in the coming years.

6. Summary

Furthermore, we devoted ourselves to examining the relationships between various macroeconomic variables and corporations' effective tax rates in the analysis. A fundamental finding is the confirmation of the direct and positive impact of the nominal tax rate on the effective tax rate, which is supported by statistically significant results ($p < 0.0001$). For more details, see Table 4.

Table 4. Comparison of analysis results.

Variable	Our Expectations	Analysis Results
NOMIN	Positive	Positive
GDP	Negative	Negative
INFL	Negative	Negative
REV	Negative	Negative
DEBT	Positive	Positive
UNEM	Positive	Positive

Source: own elaboration.

At the end of the study, we used the panel regression method to examine the distribution of effective tax rates between the European Union member states and the Slovak Republic. Based on the analysis results, we divided the countries according to the amount of their effective tax rate compared to Slovakia. This approach allowed us to determine how the tax burden differed within individual member states. It provided an important comparison that can serve as a basis for further political and economic decisions in tax policy.

According to the effective tax rate, the European Union and the Slovak Republic (Table 5) were divided into four groups: The first is countries with a higher effective tax rate than Slovakia. The second group comprises countries with a lower effective tax rate than the Slovak Republic. Further, we divided the countries based on differences which are statistically insignificant in the analysis, and the last group consisted of interesting observations where we included the countries of Estonia, Spain, Bulgaria, and Greece.

Table 5. Distribution of the EU countries according to the effective tax rates.

Countries with a higher effective tax rate than the Slovak Republic	Austria, Belgium, Germany, Denmark, Estonia, Finland, France, Italy, Netherlands, Lithuania, Malta, Spain, Sweden
Countries with a lower effective tax rate than the Slovak Republic	Bulgaria, Cyprus, Czech Republic, Croatia, Greece, Hungary, Latvia, Luxembourg, Poland, Romania, Slovakia
Statistically insignificant differences	Belgium, Italy, Ireland, Portugal
Interesting observations	Estonia and Spain, Bulgaria and Greece

Source: own elaboration.

The analysis reveals statistically significant differences in effective tax rates among various European Union countries. These disparities point to a divergence in tax policies and their potential impact on economic decision-making and competitiveness. The findings offer valuable insights for governments and the business community, empowering them to devise effective tax policies and strategies at the international level.

The analysis results confirm that both nominal and effective tax rates have been on a downward trend since 2004 (answer to the first sub-question). This finding is consistent with previous studies (Fullerton, 1984; Feldstein et al., 1983; Uemura, 2023; Pomerleau & Cole, 2017), further validating our research. The answer to the second working sub-question suggests that the nominal tax rate is the most influential variable in calculating the effective corporate tax rate, is firmly rooted in theory (Desai & Hines, 2003). This theory posits that the statutory tax rate should directly and significantly impact the resulting effective tax rate, reflecting the actual tax burden on businesses. Understanding this relationship is crucial for grasping how tax rates translate into real economic burdens on corporations and how corporations can adapt to changes in tax policy. To answer the third working sub-question we extended our analysis by assuming a direct positive relationship between the nominal and effective tax rates. This means that any increase in the nominal tax rate should lead to a proportional increase in the effective tax rate, implying that higher legislative tax rates directly increase the tax burden on corporations. This relationship is critical for evaluating the effectiveness of tax policies. The panel regression results clearly show that the nominal tax rate is a significant indicator of the effective corporate tax rate, confirming our third hypothesis. The coefficient for the nominal tax rate significantly exceeds the coefficients of the other examined macroeconomic variables, which points to its central position in the model of the effective tax burden. The given results do not agree with the claims of Schwellnus and Arnold (2008), Arnold et al. (2011), and Abbas and Klemm (2013), who talk about the negative relationship between these two rates.

In examining the relationship between nominal and effective tax rates, the results of our analysis demonstrate several key trends that align with the existing body of literature on fiscal policy and tax competitiveness. Numerous studies have highlighted the gradual reduction of nominal tax rates across EU countries as a means of fostering fiscal competitiveness, particularly in response to global economic pressures and the financial crisis of 2008. Our findings corroborate these conclusions, showing that many countries have reduced their nominal tax rates over time to attract foreign direct investment (FDI) and stimulate economic growth.

However, as supported by previous research, we observe that while nominal rates have generally declined, effective tax rates have shown more variability, shaped by differences in tax enforcement, exemptions, and deductions. This aligns with studies by scholars such as Devereux and Griffith (2003), who point out that tax policy changes do not always lead

to parallel shifts in actual tax burdens due to the complex interplay between statutory tax rates and their implementation. Our results suggest that this divergence between nominal and effective rates continues to be an important factor in understanding the real fiscal impact of tax policies.

In terms of practical implications, these results offer valuable insights for policymakers. The observed trends emphasize the importance of not only setting competitive nominal tax rates but also ensuring that the effective rates reflect the intended fiscal policy outcomes. For instance, while lower nominal rates may signal a pro-business environment, if the effective rates remain high due to loopholes or inefficiencies in tax enforcement, the intended benefits of these reforms may not materialize. This is particularly relevant in the context of fiscal sustainability. Our findings suggest that aggressive reductions in nominal tax rates, without corresponding reforms to broaden the tax base or improve tax collection, could undermine long-term fiscal stability, a conclusion also reached in studies by Arnold et al. (2011).

Additionally, the results highlight the varied impact of tax policy changes across different EU member states. As noted in previous sections, countries with more robust economies, such as Germany and France, have been able to maintain relatively stable effective tax rates, balancing competitiveness with fiscal sustainability. On the other hand, several Eastern European countries have focused on nominal rate reductions as a tool to attract investment, sometimes at the expense of fiscal sustainability. This divergence is supported by existing literature that emphasizes the role of country-specific economic and institutional factors in shaping the outcomes of tax reforms.

In practice, these findings suggest that policymakers should consider both short-term competitiveness and long-term fiscal health when designing tax policies. Countries that prioritize lowering nominal rates as a quick fix for economic challenges may experience short-term gains but could face fiscal imbalances in the long run if the effective rates do not support sufficient revenue generation. Moreover, aligning nominal and effective rates more closely through transparent tax policies and efficient administration could enhance the overall credibility and sustainability of fiscal strategies.

In conclusion, our results not only align with the broader literature on tax policy and competitiveness but also offer practical insights for shaping future fiscal policies. Policymakers must weigh the trade-offs between fostering a competitive tax environment and ensuring long-term fiscal sustainability, and our findings provide a data-driven basis for informing these decisions.

7. Conclusions

This study aimed to explore the relationship between nominal and effective tax rates across EU countries and assess their influence on fiscal competitiveness. Key findings highlight a growing divergence between nominal and effective tax rates, driven by differences in tax enforcement, exemptions, and deductions among member states. While this aligns with existing literature, some discrepancies, such as the negative correlation between nominal and effective rates in certain studies, warrant further investigation.

The findings reveal that country-specific economic conditions and fiscal policies significantly shape this relationship. Advanced economies with robust tax enforcement, such as Germany, display a more stable alignment between nominal and effective rates. In contrast, Eastern European countries that aggressively reduce nominal rates to attract investment often experience wider gaps due to weaker enforcement and prevalent tax incentives. These results underscore the importance of considering institutional and economic contexts when analyzing fiscal outcomes.

Based on these findings, the following recommendations are proposed:

- Broadening the Tax Base: Reforms should focus on reducing tax exemptions and deductions to ensure effective tax rates align with nominal rates, supporting sufficient revenue generation for public services and infrastructure.
- Strengthening Tax Enforcement: Enhancing the capacity of tax authorities through technology, improved compliance monitoring, and reducing opportunities for tax evasion can help narrow the gap between nominal and effective rates.
- Balancing Competitiveness and Fiscal Stability: Policymakers should avoid aggressive nominal rate reductions without addressing effective tax burdens. A balanced approach combining rate reductions with revenue-enhancing reforms ensures long-term sustainability.
- Fostering EU Cooperation: Stronger coordination on tax policies, including harmonizing effective tax rates, can prevent harmful tax competition and foster fiscal stability across member states.

This study has several limitations. It relies on aggregate data, which may not fully capture local tax policies or political dynamics. Future research could include more granular, country-specific analyses and extend the timeframe beyond 2022 to explore the impact of post-pandemic recovery and ongoing energy crises. Additionally, investigating demographic shifts, environmental taxes, and digital economies may provide deeper insights into fiscal competitiveness.

This study contributes to our understanding of the EU's fiscal competitiveness by illuminating the intricate relationship between nominal and effective tax rates. Policymakers must adopt a holistic approach that balances competitive tax rates with fiscal sustainability. By addressing the gaps identified in this research and implementing the recommended policy changes, countries can foster stable and equitable tax environments that support economic growth and fiscal health.

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