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Impact of Macroeconomic Factors on the Performance of EU27 Firms

Abstract

Research background and purpose: This research explores the moderating role of macroeconomic factors such as unemployment and GDP per capita in the relationship between corporate tax rates and firm performance, offering a deeper understanding of these complex interactions within the context of the EU27. Corporate taxation is a critical factor shaping firm performance, yet its interaction with broader macroeconomic conditions—such as GDP, unemployment, and inflation—remains largely unexplored. This study addresses this gap by examining how corporate tax rates impact firm performance in the EU27, with a specific focus on the moderating role of macroeconomic factors.

Design/methodology/approach: Using a robust quantitative approach and data from the Orbis database, the study applies robust regression models to account for non-normal distributions and outliers, ensuring reliable results.

Findings: The findings challenge conventional assumptions, revealing that corporate tax rates alone do not have a significant impact on firm performance. However, GDP per capita and unemployment rates emerge as key drivers, with unemployment directly influencing performance and moderating the relationship between tax rates and profitability. Interestingly, inflation's impact is minimal.

Value added and limitations: This research provides new insights into the complex relationship between taxation and macroeconomic conditions, with practical implications for policymakers. However, the study is limited by its reliance on cross-sectional data, suggesting that future research incorporating longitudinal data could provide a more dynamic understanding of these relationships over time.

Keywords: *firm performance, unemployment rate, corporate taxation, macroeconomic factors, inflation impact*

JEL Classification: H25, E60, L25

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1. Introduction

The relationship between corporate taxation, macroeconomic factors, and firm-level performance has become a focal point of economic policy discussions in the European Union (EU). This article seeks to prove how corporate income tax rates, along with key macroeconomic factors such as GDP per capita, unemployment rates, and inflation, affect the performance of firms within the EU27. While previous research has shown that tax rates and macroeconomic conditions can influence business outcomes, studies often focus on individual countries or fail to integrate multiple macroeconomic variables. Furthermore, the extent to which these factors impact firm performance across the diverse economies of the EU27, with varying corporate tax rates and economic conditions, remains inadequately explored. This study addresses this gap by focusing on a dataset of 20 top companies from each EU country, utilizing financial indicators such as operating revenue, profit margin, return on assets (ROA), and total assets in 2022.

The primary research question guiding this study is: How do corporate income tax rates and macroeconomic factors (GDP per capita, unemployment, and inflation) impact the performance of firms in the EU27 in specified period? This question arises from the need to better understand the dynamics of firm performance in the context of varying economic and policy environments across the EU. While corporate taxation has been extensively studied in the context of firm decisions, much less is known about how it interacts with broader macroeconomic conditions such as unemployment or inflation.

From the existing literature, several hypotheses can be derived. First, it is hypothesized that higher corporate tax rates are negatively associated with firm performance, particularly with lower profit margins and return on assets. Previous studies suggest that high tax burdens can limit companies' ability to reinvest profits and grow. Second, the literature suggests that a higher GDP per capita is correlated with better firm performance, as wealthier economies tend to support more robust business environments and higher consumer demand. Third, unemployment rates are likely to have a negative effect on firm performance, as higher unemployment can reduce overall economic activity, leading to lower sales and profitability. Additionally, inflation is expected to exert a negative effect on company performance, as it increases operational costs and reduces purchasing power. Last hypothesis posits that the relationship between corporate income tax rates and firm performance is moderated by macroeconomic factors such as GDP per capita, unemployment rate, and inflation rate. This suggests that the impact of tax rates on performance may be influenced by the broader economic environment, with stronger or weaker effects depending on macroeconomic conditions. These hypotheses are based on a review of the existing economic theories and empirical evidence on the links between

taxation, economic conditions, and firm outcomes, which will be discussed in more detail in the literature review section.

After this introduction follows the literature review, which examines the current body of research on corporate taxation, macroeconomic factors, and firm performance, identifying the theoretical and empirical foundations for the hypotheses. The methods section outlines the data sources, the sample of companies used for the analysis, and the statistical methods employed to test the hypotheses. The results section presents the findings of the analysis, and the discussion interprets these results in the context of the research hypotheses and existing literature. Finally, the conclusion summarizes the key insights, offers policy recommendations, and suggests directions for future research in this area.

2. Literature review

Corporate tax rates are widely believed to negatively impact firm profitability, particularly through lower profit margins and ROA. Studies consistently support this view. Lazăr and Istrate (2018) find that a higher firm-specific tax rate leads to a reduction in return on assets, limiting reinvestment opportunities. Tennant and Tracey (2018) further confirm that increased tax scrutiny via large taxpayer units results in lower pre-tax profit margins, demonstrating the negative impact of higher taxes on profitability. Savitri (2019) also shows that effective tax rates exacerbate the relationship between profitability and debt, suggesting that higher taxes strain firms' financial performance. Amaniampong et al. (2018) reinforce these findings, linking higher corporate taxes with lower profitability. However, Olatunji (2019) offers a contrasting perspective, arguing that certain taxes, like marginal and effective tax rates, can positively influence profitability, especially when mitigated by tax exemptions. These studies underscore that while corporate taxes generally decrease profitability, the impact may vary depending on factors like tax exemptions and the specific tax environment, setting the stage for further investigation into the relationship between corporate taxation and firm performance.

A growing body of literature suggests that higher GDP per capita is positively correlated with better firm performance, particularly through developing a more robust business environment and higher consumer demand. Bonfiglioli et al. (2025) argue that countries with higher GDP per capita tend to have more heterogeneous firms, which are better equipped to compete and innovate. The authors demonstrate that this heterogeneity, stemming from factors such as the number of firm products and the dispersion of appeal, significantly influences a firm's export performance and overall economic growth. The higher GDP per capita correlates with a larger number of diverse firms, which can cater to a broader market, driving up firm performance. Similarly, Kiymaz et al. (2024) highlight that macroeconomic factors

like GDP can significantly affect a firm's working capital management, which, in turn, impacts profitability. In both developed and emerging economies, the efficiency of working capital management, influenced by factors such as the cash conversion cycle and GDP, can determine firm performance. The authors emphasize that GDP plays a crucial role in shaping how firms manage their liquidity and operational efficiency. Xuan (2025) further supports this by revealing the short- and long-term relationships between GDP, foreign direct investment (FDI), renewable energy, and open innovation. His findings indicate that GDP not only fosters economic growth but also enhances the impact of FDI and innovation, which contribute significantly to better firm performance, particularly in industries linked to sustainable development. Finally, Savitri (2019) emphasizes the role of firm-level factors in optimizing the effect of macroeconomic variables on performance. Savitri suggests that while GDP influences working capital management, the relationship between profitability and firm-specific factors, such as inventory management and collection periods, also plays a critical role. These factors, which vary across different economies, highlight the complex dynamics between macroeconomic variables like GDP and firm performance. Collectively, these studies underscore the importance of a high GDP per capita in promoting better firm performance through improved business environments, enhanced competitiveness, and efficient management of resources, including working capital and innovation.

Several studies highlight the negative impact of unemployment on firm performance. Blömer et al. (2024) suggest that unemployment dynamics, influenced by policies like the minimum wage, affect firm behavior and labor market outcomes. They argue that higher unemployment can lead to reduced firm performance, especially in regions with varying skill levels. Duffy and Jenkins (2024) find experimental evidence showing an inverse relationship between vacancies and unemployment, supporting the idea that firms' recruitment decisions, and consequently their productivity, are negatively impacted by higher unemployment. Galindo da Fonseca (2022) shows that while high unemployment can drive more entrepreneurship, it tends to result in smaller, less profitable firms. Similarly, Ardiyono (2022) finds that during the COVID-19 pandemic, firms in the ASEAN-5 countries reduced employment in response to revenue losses, which further impaired their performance. These studies indicate that higher unemployment rates can reduce firm performance by limiting labour availability, which in turn leads to lower productivity and profitability.

Inflation is widely expected to exert a negative effect on firm performance, primarily through its impact on operational costs and purchasing power. Research consistently shows that rising inflation increases the cost of inputs, reduces consumers' purchasing power, and can create economic instability, all of which may negatively affect firm performance. Bambe et al. (2024) explore the impact of inflation targeting on firm performance in developing countries. Their study finds that inflation targeting can

significantly enhance firm performance, particularly by reducing macroeconomic instability, which creates a more favourable environment for business growth. This finding suggests that managing inflation and stabilizing the economy are crucial for improving firm performance, especially in developing countries where inflation fluctuations tend to be more pronounced. On the other hand, a study by Tarkom and Ujah (2023) analyses the relationship between inflation, interest rates, and firm efficiency. Their results show that while inflation positively affects firm efficiency, the moderating effect of policy uncertainty amplifies the significance of inflation. This highlights that while inflation can have a direct positive impact on some aspects of firm performance, the effects are not uniform across different firms, and the influence of external factors such as policy uncertainty cannot be underestimated. Karkowska et al. (2025) investigate inflation's impact on the profitability of European banks. They find that although inflation can drive higher revenues for banks, its effects on operational efficiency are more complex. Higher inflation results in increased interest and non-interest incomes, but it also leads to a deterioration in efficiency ratios, reflecting a negative impact on long-term stability. This dual effect suggests that while short-term profits may increase, inflation ultimately undermines operational performance and long-term profitability. Furthermore, Yu et al. (2024) examine the relationship between inflation rates and resource utilization policies in OPEC countries. Their study reveals a negative impact of inflation rates on resource rents, particularly in sectors like coal, oil, and natural gas. This suggests that inflation may reduce profitability in extracting and utilizing key natural resources, aligning with the broader understanding that inflation negatively affects firm performance by reducing returns and increasing operational costs. Taken together, these studies support the view that inflation is a significant factor influencing firm performance. While some effects, such as increased revenue in certain sectors, may be observed in the short term, the long-term consequences typically involve higher operational costs, reduced efficiency, and decreased profitability. Therefore, firms must navigate inflationary environments carefully, with policy adjustments to mitigate these adverse impacts.

Studies exploring the relationship between corporate income tax rates and firm performance emphasize the moderating role of macroeconomic factors such as GDP, unemployment, and inflation. De Vito et al. (2024) show that personal income taxes reduce profit shifting by multinational enterprises (MNEs), demonstrating how macroeconomic conditions interact with corporate tax rates to affect firm behaviour and performance. Similarly, Dyrda et al. (2024) argue that macroeconomic factors influence the effectiveness of corporate tax reforms, such as profit tax base reallocations and a global minimum corporate tax, which can reduce profit shifting and stabilize firm performance globally. Yu et al. (2024) highlight the negative effects of inflation on profitability in resource-dependent industries, suggesting that inflation, as a key macroeconomic factor,

interacts with corporate strategies to impact performance. Finally, Dabla-Norris and Lima (2023) find that changes in tax rates and bases during fiscal consolidations affect firm performance differently, with base-broadening reforms leading to smaller declines in output and employment, indicating how tax policies are shaped by broader fiscal and macroeconomic conditions. These studies collectively show that corporate income tax rates are moderated by macroeconomic factors, which significantly influence firm performance outcomes.

3. Methods

The statistical hypotheses in this study were developed based on the extensive literature review, which highlighted key relationships between corporate taxation, macroeconomic factors, and firm performance. The hypotheses aim to test the impact of macroeconomic factors such as GDP per capita, unemployment rates, inflation, and corporate tax rate on firm performance.

This study uses robust regression, specifically Huber regression, to test the relationships between corporate taxation, macroeconomic factors, and firm performance. Huber regression is preferred over traditional linear regression because it effectively handles outliers and violations of assumptions like normality and homoscedasticity. It ensures reliable results despite extreme values and is suitable for datasets with heteroscedasticity and skewed distributions. Firm performance (either profit margin or ROA) serves as the dependent variable, while corporate tax rates, GDP per capita, unemployment, and inflation are the independent variables. The parameter β represents the strength and direction of the relationship between each independent variable and firm performance. The following hypotheses were developed to test the influence of macroeconomic factors on firm performance:

H1: *Higher corporate tax rates are negatively associated with firm performance, particularly with lower profit margins.*

- Statistical Hypothesis (H1): H0: $\beta_1 \geq 0$, H1: $\beta_1 < 0$

H1 was tested using robust regression model, where firm performance (measured by profit margin) was regressed on corporate tax rates. To calculate this hypothesis the profit margin was used to indicate firm performance because income tax directly affects how much will a company retain as profit. Thus, the profit margin reflects the impact of tax politics on the profitability more appropriately than ROA. Initially, the average effective corporate tax rate for each country was used to test this hypothesis. However, it was found that this variable did not produce significantly different results.

As a result, the standard corporate tax rates, as set by local tax policies, were used in the final analysis.

H2: *Higher GDP per capita is positively associated with firm performance, as wealthier economies tend to support more robust business environments.*

- Statistical Hypothesis (H2): H0: $\beta_2 \geq 0$, H1: $\beta_2 < 0$

H2 involves a robust regression where firm performance is modelled as a function of GDP per capita, testing the positive relationship between higher GDP and improved firm performance. The firm performance, in this case, was also measured by profit margin because GDP per capita expresses economic prosperity and has an impact on the firm's profits sales. Therefore, the profit margin was chosen as a direct indicator of firm performance. The independent variable, GDP per capita, was expressed in euros for each country.

H3: *Higher unemployment rates negatively affect firm performance, as higher unemployment reduces overall economic activity.*

- Statistical Hypothesis (H3): H0: $\beta_3 \geq 0$, H1: $\beta_3 < 0$

H3 was tested by regressing firm performance on unemployment rates to investigate the negative impact of unemployment on firm performance. Unemployment has much broader repercussions such as labour force availability, resource utilization and more. These influences will not affect the profit margin directly but rather effective usage company assets. For this reason, ROA was chosen as the firm performance indicator for testing H3 alongside with the unemployment rate.

H4: *Inflation exerts a negative effect on company performance, as it increases operational costs and reduces purchasing power.*

- Statistical Hypothesis (H4): H0: $\beta_4 \geq 0$, H1: $\beta_4 < 0$

H4 was examined through robust regression where inflation rates are tested as a determinant of firm performance, expected to show a negative relationship with operational efficiency and profitability. The inflation leads to higher costs of firms and the companies must optimize the asset management to retain profitability, which is why ROA was chosen as firm performance indicator to demonstrate the impact of inflation.

H5: *The relationship between corporate income tax rates and firm performance is moderated by macroeconomic factors such as GDP per capita, unemployment rate, and inflation.*

- Statistical Hypothesis (H5): H0: $\beta_5 = 0$, H1: $\beta_5 \neq 0$

H5 required a moderation analysis using interaction terms in a multiple linear regression model. This model tested whether the relationship between corporate tax rates and firm performance is moderated by macroeconomic factors such as GDP per capita, unemployment rates, and inflation rates. Since H5 investigates how macroeconomic factors affect the relationship between corporate tax rates and firm performance, ROA indicator is more sensitive to these factors. ROA incorporates the firm's total asset base, which allows for a more nuanced view of performance. In contrast, profit margin focuses on sales and costs without considering the scale of assets. ROA reflects not just the profitability but also the company's ability to create value from its entire asset base, which is more aligned with the broader scope of H5, which is why ROA was used as a firm performance indicator.

To test the hypotheses, robust regression was used for H1 to H4 instead of traditional linear regression, as linear regression assumptions of normality and homoscedasticity were violated (as shown by Shapiro-Wilk and variance tests). Robust regression addresses outliers by reducing their influence and does not assume normally distributed residuals, making it more suitable for economic and financial data. Certain variables, like ROA and inflation rate, were transformed using the inverse hyperbolic sine (IHS) to handle negative values and stabilize variance. For positive variables requiring normalization, Box-Cox transformations were applied. For H5, a moderation analysis with interaction terms in a multiple robust regression model was used to investigate how macroeconomic factors (GDP per capita, unemployment rate, inflation) influence the relationship between tax rates and firm performance, allowing for a more nuanced understanding of these complex interactions. The data were processed and analysed using RStudio, which aided the implementation of all statistical methods, transformations, and visualizations.

The regression models allowed us to analyse the main effects as well as the potential interaction effects between tax rates and macroeconomic conditions. All statistical tests were performed at a 5% significance level.

The dataset for this analysis was obtained from two main sources Orbis and Eurostat.

- Orbis database: The primary firm-level data source will be the Orbis database, which provides detailed financial information for a large sample of companies across the EU. For this study, a sample of the 20 largest companies (based on turnover) in each EU27 country were analysed. The data includes key financial metrics for 2022, such

as operating revenue (turnover), number of employees, total assets, profit margin, and ROA. All the financial indicators were collected in EUR. Data for previous years are sparse for many companies, and 2022 is selected as the most recent year with the most comprehensive and reliable data available.

- Eurostat: The macroeconomic data, including corporate income tax rates, GDP per capita, unemployment rates, and inflation rates for each EU country, are sourced from Eurostat. Eurostat provides reliable and comprehensive statistical data at the EU level, and the 2022 figures have been selected for consistency with the firm-level data.

Profit margin is defined as net income divided by total sales, reflecting the profitability of a company after taxes. As a post-tax measure, profit margin is directly influenced by corporate income tax rates. On the other hand, ROA is calculated as net income (EBIT) divided by total assets. While ROA is typically a pre-tax measure and represents a company's ability to generate profit from its assets, it may not be directly affected by taxes but is influenced by other economic factors. These two performance measures were selected to provide a comprehensive view of firm performance, considering both profitability and asset utilization.

The analysis uses data from 2022, as it represents the most reliable and comprehensive set available. Larger companies often finalize their financial year later, causing delays in data publication. By using 2022 data, we ensure alignment between firm-level financial data from Orbis and macroeconomic data from Eurostat, minimizing discrepancies and enhancing result robustness. The analysis is restricted to accounting-based performance indicators due to data availability and comparability across countries, market-based indicators such as Tobin's Q were not included due to significant limitations in data availability and consistency across firms and countries in the Orbis database. Moreover, incorporating Tobin's Q would shift the methodological framework from accounting-based to market-based analysis, requiring a different data structure and potentially introducing selection bias by excluding non-listed firms. To maintain methodological consistency and data comparability across all EU27 countries, the study focused on widely available accounting-based indicators such as ROA and profit margin.

4. Results

For clarity and ease of understanding, the following table summarizes the key results for each hypothesis, including the corresponding p-values, beta coefficients, and R-squared values.

Table 1. **Statistical results summary**

Hypothesis	H1	H2	H3	H4	H5
Beta (Corporate Tax Rates)	0.09367				
Beta (GDP per Capita)		2,3486			
Beta (Unemployment Rate)			-0.7126		
Beta (Inflation Rate)				1.7486	
Beta (Interaction GDP) Beta (Interaction Unemployment) Beta (Interaction Inflation)					0.3675 -3.12102 0.4599
R^2	0.04764	0.04088	0.00163	0.01063	0.0657
P-value (Corporate Tax Rates)	0.0643				
P-value (GDP per Capita)		0.0000115			
P-value (Unemployment Rate)			0.35		
P-value (Inflation Rate)				0.0236	
P-value (Interaction GDP) P-value (Interaction Unemployment) P-value (Interaction Inflation)					0.286 0.0000032 0.480

Source: own study

The robust regression model results for the first hypothesis (H1) show that the intercept is statistically significant with a p-value of 0.0446, indicating that when both corporate tax rates and GDP per capita are zero, profit margins are expected to be positive. The coefficient for corporate tax rates is highly significant with a p-value of 0,0643, indicating that there is no statistically significant relationship between corporate tax rates and firm performance (measured by profit margins) in this model. The scatter plot in Figure 1 visualizes the relationship between corporate tax rates and profit margins. The plot shows that there is a weak positive correlation between the two variables, with a general trend of low profit margins corresponding to lower corporate tax rates. However, the trend is not very strong, and the points are widely dispersed, suggesting that other factors, possibly macroeconomic variables, might play a more significant role in explaining the variance in profit margins.

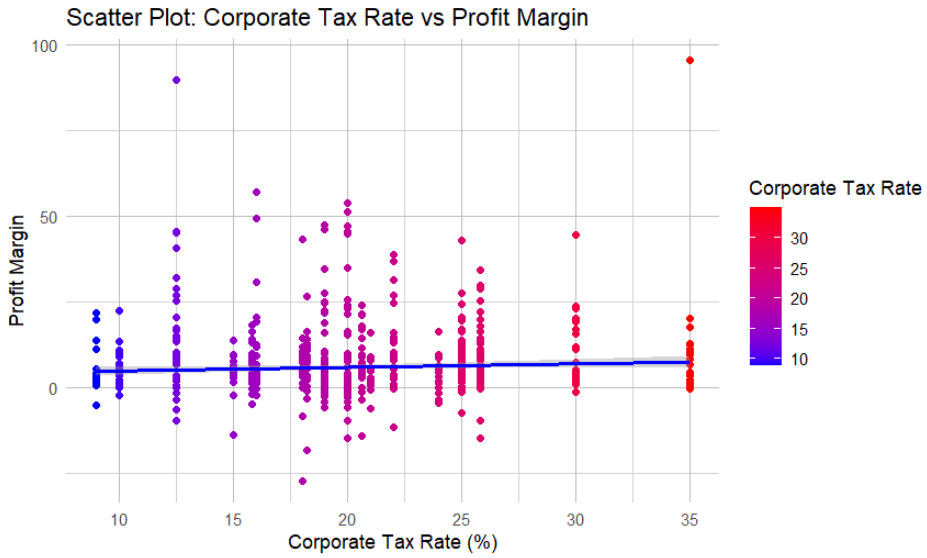

Figure 1. **Scatter plot of profit margin vs corporate tax rate H1**

Source: own study

The density plot of residuals from the robust regression model revealed the distribution of the residuals. The plot showed a right-skewed distribution with a peak around zero, indicating that the residuals are not perfectly symmetric. The median of the residuals is approximately zero, suggesting that the model's predictions align closely with the observed values. The presence of some outliers is also noted, as they appear on the far left and right tails of the distribution.

The null hypothesis (which posits no negative relationship between corporate tax rates and firm performance) cannot be rejected. Hypothesis 1 suggests that higher corporate tax rates are negatively associated with firm performance, but this is not supported by the data. The lack of a statistically significant relationship between corporate tax rates and profit margin suggests that corporate taxation may not have a direct impact on firm performance in EU27 countries, or that the relationship is influenced by other macroeconomic factors, such as GDP per capita, which are shown to have a more significant impact on firm performance. This indicates that while corporate tax rates may be a factor in firm performance, their influence may be indirect or moderated by other economic conditions.

The second hypothesis (H2), which posits that higher GDP per capita is positively associated with firm performance, was tested using a robust regression model. The

p-value of 1.15e-05, is statistically significant at the 5% level. This suggests that there is a positive relationship between GDP per capita and firm performance (as measured by profit margin). The positive coefficient indicates that, as GDP per capita increases, the profit margins of firms tend to rise, supporting the notion that wealthier economies tend to support more robust business environments. Moving on to the scatter plot (Figure 2), we observe that there is a slight upward trend in the relationship between profit margin and GDP per capita. The data points, which represent various firms, are color-coded based on GDP per capita, with firms in wealthier economies (represented by red and purple) showing marginally higher profit margins compared to firms in economies with lower GDP per capita (represented by blue). However, the trend is not very steep, and the points are dispersed across the graph, suggesting some variability in the profit margins even within countries with similar GDP levels.

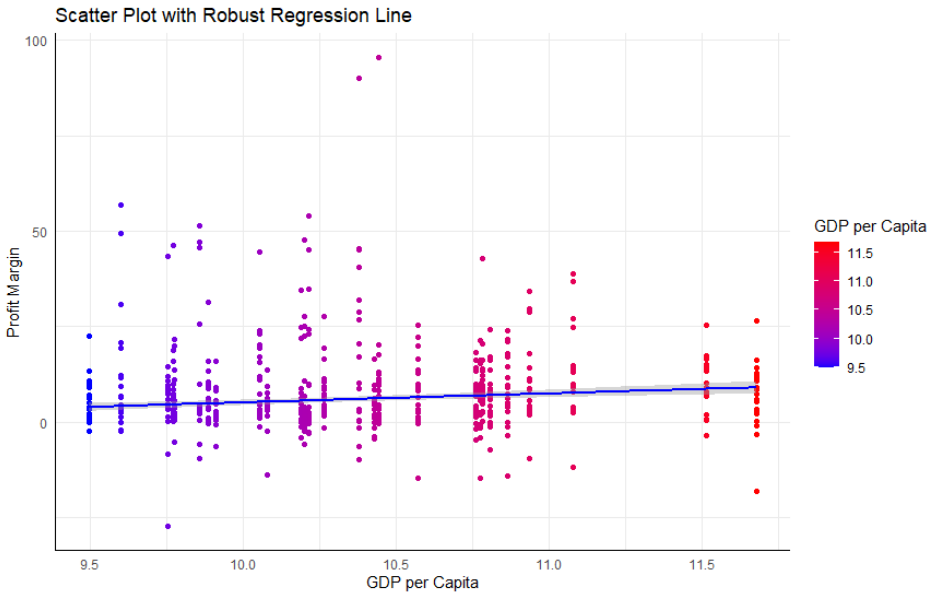

Figure 2. **Scatter plot of profit margin vs GDP per capita H2**

Source: own study

The density plot of residuals revealed that the residuals are somewhat concentrated around zero but have a right-skewed distribution with a slight peak near zero. The median of the residuals is close to zero, which suggests that the model's predictions are generally

close to the observed values, but there are some observations with larger deviations from the fitted values. This residual distribution indicates that the data may still have some outliers, but overall, the model appears to fit the data reasonably well.

The second hypothesis is supported by the results. The null hypothesis was rejected, which suggests that GDP per capita does have a statistically significant positive effect on firm performance. The statistically significant positive relationship between GDP per capita and firm performance implies that wealthier economies tend to provide more favourable business conditions that foster higher profit margins. However, despite statistical significance, the relationship between GDP per capita and profit margins is relatively weak, suggesting that other factors, such as corporate tax rates and industry-specific characteristics, might play a larger role in firm performance in EU27 countries.

For the third hypothesis (H3) the unemployment rate was transformed to improve the normality of its distribution and address issues of non-linearity and heteroscedasticity (unequal variance in the residuals) in the regression model. In its raw form, the unemployment rate exhibited skewness, which reduced the reliability of the statistical model. To mitigate this, a Box-Cox transformation was applied. The robust regression results indicate an intercept estimate of 6.03, which is statistically significant. This value represents the baseline ROA when the transformed unemployment rate is zero. However, the coefficient for unemployment rate is -0.71, with a high p-value of 0.35, indicating that the relationship between unemployment rates and firm performance is not statistically significant at the 5% level. The adjusted R^2 is extremely low (- 0.00022), suggesting that unemployment rates explain virtually none of the variation in ROA in this model. The robust residual standard error is 5.07, and 8 observations were identified as outliers, having weights near zero. Despite these adjustments, the model did not show a significant relationship.

The scatter plot (Figure 3) illustrates the relationship between the transformed unemployment rate and ROA. Each point represents an observation, and the colour gradient corresponds to the unemployment rate, ranging from lower values (blue) to higher values (red). The robust regression line is nearly flat, indicating a lack of strong linear relationship between the two variables. The dispersion of points remains relatively consistent across different unemployment levels, reinforcing the statistical insignificance observed in the regression results.

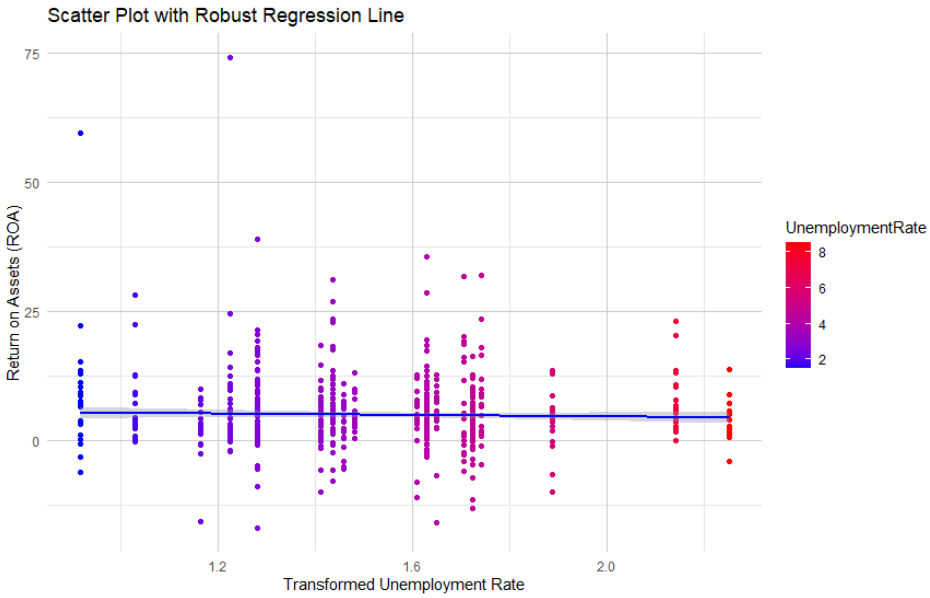

Figure 3. **Scatter plot of ROA vs unemployment rate H3**

Source: own study

The density plot showed relatively symmetrical distribution, with the median positioned near zero, suggesting no severe skewness or bias in the residuals. The residual spread indicates a moderate degree of variability but no significant deviations from normality that would suggest a model misfit.

Based on the statistical analysis the null hypothesis can't be rejected, meaning there is no statistically significant evidence to support the claim that higher unemployment rates negatively affect firm performance (ROA). The robust regression suggests that unemployment rates do not have a direct and measurable impact on the ROA of firms in the chosen sample. In the context of the EU27 countries, the findings suggest that while unemployment may have macroeconomic implications, its direct impact on firm-level profitability (as measured by ROA) is not evident. This result could be attributed to various buffering mechanisms within the EU economies, such as social safety nets or sectoral differences in how unemployment affects businesses. It also highlights the importance of examining other macroeconomic factors alongside unemployment to capture the full scope of influences on firm performance.

The fourth hypothesis (H4) proposed that inflation exerts a negative effect on company performance, as it increases operational costs and reduces purchasing power. To test this hypothesis, robust regression model was employed, using Return on Assets (ROA) as the dependent variable and the inflation rate as the independent variable. Due to the presence of negative values in the ROA variable, the Box-Cox transformation was not applicable. Instead, the Inverse Hyperbolic Sine (IHS) transformation was applied to normalize the data. The IHS transformation is particularly useful when dealing with variables that include both negative and positive values, as it behaves similarly to a logarithmic transformation while preserving interpretability. The robust regression showed an intercept of -0.3355, which was not statistically significant. However, the coefficient for the inflation rate was 1.7486, with a p-value of 0.0236, indicating a statistically significant positive relationship at the 5% significance level. The robust residual standard error was 4.999, and the multiple R-squared value was 0.01063, suggesting that only a small proportion of the variance in ROA is explained by the transformed inflation rate. These results reveal an unexpected outcome: inflation appears to have a statistically significant positive association with firm performance, contrary to the initial expectation of a negative effect. This could imply that companies in the EU27 may have mechanisms to pass increased costs onto consumers or adapt their operations in ways that maintain profitability during periods of rising inflation. Figure 4 shows the scatter plot with a robust regression line, illustrating the relationship between the transformed inflation rate and ROA. The regression line has a slight upward slope, reflecting the positive association between the variables. The data points are color-coded according to the original inflation rate, with higher inflation rates in red. Although the upward trend is evident, the variability in the data indicates that other factors may also influence firm performance.

The density plot of residuals showed a symmetric distribution with the median close to zero. The residual distribution supports the robustness of the model, although a small peak in the right tail suggested the presence of some outliers, which were down weighted in the robust regression approach.

Based on the statistical analysis, the null hypothesis that inflation has no significant impact on firm performance is rejected at the 5% significance level. However, the direction of the relationship is positive rather than negative, contradicting the initial assumption. These findings suggest that companies across the EU27 may have adapted more effectively to inflationary pressures than anticipated. This resilience could be linked to regional or industry-specific factors, which may mitigate the negative consequences of inflation.

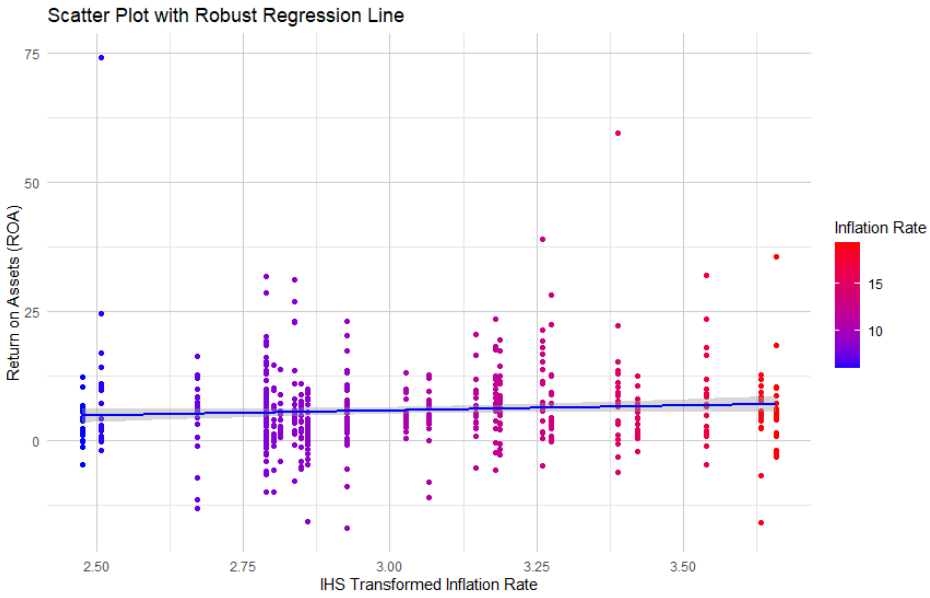

Figure 4. **Scatter plot of ROA vs inflation rate H4**

Source: own study

To test the fifth hypothesis (H5) data transformation was necessary to meet the assumptions of robust regression due to the presence of non-normal distributions and the combination of positive and negative values in key variables such as ROA. The inverse hyperbolic sine (IHS) transformation was applied to the dependent variable, ROA, as well as to independent variables Corporate Tax Rate, GDP per Capita, Unemployment Rate, and Inflation Rate to handle negative values and reduce skewness. This transformation ensures a more reliable and interpretable model. The statistical results show that the interaction term between corporate tax rates and unemployment rate is significant at the 0.001 level, suggesting that unemployment rate strongly moderates the relationship between tax rates and firm performance. Specifically, as unemployment increases, the negative effect of corporate tax rates on ROA is amplified. The other interaction terms, such as those involving GDP per Capita and Inflation Rate, are not statistically significant, indicating that their moderating effects are less pronounced in this model.

In Figure 5, the scatter plot with the robust regression line presents the relationship between the transformed Corporate Tax Rate and ROA, coloured by the transformed GDP per Capita. The regression line shows a slight negative slope, indicating a potential

negative relationship between corporate tax rates and firm performance. However, the inclusion of moderation effects complicates the interpretation of the direct effect. Observations with higher GDP per Capita are coloured in red, while those with lower GDP per Capita are coloured in blue. There is significant dispersion of points around the regression line, indicating variability in the moderation effect.

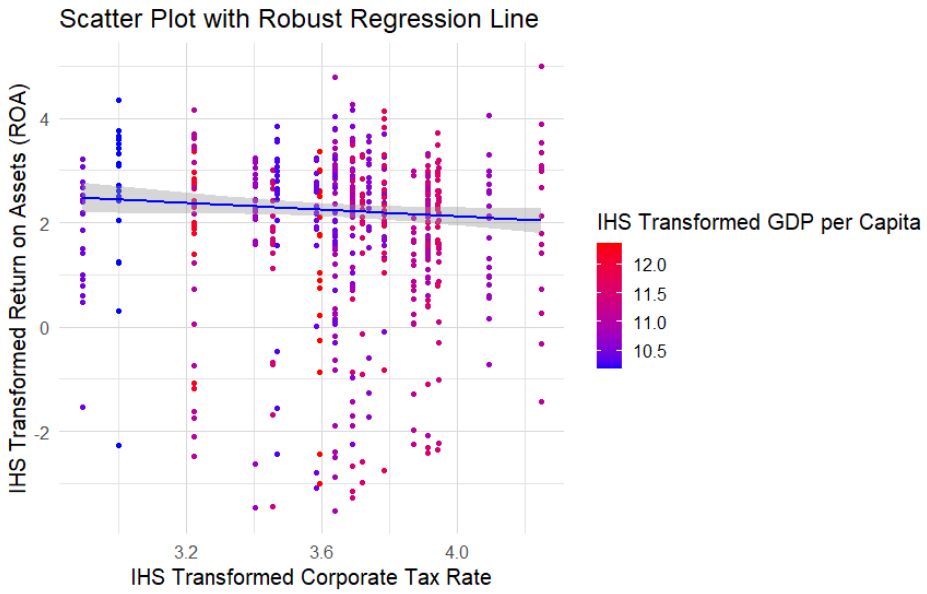

Figure 5. **Scatter plot of ROA vs corporate tax rate H5**

Source: own study

The density plot of residuals revealed a unimodal distribution centred around zero, indicating a reasonable fit of the model. The median residual closely aligns with zero, further supporting the model's robustness. Although the distribution is generally symmetric, some residuals at the tail end suggest the presence of outliers or extreme values. These observations were identified as outliers or influential data points by the regression model's robustness weights, which assigned them very low values, indicating they deviate significantly from the overall pattern in the data.

Based on these findings, it is concluded that the hypothesis regarding the moderating role of unemployment rate on the relationship between corporate tax rates and firm performance is supported. However, the other macroeconomic variables, while important, do not exhibit a statistically significant moderating

effect in this model. The null hypothesis can partially be rejected for unemployment. However, for corporate tax rate, GDP per capita, inflation rate, the null hypothesis cannot be rejected. These results suggest that the interaction between corporate tax rates and unemployment rate significantly affects firm performance in the EU27 context. This highlights the complex dynamics within the EU27 countries, where labour market conditions play a critical role in shaping how corporate taxation affects firm outcomes.

5. Discussion

The findings of this study provide significant insights into the relationship between corporate taxation, macroeconomic factors, and firm performance across EU27 countries. The results offer a nuanced perspective that aligns with and, in some cases, challenges existing research in the field.

In testing the first hypothesis, the analysis revealed no significant relationship between corporate tax rates and firm performance (measured by profit margin), which stands in contrast to the initial prediction that higher tax burdens would negatively impact profitability. This finding suggests that other factors, such as corporate tax planning or country-specific tax policies, may mitigate the direct impact of tax rates on firm performance. Similar findings have been observed in studies highlighting the limited direct influence of tax rates when firms adopt efficient financial strategies (De Vito et al., 2024). The second hypothesis confirmed a significant and positive relationship between GDP per capita and firm performance. This result aligns with prior research indicating that wealthier economies offer more stable and supportive business environments, which foster corporate growth and profitability (Xuan, 2025). Higher GDP per capita reflects stronger purchasing power and infrastructure, creating favourable conditions for firms to thrive. The third hypothesis, which proposed that higher unemployment negatively affects firm performance, was not supported. The lack of statistical significance could be explained by the heterogeneity of the sample across countries and industries. Some firms may benefit from lower labour costs in high-unemployment contexts, while others face demand-side challenges. These mixed dynamics require further investigation, as prior studies have reported varying effects of unemployment on firm outcomes (Galindo da Fonseca, 2022). The fourth hypothesis produced an unexpected result: inflation showed a weak but statistically significant positive association with firm performance. This finding deviates from the common assumption that inflation harms profitability. A plausible explanation is that during periods of moderate inflation, firms may pass increased costs on to consumers or benefit from inflation-driven revenue growth, which outweighs cost increases (Bambe et al., 2024). Finally, the moderation analysis in the fifth hypothesis confirmed that

unemployment significantly moderates the relationship between corporate tax rates and firm performance. This interaction highlights the importance of considering labour market conditions when evaluating the effects of taxation policies. However, other macroeconomic factors, such as GDP per capita and inflation, did not exhibit significant moderation effects, suggesting that their influence may be more independent of taxation policies.

Overall, this study contributes to the growing body of knowledge by offering a comprehensive analysis of how macroeconomic conditions and tax policies interact to shape corporate performance in the EU27 context.

6. Conclusions

The present study aimed to examine the relationship between corporate income tax rates, macroeconomic factors, and firm performance within the EU27, focusing on profit margins, return on assets (ROA), and the moderating effects of key macroeconomic variables. Using robust regression analysis, five hypotheses were tested to assess the direct and interactive effects of corporate tax rates, GDP per capita, unemployment, and inflation on firm performance.

The results yielded several important findings. Contrary to initial expectations, corporate tax rates were not significantly associated with firm performance, suggesting that firms in the EU27 may have developed effective tax planning strategies that reduce the burden of higher tax rates. In contrast, GDP per capita was found to be positively correlated with firm performance, indicating that firms benefit from operating in wealthier economies with stronger demand and business environments. Unemployment, however, did not have a statistically significant direct impact on firm performance, challenging the assumption that higher unemployment universally harms corporate outcomes. Interestingly, inflation had a weak but significant positive association with firm performance, likely reflecting firms' ability to adapt to moderate inflationary pressures. The moderation analysis further revealed that unemployment significantly affects the relationship between corporate tax rates and firm performance, emphasizing the importance of labour market conditions in shaping the broader economic impact of tax policies.

These findings contribute to the existing literature by highlighting the complex interplay between corporate taxation, macroeconomic factors, and firm performance in the European context. They offer practical implications for policymakers, suggesting that a comprehensive approach to fiscal policy should account for labour market dynamics and country-specific factors to promote business growth. For managers, the results underscore the importance of adjusting corporate strategies based on broader economic conditions to remain resilient in diverse macroeconomic environments.

Despite these contributions, the study is not without limitations. First, the analysis was limited to a cross-sectional dataset from 2022, which restricts the ability to capture dynamic relationships over time. Additionally, the sample was constrained to 20 companies per country, potentially limiting the generalizability of the findings. Future research could address these limitations by adopting a longitudinal approach, incorporating industry-specific factors, and expanding the sample size to gain deeper insights into how corporate taxation and macroeconomic conditions interact over time and across various sectors. Additionally, the study does not include certain market-based or monetary indicators, such as Tobin's Q or exchange rate fluctuations. While these variables offer further insight into firm valuation and external competitiveness, they were excluded to preserve the focus and consistency of the cross-sectional dataset, which is based on harmonized firm-level and macroeconomic indicators from a single year. Including variables such as exchange rate volatility or Tobin's Q would require either time-series data or market-based inputs that are not consistently available across all EU27 countries at the firm level. Future research could integrate such indicators to explore forward-looking dimensions of firm performance and external macroeconomic shocks.

In summary, this study offers a nuanced understanding of how macroeconomic factors shape the impact of corporate taxation on firm performance, emphasizing the need for tailored policies and adaptive business strategies in the diverse economic landscape of the EU27.

Authors' contribution

V.H.L.: article conception, theoretical content of the article, research methods applied, conducting the research, data collection, analysis and interpretation of results,draft manuscript preparation. **J.H.:** article conception, theoretical content of the article, analysis and interpretation of results,draft manuscript preparation. **D.B.:** article conception, theoretical content of the article, draft manuscript preparation.

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