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”The impact of macroeconomic factors on capital structure: Evidence across EU countries”

Master Thesis

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Abstract

The purpose of this thesis is to investigate how macroeconomic factors impact the firms' capital structure using a dataset of 1298 non-financial listed firms within 16 EU countries during 2016-2019. By using the feasible generalized least square (FGLS) regression, this thesis tests the effects of macroeconomic variables on three leverage proxies, namely long-term, short-term, and total debt. The findings suggest that inflation acts as the strongest deterrent to leverage, while bank positively impacts firm leverage. GDP growth negatively impacts only long-term debt, implying that during economic expansion, firms in the EU prefer their retained earnings as financing means for their investments. The tax rate is positive and significant for long-term debt, whereas stock market development positively affects long-term debt but the opposite is true for short-term debt. It is also argued that the macroeconomic determinants of leverage differ between the manufacturing industry and other pooled industry categories. The empirical results show that GDP growth and tax are statistically significant only for the manufacturing industry. At the same time, inflation appears to be a more important determinant for other industries than the manufacturing sector. The results will support managers in adjusting their leverage levels to economic conditions in order to enhance their capital structure choices. Managers can have an ex-ante risk management plan by anticipating how changes in macroeconomic conditions, might influence their leverage decisions. This study contributes to existing literature by providing up-to-date empirical evidence on how a set of macroeconomic variables affect the leverage of firms operating under an economic and monetary union, while providing a foundation for the importance of considering several leverage proxies when assessing the macroeconomic factors that impact firms' debt decisions.

Keywords: capital structure, macroeconomic determinants, EU, listed firms, leverage, long-term debt, short-term debt, total debt, FGLS

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1 Introduction

1.1 Background

One of the most discussed topics in Corporate Finance is the choice of capital structure. The theory of capital structure was first presented by Modigliani and Miller (1958), who concluded that the firm value remains unaffected by capital structure, meaning, financing decisions are irrelevant in perfect capital markets. Considering that we live in imperfect capital markets, Modigliani & Miller's work on capital structure was followed by many empirical studies, leading to the emergence of several theories, that attempt to explain capital structure decisions. Among the most studied ones are the trade-off theory and pecking-order theory(Eugene F. Fama, 2002; Frank and Goyal, 2009; Kayhan and Titman, 2007; Shyam-Sunder and Myers, 1999), market timing theory (Baker and Wurgler, 2002; Bie and Haan, 2007) and agency theory (Kochhar, 1996). Empirically, researchers have examined the capital structure into three levels, respectively, firm-specific, industry-level, and macro -level determinants. The overall conclusion from the existing literature is that firm, industry, and country-level determinants have a significant explanatory power in capital structure choice.

An extensive amount of literature has employed for a long time the Trade-Off and Pecking Order theoretical foundations to explain how firm-specific factors influence leverage decisions, in single and multiple-country contexts (Acedo-Ramírez and Ruiz-Cabestre, 2014; Chen, 2004; Haron, 2011; Moradi and Paulet, 2019). Based on the aforementioned studies some crucial internal factors influence the degree to which firms use leverage, for example, profitability, asset tangibility, growth opportunities, and firm size. Other studies contend that industry factors explain a part of the variations in firms' financial leverage (Fan et al., 2012; Li and Islam, 2019; MacKay and Phillips, 2005).

Although some authors argue that firm-specific determinants are the most important factors in explaining capital structure decisions, macroeconomic characteristics are also found to be important determinants of leverage (Booth et al., 2001). In addition, this notion is further supported by the study of de Jong et al. (2008), who found that the macro-specific factors not only influence corporate leverage indirectly (through firm-specific characteristics), but also provide evidence that they have a direct impact on the firms' capital structure choices. By combing the analysis of firm- and macro-level factors, few empirical studies suggest some macroeconomic factors that impact the firms' capital structure. For example, Li and Islam (2019), argue that GDP significantly correlates to corporate leverage. In addition, scholars also demonstrate inflation as a significant determinant. Other studies aimed to explain the capital structure by additional macro-level determinants, such as stock capitalization, banking development, bond market development, legal environment, and shareholder/creditor rights (de Jong et al., 2008; G.Rajan and Zingales, 1995).

Notably, while literature has shed light on the macroeconomic factors that influence leverage, the results on the direction of the relationship between macroeconomic factors and leverage decisions remain inconclusive. Most of the studies combine firm-specific factors with macroeconomic factors to explain financing decisions, while studies that examine the macroeconomic factors as their primary variables are scarce, especially in the EU context.

The aim of this study is to build up the existing literature, by primarily investigating the type of the relationship that exists between the macroeconomic factors and the firms' capital structure choices across the European Union (EU). This thesis is based on its EU member states for the following reasons. First, some research investigates the impact of macroeconomic factors on capital structure through a group of countries who have similar economic conditions such as developing countries (Agarwal and Mohtadi, 2004; Bas et al., 2010; Mateev et al., 2013; ul Ain et al., 2011), emerging economies (Bokpin, 2009; Zafar et al., 2019), European countries (Hanousek and Shamshur, 2011; Namara et al., 2017) with the exception of some worldwide studies (de Jong et al., 2008; Kayo and Kimura, 2011). EU applies a unified monetary policy for the euro area, which impacts the interest and exchange rates of its member states similarly [1]. As a result, the member states have a much more coordinated economic area, which enhances the generalizability of the findings across the EU. Second, because countries with different monetary policies will have varying interest rates, which can impact the leverage decisions differently (Mokhova and Zinecker, 2014), existing empirical evidence might not necessarily be applied in the EU context. Third, as posited by Kedzior (2012), publicly listed companies within the EU, have a unified framework to provide consolidated financial statements based on International Accounting Standards, which reduces the risk of inconsistency of financial data. Finally, EU countries have well-established statistical databases, which facilitate data access.

[1] European Commission

All the above considered, the following research question has been formulated:

"What is the relationship between the macroeconomic factors and the capital structure choices among publicly listed firms across the EU?"

1.2 Structure

The remainder of this thesis is organized as follows: Section 2 covers some relevant theories on capital structure. It further uses past literature on the relationship between macroeconomic factors and capital structure to develop the hypotheses of this thesis. Section 3 describes the methodology used including data collection and model specification. Section 4 comprises discussions regarding the descriptive and empirical results. Section 5 summarizes the main findings with their theoretical and managerial implications. Finally, section 6, addresses the limitations and points for future research.

2 Literature Review

This part of the study reveals the past literature regarding capital structure and its determinants. The review starts with section 2.1, which presents the theories of capital structure and explains theoretically how firms are expected to adjust their capital structures. This part is later followed by section 2.2, which covers the relevant empirical literature on macroeconomic determinants and capital structure. Although the existing studies contradict each other on the type of relationship that exists between the macroeconomic factors and the capital structure choices, they do agree that macroeconomic factors have an explanatory power over firms' capital structure. Based on the information from the previous studies and theories, the hypotheses for this research are created. Both, theory and empirical evidence are employed to predict the direction of the relationship between leverage and macroeconomic determinants. Finally, section 2.3 provides an explanation, substantiated by literature, for the chosen control variables that will be added to the regression of this study.

2.1 Theoretical background

2.1.1 Modigliani and Miller Irrelevancy Theory

Modigliani and Miller (1958) developed the Irrelevancy Theory of capital structure, which implies that in perfect capital markets, in the absence of taxes, bankruptcy costs, information asymmetry, or additional imperfections, any combination of securities will maximize the firm value. From this fundamental, they arrived at proposition 1, which implied that, in capital markets without imperfections, the market value of any firm is unaffected by capital structure choices. As a result, the value of a levered firm will always equal the value of an unlevered firm. The second proposition says that the cost of equity, or the rate of return, increases with more leverage. This implies that when the cost of equity remains higher than the cost of debt, then companies should increase their leverage levels to decrease the cost of capital (WACC). However, according to MM proposition 2, the cost of capital cannot be decreased by raising the debt-to-equity levels, because the increased rate of return is offset by the increased financial risk, hence making the cost of capital remain constant. This makes sense because as leverage increases, so does the risk of the debt, hence the equity becomes riskier, ultimately making debtholders require higher interest rates. As a result, investors will require a premium to compensate for the risk of holding stocks of a levered company.
The first two propositions assumed away so many market complications, most importantly they ignored taxes. To effectively address such a matter, Modigliani and Miller (1963) corrected the previous version of the propositions into two new ones, reflecting the imperfections of capital markets. Preposition 1 with taxes asserts that the value of a levered firm is the same as the value of an unlevered firm plus the present value of the interest tax shield. The firm receives a tax shield because when the company takes debt, the interest payments are tax-deductible. This ultimately minimizes the present value of the corporate tax bill, and increases cash reserves, thereby enhancing the firm's overall value. The attractiveness of interest rate expenses lies in the fact that shareholders anticipate a return regardless of the company's decision to leverage through debt. Unlike payments to debtholders, shareholder payments are not eligible for the tax deduction, thereby eliminating the tax shield benefits. Preposition 2 with taxes is the same as proposition 2 without taxes, that cost of equity increases as leverage levels rise, with the sole difference

that when incorporating taxes, WACC does not remain constant anymore, but slightly declines as debt increases.

The trade-off between tax shield and debt interest rate

As stated by Modigliani and Miller (1963), debt financing has the advantage that the interest payments to the debtholders are tax-deductible. Intuitively, the firm can effectively reduce its tax burden at the corporate level, by leveraging the benefits of the interest tax shield. A reasonable assumption is whether the benefits of the tax shield remain unchanged with the introduction of personal taxes on shareholders. In a thorough examination of the effects of rising interest rates on the value of tax shields, Hochman and Palmon (1985), emerge as pivotal figures, challenging the findings of earlier scholars who contend that debt financing becomes more attractive with higher interest rates because of interest deductions and tax shield benefits. In contrast, Hochman and Palmon (1985) demonstrate that the value of tax shield benefits is shrunken when personal taxes on interest and the effective personal tax rate on equity income are introduced. In this scenario, the ultimate firm's objective is to minimize the present value of all taxes (personal taxes paid by bondholders/stockholders and corporate tax). In cases where the personal tax, is equal to the corporate tax, the advantage of a tax shield depends solely on corporate tax. A special case is also when corporate tax and personal tax cancel each - other out and make the debt policy irrelevant. Such a case can only happen when the corporate tax is much less than the personal tax and when the effective personal tax on equity income is small. Ultimately, to determine the net tax advantage, firms must be aware of the tax rates of the marginal investor – that is an investor whose actions significantly impact the prices of a security. Therefore, when the personal tax rate of the marginal investor exceeds the corporate tax, then the tax shield benefits are offset by the increased tax liability of the marginal investor. Eventually, tax-paying investors are more reluctant to hold debt and would prefer to hold common stock or tax-exempt bonds. When recognizing for such personal taxes, the tax shield advantage loses its value, yet does not disappear, but is only valuable to companies that are reasonably sure that the corporate tax shields. However, the tax shield may disappear and turn into a disadvantage for companies that cannot reasonably use or benefit from the tax shield. Hence, this strand of analysis uncovers how the value of the interest tax shield can be overstated when the total value of corporate and personal taxation can potentially either offset the present value of the interest tax shield or create a tax disadvantage.

2.1.2 Trade-off theory

When Modigliani and Miller (1958) place the role of the government in capital structure, debt financing has a major advantage due to the tax shield that corporations receive. Modigliani and Miller (1958) argue that the firm value and shareholders' wealth would increase with more debt due to the tax shield. If a firm value increases with more debt due to tax shield, then it is reasonable to assume that the firm should maximize its debt levels. One rationale why this is not wholly realistic has been previously articulated in this thesis, which involved how the tax shield benefit is diminished with the incorporation of personal taxes of stockholders. A second rationale is that the value of the tax shield is overstated when the financial distress costs, associated with excessive borrowing, are ignored. Sometimes financial distress can lead to bankruptcy, incurring costs that are burdensome for firms. Kraus and Litzenberger (1973) developed the trade-off theory of capital structure, which aims to adjust the levels of debt without causing adverse effects on firm value. The trade-off theory indicates that corporations should have a debt level that maximizes firm value yet minimizes the probability of entering into financial distress. Figure 1 exemplifies how the trade-off between interest tax shields and the costs of distress can influence the optimal capital structure. The present value of the tax shield initially increases with borrowing, where the probability of financial distress is small. Nevertheless, the chances of entering financial distress rapidly increase with excessive borrowing by negatively impacting firm value at some point. Hence, the target debt level is reached when the present value of the tax shield is offset by the increased present value of financial distress costs, coinciding with the peak of firm value (Myers and Majluf, 1984).
Financial distress erodes the firm value, and according to Kraus and Litzenberger (1973), it is of high importance to incorporate the financial distress costs when deciding upon capital structure. Financial distress costs include the direct costs of bankruptcy, such as legal and administrative, and the indirect costs of bankruptcy, such as the time effort, and court costs. Therefore, unlike Modigliani and Miller (1958) who seem to neglect financial distress when borrowing, the trade-off theory rationalizes the debt levels and suggests that financial managers should be always on the lookout for the probability of financial

distress. According to the theory, some firm-related characteristics impact the firms' capital structure choices. Companies that are profitable (considerable taxable income to shield) and possess safe and tangible assets should maintain high debt ratios. Conversely, unprofitable companies holding risky and intangible assets should predominantly rely on equity financing. However, a limitation of the trade-off theory is that it fails to explain how highly profitable companies, flourish in very low or non-existent debt. While the theory predicts that profitable firms should have high levels of debt-to-equity ratios, Myers et al. (2020) mention that profitable firms borrow the least.

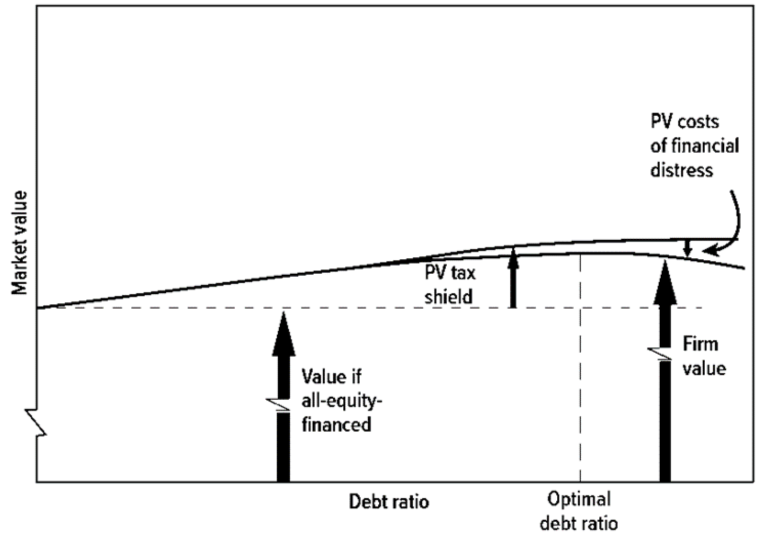

Figure 1: Trade-off theory[2].

2.1.3 Pecking-order theory

Myers and Majluf (1984) have presented a model that explains how corporate financing should work, which is addressed in literature as the pecking-order theory. The principle that pioneers this theory is asymmetric information – a widely used word in economics that implies that managers know more about their companies' risks and values than external investors. Consequently, as the theory name suggests, the choice between debt or equity financing leads to an order. To reduce the asymmetric information, firstly, the firms tend to choose internal funds through retained earnings as financing means, followed by issues of safe debt, and only when the company has run out of debt capacity, they rely on equity financing (issuing new shares). The theory suggests that asymmetric information can force managers to issue debt rather than new shares, to signal outside investors. When a company issues debt it signals to outside investors, that the company is not only confident in fulfilling the debt obligations, but it also signals that they do not want to issue undervalued equity. In contrast, when issuing equity, it signals investors that the stock is overvalued, thereby forcing the stock price to go down. Using internal funds does not share any information with outside investors, thus it does not bear the costs of information, placing it in the first place of the order. The pecking-order theory advocates that there is a relationship between macro- and firm-specific characteristics and capital structure decisions. For instance, the theory predicts that more profitable firms will rely on internal financing. It also suggests that economic growth results in higher profits for the companies, helping them to rely on internal capital rather than on debt.

2.1.4 Market timing

The market timing theory was studied by Baker and Wurgler (2002), who argue that this theory revolves around irrational investors and time-varying mispricing. Market timing theory indicates that companies issue shares when the stock prices are high (market-to-book ratios are relatively high) and buyback the shares at low prices, (the market-to-book values are relatively low). Baker and Wurgler (2002) provide evidence that corporations adjust their debt ratios to capture the effects of market timing. They justify their results by explaining that, since there is no optimal capital structure, financing decisions

[2]The picture is extracted from the eighteenth chapter of the textbook: Brealey, R. A., Myers, S. C. Allen, F. (2020). Principles of Corporate Finance. (13th edn). McGraw Hill Education, New York

are impacted by the equity market. In addition, the market timing effects are captured by scholars Chang et al. (2019), who suggest that companies employ favorable market conditions and issue more equity during high stock prices, ending up with low debt ratios. According to Myers et al. (2020) market timing explains why issuing stock as a means of financing is mainly concentrated in bull markets but falls drastically in bear markets.

2.2 Previous literature: Macroeconomic determinants of capital structure

There is no one theory that can explain 100% of the capital choices of corporations (Myers et al., 2020). Although Hanousek and Shamshur (2011) address the traditional firm-specific characteristics, e.g. profitability, size, asset tangibility, growth, and risk, to have a 60% explanatory power in leverage decisions, there is some empirical evidence that the broader economic landscape within which firms operate can influence such firm choices. Hence, in this section, five macroeconomic variables are incorporated, all substantiated to have significant power in explaining capital structure decisions around the world. The macroeconomic variables, specifically used in this study are stock market development, development of the banking industry, GDP growth, inflation, and corporate tax rate. It is important to point out that not all the macroeconomic factors are included in this study. The variable selection was primarily based on the capital structure literature. Only the variables that reflect the current macroeconomic state and have empirical evidence from past research to correlate with leverage decisions are used in this study.

2.2.1 GDP Growth

One of the most common macroeconomic determinants employed by researchers is GDP growth (Bokpin, 2009; Kayo and Kimura, 2011; Zafar et al., 2019). These studies contend that there exists a significant and negative relationship between the GDP growth rate and the leverage levels of firms. However, literature shows that the results of the correlation between GDP growth and leverage remain inconsistent, which can be attributed to differences that exist between countries. For example, in the study of Mokhova and Zinecker (2014), which examined the influence of macroeconomic factors on firms' debt levels among different European countries, the empirical results showed that GDP growth has a non-significant relation with capital structure, except for Greece, where they recorded a strong positive impact on short-term debt. de Jong et al. (2008) found that GDP growth has a significant and positive impact on leverage. Likewise, Gungoraydinoglu and Özde Öztekin (2011) argue that GDP is positively related to corporate leverage. They explain that firms use more debt during periods of economic growth. However, according to the pecking-order theory, companies will prefer internal financing over debt when they have sufficient retained earnings. The underlying fundamentals behind the theory suggest that during expansions of the economy, the companies will be able to accumulate more cash and profits. Having cash reserves will provide the companies with the possibility of using such retained earnings to finance their needs. Hence, if the pecking-order theory holds in capital markets, then there should be a negative relationship between economic growth and leverage. Although the overall empirical results remain inconclusive, in line with the findings of Kedzior (2012), whose research scope includes European countries and consistent with the predictions of the pecking-order theory, I hypothesize the relationship between GDP growth rate and leverage as follows:

H1: GDP growth rate negatively impacts firm leverage.

2.2.2 Stock Market Development

For a long time, stock market development has been used as a determinant to explain firms' capital structure choices. Theoretically, the stock market of developed countries tends to be active, recording a high volume of trading, and is less volatile, while the opposite occurs for developing countries (Kayo and Kimura, 2011; ul Ain et al., 2011). Hence, the development of stock markets means firms face additional sources of funding, for example, selling shares to raise capital (Wang et al., 2021). Firms tend to show a greater willingness to restrict debt usage. Specifically, when the stock is overvalued in the market, equity financing is preferred over debt, confirming the market timing theory. In practice, prior studies also found that as the stock market develops, it becomes a financing source, hence firms make less use of debts (Bokpin, 2009; Zafar et al., 2019). In light of the evidence from prior research, and consistent with the market timing theory, I therefore, hypothesize that stock market development is expected to have a negative effect on leverage.

H2: Stock market development negatively impacts firm leverage.

2.2.3 Banking Sector Development

From a theoretical standpoint, the development of the baking sector within a country influences firms' capital structure choices. A rationale is that a developed and well-functioning banking sector, makes external financing to firms more easily accessible, thereby enticing firms to adopt high levels of debt in their capital structure formation. These arguments find further evidence in the study of Agarwal and Mohtadi (2004) and Bokpin (2009) who posit a positive relationship between the banking industry development and long-term debt. Additionally, the results of Kedzior (2012) and Zafar et al. (2019), demonstrate that the banking sector positively affects leverage. Tchuigoua (2014) who investigated the degree to which the microfinance entities use leverage, also found that the development of the banking sector has a significant and positive effect on leverage. They show that the development of the banking sector causes firms to lean towards long-term debt over equity financing. Consistent with prior empirical findings I hypothesize as follows:

H3: The development of the banking sector positively impacts firm leverage.

2.2.4 Inflation

Inflation is another macroeconomic factor, that has been widely employed by literature as a possible determinant of capital structure choices (Gungoraydinoglu and Özde Öztekin, 2011; Kedzior, 2012; Zafar et al., 2019). It must be noted that prior research on the relationship between inflation and leverage has generated very contradicting results, leading to the emergence of two predominant perspectives within the literature regarding the relationship between inflation and the debt-to-equity ratio. The first perspective relies upon the assumption that debt financing becomes more attractive during periods of higher inflation rates. An increase in inflation levels is expected to cause a rise in interest rates. It is reasonable to predict that during inflationary periods firms would favor debt because interest rates increase, leaving companies better off due to the interest tax shield they obtain. These arguments are consistent with the study of Zafar et al. (2019) which found a positive relationship between inflation rates and debt financing. Likewise, Hanousek and Shamshur (2011) show that inflation has a positive correlation with debt financing. Conversely, the second perspective relies on the assumption that inflation causes price fluctuations and uncertainty in capital markets, making it difficult for companies to project the future. For example, to commensurate with the increased risk, lenders would expect higher rates of returns by placing greater risk premiums, ultimately increasing the cost of debt. Hence the firms may be more reluctant to take on debt due to the fear of not being able to meet the interest payment obligations (bankruptcy costs), resulting in firms issuing less debt. However, many would prompt questions about firms' hesitance to issue debt, particularly considering the previously mentioned advantages of interest rates, which result in firms being better left off due to benefits from interest tax shields. Literature addresses this inquiry by stating that, the uncertainty caused by inflation, damages the tax shield benefits. Because an inflationary environment is unpredictable, the tax shield benefits become also uncertain. For example, Hatzinikolaou et al. (2002) posit that inflation may cause distortions in the firm's income. They further argue inflation causes volatility in a firm's cash flows, ultimately limiting the chances to fully utilize the tax shield benefits or even losing them. Therefore, the uncertainty that inflation causes on interest rates increases the debt and bankruptcy costs and decreases the leverage benefits, by reducing the debt-equity ratio. These lines of arguments find evidence strong evidence in the study of Kedzior (2012), which shows a negative relationship between high inflation rates and debt usage due to increased bankruptcy costs and decreased leverage benefits. Gungoraydinoglu and Özde Öztekin (2011) also find that inflation negatively impacts debt levels. Likewise, Hochman and Palmon (1985) who particularly focused on the impact of inflation on the aggregate debt-asset ratio, found that an increase in inflation is associated with a decrease in debt because the interest rates tax shield loses its value. As mentioned before, fluctuations in interest rates, impact not only corporate taxes but also personal taxation of marginal investors. When personal taxation is introduced, the interest tax shield can be overstated as the combined effects of corporate and personal taxes can potentially either offset the present value of the interest tax shield or create a tax disadvantage. Additionally, companies cannot be sure whether they will benefit from tax shields in the future, especially during inflation periods, which increases uncertainty. For this thesis, I formulate the hypothesis by following the findings of Kedzior (2012), whose findings were based on EU-selected countries:

H4: Inflation negatively impacts firm leverage.

2.2.5 Corporate Tax Rate

In the corrected version of their research, Modigliani and Miller (1963) recognized the role of corporate taxes in capital structure and demonstrated how firms receive the interest tax shield when firms use debt. Considering the interest tax shield benefits, it is fair to predict that there is a positive relationship between corporate tax and debt. Tax shield benefits are additionally an important consideration in the trade-off theory, which aims to indicate the appropriate debt level that balances the interest tax shield benefits and the cost of financial distress. As predicted by the trade-off theory the present value of the tax shield initially increases with moderated borrowing, when the chances of entering financial distress are small. Additionally, Frank and Goyal (2009)) mention that this theory predicts a positive relationship between tax rate and leverage. Jõeveer (2013) finds that taxes are positively related to leverage, as higher tax rates suggest greater benefits from interest tax shields, thereby inducing leverage. Likewise, Gungoraydinoglu and Özde Öztekin (2011) find that higher tax rates are associated with increased levels of leverage. Nevertheless, the impact, that the corporate tax has on leverage, remains debatable. For example, according to trade-off theory, the positive relationship between corporate tax rate and leverage is especially true for big profitable firms, which can reasonably expect to make more use of tax shield benefits since the probability of entering financial distress is smaller. The opposite is true for smaller firms, which are less likely to benefit from the interest tax shield since they have a higher probability of insolvency than big firms. In addition, Bas et al. (2010) differentiate between long-term and short-term debt. They find a negative correlation between corporate tax rates and long-term debt, whereas a positive correlation was reported between tax rates and short-term debt. As corporate tax rates rise, firms tend to reduce their reliance on long-term debt while increasing their utilization of short-term debt. They further explain their results by contending that owing to the potential for bankruptcy and financial instability, corporations favor short-term debt to capitalize on tax shield advantages, thereby deeming long-term debt less favorable. According to Kedzior (2012), a consensus among capital structure scholars suggests that higher corporate tax rates tend to drive firms toward reducing their tax liabilities. Therefore, I expect a positive relationship between corporate tax and leverage.
It is worth highlighting that the tax rate is often classified as a firm-specific variable (Namara et al., 2017; Zafar et al., 2019). However, other scholars (Bas et al., 2010; Jõeveer, 2013; Kedzior, 2012) have categorized it as a macroeconomic determinant. Therefore in this study, I also categorize tax as a macroeconomic variable.

H5: Corporate tax positively impacts firm leverage.

2.3 Control variables

In addition to the five main macroeconomic independent variables, this study also includes a set of six control variables in the regression to better isolate the effects of the independent variables. Although the control variables are not of interest in the study, they are controlled because they may influence the regression outcomes. Often, similar literature controls for firm-specific characteristics (Gungoraydinoglu and Özde Öztekin, 2011). According to Fukui et al. (2023), the capital structure literature has employed different control variables, and the strategy to decide on which variables to include is not obvious. Based on existing literature examination (Bokpin, 2009; G.Rajan and Zingales, 1995; Gungoraydinoglu and Özde Öztekin, 2011; Zafar et al., 2019), this study includes the most commonly used control variables which are firm size, asset tangibility, firm profitability and volatility. Likewise, Fukui et al. (2023) argue that firm size, tangibility, and profitability are the most employed variables, while volatility is used somewhat frequently, and the other variables are used much less.

The first control variable is firm size. According to the trade-off theory, the bigger the company, the less the probability of facing bankruptcy. More precisely the theory suggests that these large companies are too big to fail, making it less risky for them to issue debt. Consequently, as predicted by the theory and tested by empirical studies there is a positive relationship between firm size and leverage (Dang and Garrett, 2015; Deesomsak et al., 2004). The second control variable is profitability, which also has the most consistent usage in literature as a control variable (Fukui et al., 2023). As predicted by the pecking order theory, firms adjust debt levels according to their profitability. The theory posits that more profitable firms have more retained earnings, making it a funding source, hence decreasing the amount of debt used. Empirically, studies (Huang and Ritter, 2009; Öztekin, 2015), have consistently found a negative relationship between profitability and leverage, supporting the pecking order theory.

Furthermore, the tangibility of firms' assets is controlled for in this study. If the trade-off theory holds, the leverage levels increase with asset tangibility. Tangible assets represent more secure collateral for investors, reducing debtholder risk, and hence reducing the cost of debt (Dang and Garrett, 2015)

An additional control variable to be tested for includes the volatility associated with a specific firm (Bokpin, 2009; Fukui et al., 2023). The level of risk plays a fundamental role in capital structure formation. As the volatility of a firm's cash flow rises, the likelihood of failing to meet debt obligations also increases. Hence, as the trade-off theory predicts, with respect to bankruptcy cost, a negative relationship between leverage and firm volatility is expected. However, consistent with the study of de Jong et al. (2008), mixed results can be generated regarding volatility, especially in a cross-country setting,

Moreover, besides the firm-specific variables, following the approach of de Jong et al. (2008), I control for industry variation. According to Kedzior (2012), a specific industry can potentially pose patterns in capital structure. Hence, companies tend to adjust their debt levels according to the industry they belong to. Therefore, to control for industry variations, industry dummies are included within the regression, based on a widely used industry classification method in literature. The industry is classified into six categories under SIC codes.

Finally, to control for the time effect, I follow an approach of the similar capital structure studies of Dasilas and Papasyriopoulos (2015) and Gungoraydinoglu and Özde Öztekin (2011), where time is included as a dummy variable.

Table 1: Literature review

Authors	Macroeconomic factors	Sample Scope	Sample Period	Findings
Zafar et al. (2019)	Bank industry size, Equity market size, Bond market size, GDP growth, Inflation, Tax rate	16 Asian countries	2008-2014	Positive relationship between inflation and debt financing due to increased tax shield benefits. Stock market development has a significant and negative impact on leverage. Bond market development is positively and significantly associated with leverage. Bank industry development is positively and significantly associated with leverage. GDP has a significant and negative impact on leverage. Tax rate has a significant and positive impact on leverage.
Jõeveer (2013)	GDP growth, Inflation, Foreign banks, Corruption, Corporate tax, Bank concentration, Shareholder rights, Credit rating	9 emerging countries	1995-2002	Tax rate, foreign bank concentration, and corporate tax have a significant positive impact on leverage. GDP growth, shareholder rights protection, inflation, and country credit rating have a significantly negative impact on leverage. Corruption is significantly and negatively related to leverage (less corruption, higher leverage levels).
Kedzior (2012)	Inflation, Stock market development, Bank industry development, GDP growth	EU selected countries	2001-2007	Inflation has a negative impact on high levels of debt. Stock market development has a significant and negative impact on debt issuance. Bank industry development has a significant and positive impact on debt issuance. Economic growth has a negative impact on debt issuance.
Gungoraydinoglu and Özde Öztekin (2011)	GDP growth, Inflation, Tax rate	37 countries internationally	1991-2006	Positive relationship between GDP and leverage. Negative relationship between inflation and leverage. Higher tax rates are associated with increased levels of leverage.
Hanousek and Shamshur (2011)	GDP growth, Expected inflation	7 Eastern European Countries	1996-2006	GDP growth has a significant and positive impact on leverage but is not significant for profitable firms. Expected inflation has a positive impact on leverage.

Table 1: (Continued). Literature review

Authors	Macroeconomic Determinants of Capital Structure	Sample Scope	Sample Period	Findings
Bas et al. (2010)	GDP per capita, GDP growth, Inflation, Interest, Tax rate	25 developing countries	2000-2002	GDP per capita is positively related to short-term debt, but it is negatively related to long-term debt. GDP growth is positively related to long-term debt but negatively related to short-term debt. Inflation is negatively related to leverage. No significant relationship between inflation and leverage, but interest is positively related to short-term leverage and negatively related to long-term debt. Tax is positively related to short-term debt; while it is negatively related to long-term debt.
Bokpin (2009)	Bank credit, GDP per capita, Inflation, Interest rate, Stock market development	34 emerging countries	1990-2006	Banking sector development positively impacts leverage. Significantly negative relation between GDP per capita and capital structure choices. Stock market development is insignificant. Inflation has a negative but insignificant impact on leverage. Interest rate positively impacts firms' choices to substitute long-term debt with short-term debt.
de Jong et al. (2008)	Bond market development, Creditor rights protection, GDP growth, Stock market development, Capital formation	42 countries worldwide	1997-2001	Bond market development has a significant and positive impact on leverage. Creditor rights protection has a significantly negative impact on leverage. GDP growth has a significantly positive impact on leverage. Stock market and capital formation have no significant impact on capital structure.
Hochman and Palmon (1985)	Inflation	Mathematical calculations	1985	As inflation increases, debt financing becomes less attractive to the corporation and the marginal investor.

3 Methodology

3.1 Sample and Data

This study's sample sample consists of publicly listed companies in their corresponding country's major stock exchanges for the period 2016-2019. The choice to include only publicly listed firms is motivated by the fact that these firms are required to disclose extensive financial information. The decision to include only the major stock exchanges was inspired by the similar approach of Antoniou et al. (2008). The sample period choice is guided by the objective of capturing the recent economic dynamics of the EU countries. The initial sample period covered 2016-2022, however, some of the macroeconomic data was not available after 2020. Moreover, due to COVID–19, starting in 2020, the domestic economic conditions deviated from the normal economic dynamics. Ultimately, the year 2020, is excluded from the sample as it can lead to biased results. Thus, this study's final sample period is settled to four years covering 2016-2019. All the above considered, the chosen sample time is a trade-off between data availability and capturing the effects of economic conditions. Likewise, de Jong et al. (2008) and Antoniou et al. (2008) follow a similar approach for their sample period selection. Additionally, because in the empirical model, the independent variables are lagged one year to avoid the risk of reverse causality, data is collected from 2015 to 2019.

The firms in this study cover 16 EU member countries. Although the goal was to maintain the sample size high, this study is not able to include all EU countries in its sample, because many countries do not have more than 10 listed firms with financial information. According to G.Rajan and Zingales (1995), when the faction of listed firms differs widely across different countries, it can be a potential source for bias. Yet, they further mention that for international data, a perfectly homogeneous sample is not likely to be achieved. The choice of the EU countries is dependent upon the firm-level financial information in ORBIS. As a general rule, the countries that have the highest number of firms for the study period are included, whereas all countries that have available data for less than 25 listed firms are excluded from the final sample.

Additionally, this thesis includes two main types of variables, namely macroeconomic variables and firm-specific variables. Data on macroeconomic factors is collected mainly from the World Bank Database. When needed macroeconomic data is also retrieved from other sources, such as Eurostat or International Monetary Fund.

Consistent with many capital structure studies, I focus only on non-financial companies. More precisely, the firms are selected based on the US SIC codes (Standard Industry Classification), including the following industry groups: Agriculture, Forestry and Fishing (SIC code 0100-0999), Mining (SIC code 1000-1499), Construction (SIC code 1500-1799), Manufacturing (SIC code 2000-3999), Transportation and Communications (4000-4999), Wholesale (SIC code 5000-5199), Retail (SIC code 5200- 5999) and Services (SIC code 7000-8999). All financial firms under SIC codes 6000-69999 are excluded from this study. It is very common in capital structure literature (Chipeta and Deressa, 2016; de Jong et al., 2008; Deesomsak et al., 2004; McMillan. and Camara, 2012) to eliminate financial firms because they are subject to different regulations that influence their capital structures. For instance, G.Rajan and Zingales (1995) mention that the leverage of financial firms is impacted by investor insurance schemes and that their debt liabilities are not likely to be comparable to the debt liabilities of non-financial firms.

Furthermore, additional filters are applied to reach the final sample in order to improve the quality of the data. All firms with missing financial information for the study period are eliminated. Whenever needed, other sources were employed to obtain the missing financial information, such as firms' annual reports. Yet, when it was not possible, such firms were excluded. Besides, companies, that have more liabilities than total assets, are also excluded from the sample. If such an instance occurs, it means that the firm is either in financial distress or technically insolvent.

Table 2 provides an overview of the final sample including the countries, the number of years of data, number of firms, firm-year observations and firms share of the final sample. The final pooled sample comprises a balanced panel of 1298 European listed firms over 4 years. The total firm – year observations add up to 5,192 due to the 4-year sample period. The final sample comprises only 16 member countries of EU, where Germany, Sweden, Poland, Romania and France have the highest share of the final sample.

Table 2: Summary of the final sample

Country	**Main Stock Exchange**	**Number of Years of Data**	**Number of Firms**	**Firm-Year Observations**	**Share of the Final Sample (%)**
Austria	Wiener Boerse	4	31	124	2.39
Belgium	Euronext Brussels	4	35	140	2.70
Croatia	Zagreb Stock Exchange	4	53	212	4.08
Cyprus	Cyprus Stock Exchange	4	25	100	1.93
Denmark	Nasdaq OMX Copenhagen	4	52	208	4.01
Finland	Nasdaq OMX Helsinki	4	88	352	6.78
France	Euronext Paris	4	121	484	9.32
Germany	Boerse Frankfurt	4	202	808	15.60
Greece	Athens Stock Exchange	4	36	144	2.77
Italy	Borsa Italiana	4	90	360	6.93
Netherlands	Euronext Amsterdam	4	37	148	2.85
Poland	Warsaw Stock Exchange	4	156	624	12.00
Romania	Bucharest Stock Exchange	4	128	512	9.86
Slovakia	Bratislava Stock Exchange	4	26	104	2.00
Spain	Bolsa de Madrid	4	41	164	3.16
Sweden	Nasdaq OMX Stockholm	4	177	708	13.60
Total			**1,298**	**5,192**	

3.2 Model specification

To investigate the relationship between the leverage proxies and the selected independent variables panel data is used. The independent and dependent variables are all plotted in a multiple linear regression equation. Building upon this thesis hypotheses, I present the following equations which are similar to de Jong et al. (2008), Bokpin (2009), Bas et al. (2010), Gungoraydinoglu and Özde Öztekin (2011), Hanousek and Shamshur (2011):

$$
\begin{aligned}
\text{LTD}_{ijt} =&\beta_0 + \beta_1\text{STOCKM}_{j,t-1} + \beta_2\text{BANK}_{j,t-1} \\
&+ \beta_3\text{GDP}_{j,t-1} + \beta_4\text{INFL}_{j,t-1} \\
&+ \beta_5\text{TAX}_{i,j,t-1} + \beta_6\text{SIZE}_{i,j,t-1} \\
&+ \beta_7\text{PROFIT}_{i,j,t-1} + \beta_8\text{TANG}_{i,j,t-1} \\
&+ \beta_9\text{VOL}_{i,j,t-1} + \beta_{10}\text{IND}_i \\
&+ \beta_{11}\text{YEAR}_i + \epsilon_{i,t}
\end{aligned} \tag{1}
$$

$$
\begin{aligned}
\text{STD}_{ijt} =&\beta_0 + \beta_1\text{STOCKM}_{j,t-1} + \beta_2\text{BANK}_{j,t-1} \\
&+ \beta_3\text{GDP}_{j,t-1} + \beta_4\text{INFL}_{j,t-1} \\
&+ \beta_5\text{TAX}_{i,j,t-1} + \beta_6\text{SIZE}_{i,j,t-1} \\
&+ \beta_7\text{PROFIT}_{i,j,t-1} + \beta_8\text{TANG}_{i,j,t-1} \\
&+ \beta_9\text{VOL}_{i,j,t-1} + \beta_{10}\text{IND}_i \\
&+ \beta_{11}\text{YEAR}_i + \epsilon_{i,t}
\end{aligned} \tag{2}
$$

$$
\begin{aligned}
\text{TD}_{ijt} =&\beta_0 + \beta_1\text{STOCKM}_{j,t-1} + \beta_2\text{BANK}_{j,t-1} \\
&+ \beta_3\text{GDP}_{j,t-1} + \beta_4\text{INFL}_{j,t-1} \\
&+ \beta_5\text{TAX}_{i,j,t-1} + \beta_6\text{SIZE}_{i,j,t-1} \\
&+ \beta_7\text{PROFIT}_{i,j,t-1} + \beta_8\text{TANG}_{i,j,t-1} \\
&+ \beta_9\text{VOL}_{i,j,t-1} + \beta_{10}\text{IND}_i \\
&+ \beta_{11}\text{YEAR}_i + \epsilon_{i,t}
\end{aligned} \tag{3}
$$

Where each symbol denotes: LTD=long-term debt ratio; STD=short-term debt ratio; TD=total debt ratio; i=firm, j=country, t=time; $t - 1$ = variable is 1-year lagged; β_0 = intercept of the regression model; β_{1-5} = regression coefficients for the independent variables; β_{6-11} = regression coefficients for the control variables; and ϵ = error term

3.2.1 Main econometric models

Prior studies have used various econometric models to explain the impact of the selected independent variables on capital structure, namely the ordinary least squares (OLS) (de Jong et al., 2008; Deesomsak et al., 2004; Hanousek and Shamshur, 2011; Kedzior, 2012), random-effects (RE) and fixed-effects (FE) (Gaud et al., 2007; Hanousek and Shamshur, 2011; Khan and Qasem, 2024; Namara et al., 2017), generalized method of moments (GMM) (Antoniou et al., 2008; Gungoraydinoglu and Özde Öztekin, 2011; Mateev et al., 2013), and feasible generalized least squares (FGLS) (Khan and Qasem, 2024). Notably, most capital structure studies employ the OLS as an efficient method, which estimates the regression parameters by minimizing the sum of squared differences between the observed values in the dataset and predicted values by the linear model, also known as residuals. However, the OLS properties are highly sensitive to three underlying assumptions, namely homoscedasticity (no heteroscedasticity), independence of error terms (no serial correlation) and normality. M.Wooldridge (2014) warns that the assumption of error terms' independence can be violated when the model includes lagged variables. Thus, provided that this study's equations include one-year lagged independent variables, it is expected for serial correlation to be present among the models. It happens frequently in empirical research that the assumptions of OLS are violated. As a consequence, other models are preferred by empirical research. To assess the reliability of an OLS regression, a series of statistical tests are conducted. In addition, it is also tested which model between FE and RE is more appropriate for this dataset. The Hausman test is performed to select between models. The appropriate econometric model for this study's regression is selected based on the results of statistical tests and the methodologies adopted in previous research.

3.2.2 Model specification tests

Test of Heteroscedasticity The first test was performed to identify whether the models were receptive to heteroscedasticity problems. Heteroscedasticity occurs when the error terms do not have a constant variance across all independent variables, which results in biased estimations of standard errors, thus impacting hypothesis testing. To ascertain, that heteroscedasticity is not present in the regression models, the "Breusch Pagan" statistical test was performed. "Breusch Pagan" test is based on two hypotheses, namely the null hypothesis (H0), which indicates that the variance of the errors is constant (there is homoscedasticity), while the alternative hypothesis (H1) suggests that the variance of the errors is not constant (there is heteroscedasticity). This test indicated strong evidence against the null hypothesis, hence the null hypothesis was rejected, suggesting the presence of heteroskedasticity.

Test of Serial Correlation Diagnostic examinations are carried out to investigate additional estimation issues related to serial correlation, also known as autocorrelation. Autocorrelation occurs when the error terms of a model are correlated over time, meaning that the errors in one period are dependent on the errors in preceding periods. Again, as mentioned, M.Wooldridge (2014) warns of the danger of serially correlated errors, especially in the presence of lagged variables, which is the case in this study. Several comparable studies have considered testing for autocorrelation, leading to the consensus that autocorrelation has been identified. To detect the presence of autocorrelation, M.Wooldridge (2014) suggests that a reliable statistical test is the Durbin-Watson (DW) test. The null hypothesis (H0) of Durbin-Watson implies no autocorrelation, while the alternative hypothesis implies that there is autocorrelation. M.Wooldridge (2014) states that the null hypothesis is rejected when the DW test equals a value less than 2. As expected, after the test was run and the hypotheses were tested, the results for all the regression models showed significant values less than 2. Therefore, for this test, the null hypothesis is rejected, meaning that there is autocorrelation among the models.

Test of Normality Another assumption that is made when using the OLS, is that the error terms should follow a normal distribution. To test this assumption, the residuals of the regression models are plotted in histograms. As noticed from Appendix 1, the regression models (with long-term debt and short-term debt as dependent variables), appear to be slightly skewed to the right, whereas the regression model, with total debt as a dependent variable, follows a normal distribution. Nevertheless, a technique to correct non-normality is the logarithmic transformation of the model[3]. When transforming the first and second models into a fully logarithmic one, normality appears to be improved, but for the model with short-term debt as a dependent variable, normality remains a problem. Hence, to improve the robustness of the analysis, fully logarithmic regressions are executed.

Hausman Test According to M.Wooldridge (2014) both Fixed Effects (FE) and Random Effects (RE) are used to handle the issue of unobserved effects in the model that are not captured by the observed variables. RE assumes that the unobserved effect is not correlated with any of the explanatory variables while the FE accounts for such correlation by eliminating the unobserved effect. It is common among researchers to employ both FE and RE models and then test for significant differences between the coefficients among the models. However, according to M.Wooldridge (2014), in order to select which models' estimates are more robust, the Hausman test is performed. The Hausman test checks whether the unobserved effects of a model are related to the explanatory variables. The null hypothesis implies that the preferred model is RE. Rejecting the null hypothesis suggests that the RE assumption, that the unobserved effects are random and not correlated to explanatory variables, is false. The Hausman test reported a p-value < 0.05, hence the null hypothesis is rejected. This suggests that FE estimates are preferred to be used over RE estimates. Moreover, the chi-square statistic is high, which indicates that the differences between RE and FE are also high, reinforcing that the FE estimates are more robust than RE.

[3]This information was retrieved from the statistic lectures at the University of Twente, from Dr. van der Kolk, H. (2022). Non-normality of residuals and omitted variables. https://canvas.utwente.nl/courses/11292/pages/560-non-normality-of-residuals-and-omitted-variables?module$_item_id = 352834$

Model Selection Provided the tests' results, the OLS assumptions of homoscedasticity, independence and partially for normality are violated. Again, although due to the violations of the assumptions, the OLS estimates remain unbiased, the bias occurs on the standard errors, which leads to problems for statistical inference (**?**). Consequently, the OLS method appears to be inappropriate. In addition, the Hausman test examined the null hypothesis and suggested that FE estimates are preferred to be used over RE. Nevertheless, provided the test results, the main issue within our data is heteroscedasticity and autocorrelation. According to (Khan and Qasem, 2024), the FGLS method shows resilience to issues of serial correlation and heteroscedasticity and non-normality across panel data, hence it is deemed to be a suitable method for the regression. FGLS is simply a transformed method of OLS, but unlike OLS it accounts for serial correlation and heteroscedasticity. Moreover, in a comparison analysis between OLS and FGLS, M.Wooldridge (2014) states that to handle autocorrelation and heteroscedasticity, the FGLS method is preferred. Furthermore, (Khan and Qasem, 2024) mention that the FGLS estimators are more efficient compared to either RE or FE. Therefore, building upon the statistical tests and consistent with Khan and Qasem (2024) and Mugosa (2015), whose models suffered from the same issues, FGLS appears to be a suitable method to effectively address the issues arising from heteroscedasticity and serial correlation. Following Khan and Qasem (2024) the OLS method is reported alongside FGLS, solely to verify whether the nature of the relationships between the variables is consistent with those observed in FGLS. The FE method is performed as a robustness test to check if the results will remain robust.

3.3 Variables measurement

3.3.1 Dependent variables

Consistent with Frank and Goyal (2009) and Namara et al. (2017), this study employs three different proxies for leverage, namely, long-term debt, short-term debt, and total debt. Although these proxies remain the three most common leverage measures among capital structure studies, notably previous research appears to use one or two of them, generally long-term and total debt. According to G.Rajan and Zingales (1995), all these measures have their respective disadvantages. For example, the total debt ratio may overstate the leverage amount while both short – and long–term debt do not capture the fact that some of the assets are offset by non-debt liabilities. These liabilities reduce the net asset base but are not reflected in measures of long-term and short-term debt. In addition, de Jong et al. (2008), contend that short-term debt involves trade credit, which is influenced by completely different determinants rather than the macroeconomic ones, which in turn impacts the results within the macroeconomic context. Therefore, they employ long-term debt as the most suitable proxy for leverage. Likewise, Cho et al. (2014) argue that the total debt is mostly driven by long-term debt. They further posit that short-term debt does not accurately reflect the factors that impact the firm's leverage due to its primary usage for financing current assets, making them in favor of long-term debt as a proxy for leverage. Following the argumentation provided by G.Rajan and Zingales (1995) that all these measures have their respective disadvantages and in line with Namara et al. (2017), all three aforementioned leverage proxies are included as dependent variables in this thesis, to analyse how the macroeconomic factors influence various leverage measures.

3.3.2 Independent variables

In previous research, the variation in how most of the macroeconomic variables are measured is minimal. This can perhaps be attributed to the widely accepted definitions of macroeconomic variables in literature, eventually ensuring comparability across studies. First, stock market development (STOCKM) is defined as the ratio of stock market capitalization and a country's GDP. Following similar studies (Alves and Francisco, 2015; Chipeta and Deressa, 2016; de Jong et al., 2008; G.Rajan and Zingales, 1995), stock market development is measured as stock market capitalization to GDP. The next variable is the banking industry development which is measured as the ratio of the domestic credit provided to the private sector to the GDP. Many studies (Chipeta and Deressa, 2016; G.Rajan and Zingales, 1995; Kedzior, 2012; Namara et al., 2017; Zafar et al., 2019) use such a proxy to measure the development of a country's banking sector. In regards to GDP growth, following substantial studies, the economic growth of a country is measured as the percentage change in GDP between the years. Further, there is some variation in how Inflation is measured in literature. Alves and Francisco (2015) use the annual change of the Customer Price Index (CPI) to measure the inflation of a country. Similarly, Namara et al. (2017) uses CPI as a proxy for inflation. Another way to measure inflation is the annual GDP deflator. The GDP deflator reflects changes in the price level of all goods and services included in GDP.

For instance, Mokhova and Zinecker (2014) employs the GDP deflator as a proxy for inflation. Both measures are reliable inflation proxies, but due to data limitations regarding CPI, the GDP deflator is used as e measure for inflation in this study. Finally, in line with Jõeveer (2013) and Fan et al. (2012), the corporate tax rate is the rate at which a firm is taxed on their taxable income.

3.3.3 Control variables

The literature documents some variation regarding how firm-specific variables are measured. First, some studies (de Jong et al., 2008; Kayo and Kimura, 2011; Li and Islam, 2019) measure the firm size as the natural logarithm of total sales. While, other research calculates the firm size as the natural logarithm of total assets (Bie and Haan, 2007; Fukui et al., 2023; Hanousek and Shamshur, 2011; Jõeveer, 2013; Namara et al., 2017). This study measures size as the natural logarithm of total assets. Furthermore, the second control variable, which is profitability, is calculated as the ratio of earnings before interest and taxes (EBIT) to the total assets. This calculation is also employed by several studies (Fukui et al., 2023; Jõeveer, 2013; Li and Islam, 2019; Namara et al., 2017). However, some other papers (Gaud et al., 2007; G.Rajan and Zingales, 1995) measure profitability as the ratio of EBITDA to the total assets. Due to data limitation to EBITDA, in this study, EBIT over total assets is used as a measure of profitability. Furthermore, consistent with several studies (de Jong et al., 2008; Hanousek and Shamshur, 2011; Jõeveer, 2013; Kayhan and Titman, 2007; Kayo and Kimura, 2011; Namara et al., 2017) tangibility is measured as the ratio between the fixed tangible assets over the total assets value. In regards to volatility, researchers appear to use different proxies. For example, Fukui et al. (2023), de Jong et al. (2008) and Zafar et al. (2019) use the standard deviation of the return on assets as a proxy for firms' volatility, while Kedzior (2012) uses the variation of earnings before interest and taxes. Following Fukui et al. (2023), who argue that the standard deviation of return on assets is the most commonly used proxy in literature, in this study volatility is also calculated as the standard deviation of ROA. In addition, to capture industry effects, following a similar approach as de Jong et al. (2008), Hanousek and Shamshur (2011) and Jõeveer (2013), industry dummies are included in this study. Agriculture, Forestry and Fishing is the reference category. Finally, to capture for time effect, the year of observation is also included as a dummy variable (Gungoraydinoglu and Özde Öztekin, 2011; Hanousek and Shamshur, 2011). The year 2016 is the reference category.

Table 3: Variable measurement and sources

VARIABLES	ABBREVIATION	MEASUREMENT	EMPIRICAL SOURCE	RETRIEVING SOURCE
DEPENDENT VARIABLES				
LONG-TERM DEBT	LTD	Long-term debt/total assets	Cho et al. (2014); de Jong et al. (2008); Frank and Goyal (2009); Hanousek and Shamshur (2011); Jõeveer (2013); Kedzior (2012)	ORBIS
SHORT-TERM DEBT	STD	Short-term debt/total assets	Frank and Goyal (2009); Namara et al. (2017)	ORBIS
TOTAL DEBT	TD	(Long-term debt + short-term debt)/total assets	Deesomsak et al. (2004); Hanousek and Shamshur (2011); Jõeveer (2013); Kedzior (2012)	ORBIS
INDEPENDENT VARIABLES				
GDP GROWTH	GDPGROWTH	% change in GDP growth	Alves and Francisco (2015); de Jong et al. (2008); Hanousek and Shamshur (2011); Jõeveer (2013); Kayo and Kimura (2011); Kedzior (2012); Zafar et al. (2019)	WORLD BANK
STOCK MARKET DEVELOPMENT	STOCKM	Stock market capitalization/GDP	Alves and Francisco (2015); Chipeta and Deressa (2016); de Jong et al. (2008); Kayo and Kimura (2011)	WORLD BANK
BANK SECTOR DEVELOPMENT	BANK	Domestic credit to private sector/GDP	Chipeta and Deressa (2016); G.Rajan and Zingales (1995); Kedzior (2012); Namara et al. (2017); Zafar et al. (2019)	WORLD BANK
INFLATION	INFL	%GDP deflator	Mokhova and Zinecker (2014)	WORLD BANK
CORPORATE TAX RATE	TAX	Effective tax rate	de Jong et al. (2008); Fan et al. (2012)	WORLD BANK

Table 3 (Continued). Variable measurement and sources

VARIABLES	ABBREVIATION	MEASUREMENT	EMPIRICAL SOURCE	RETRIEVING SOURCE
CONTROL VARIABLES				
PROFITABILITY	PROFIT	Earnings before Interest and Tax (EBIT)/total assets	Gaud et al. (2007); Kayo and Kimura (2011); Li and Islam (2019); Namara et al. (2017)	ORBIS
TANGIBILITY	TANG	Fixed tangible assets/total assets	de Jong et al. (2008); Hanousek and Shamshur (2011); Kayo and Kimura (2011); Namara et al. (2017)	ORBIS
FIRM SIZE	SIZE	Natural logarithm of total assets	Bie and Haan (2007); de Jong et al. (2008); Fukui et al. (2023); Hanousek and Shamshur (2011); Namara et al. (2017)	ORBIS
FIRM VOLATILITY	VOL	Standard deviation of Return on Assets (ROA) over the sample period	de Jong et al. (2008); Fukui et al. (2023); Zafar et al. (2019)	ORBIS
INDUSTRY	IND	Dummy variable, 1 if a certain industry, 0 otherwise	de Jong et al. (2008); Jõeveer (2013)	ORBIS
YEAR	YEAR	Dummy variable, 1 if a certain year, 0 otherwise	Gungoraydinoglu and Özde Öztekin (2011); Hanousek and Shamshur (2011)	

4 Results

4.1 Descriptive statistics

Table 4 provides the descriptive statistics for the pooled sample, whereas Table 15 in the Appendix summarizes the descriptives per country. Overall, the long-term debt of European firms is on average 13.5%. Countries in which firms appear to use more long-term debt are Austria (18.5%), Finland (16.6%), Greece (17.1%), Netherlands (19.2%) and Spain (21.6%), although the difference with the other countries in the sample is not high. Comparable ratios for long-term debt across European firms are also found in equivalent studies. For instance, for their pooled sample, Namara et al. (2017) find that the average long-term debt of European firms is 9.5%, while they also address Finland, Germany and Greece to make use more of long-term debt, but the opposite is true for Austria. In addition, similar means for some countries' long-term debt ratios are found when compared to the study of de Jong et al. (2008). For instance, they report an average long-term debt of 5.2% (Poland), 10.3% (Sweden), 12.1% (Finland),12.8% (Croatia), and 11.2% (Belgium), which do not seem to differ greatly from the ratios in this study, which reports a mean long-term debt of 9.1% (Poland), 15.2% (Sweden), 16.6% (Finland), 15.8% (Croatia), and 15.4% (Belgium). However, for the other remaining countries, de Jong et al. (2008) find lower average long-term debt ratios.

Regarding short-term debt, a mean of 6.5% is observed among the pooled sample, which is less than the average long-term debt. This implies, that European firms prefer long-term over short-term debt as a financing means. In contrast, Namara et al. (2017) find the same ratio for both long and short-term debt, which amounts to 9.5%. This difference can occur due to the different number of countries involved in the sample. The country that uses the least short-term debt is Germany (4.1%) and the Netherlands (4.2%).

When studying the total debt ratio, it can be noticed from the full sample, that the total debt across European firms is on average 20%, which is similar to Namara et al. (2017), who find an average total debt of 18.9%. The country with the highest total debt proportion in its listed firms' capital structure is Spain (28.8%), while the country with the firms' lowest total debt proportion is Slovakia (10.4%). Nevertheless, Kedzior (2012), finds a much higher value of total debt, which equals a mean of 53.90% for the firms within old EU member states and 40.67% for firms in the new EU member states. Such a difference can occur for the following reasons. First, the study of Kedzior (2012) also includes the UK, which was a part of old EU member states. For instance Devereux et al. (2018) find the average total debt of UK firms is 50.2%, which is relatively high and perhaps has contributed to the overall average total debt of European firms. Yet, this does not explain why the new EU member states, which exclude the UK, also have a high total debt ratio. This may also be explained by the fact that the data of this thesis is much newer compared toKedzior (2012).

Interestingly, although EU countries are characterized by an economic and monetary union, from Table 15, it can be noted that there is a variation of the leverage ratios between countries, where some countries have lower leverage ratios while others have higher leverage ratios. Kayo and Kimura (2011) report the same variation in their cross-country study. However, at this stage of the analysis, it remains difficult to determine the impact of specific country factors on leverage. This issue will be further examined in this study using the FGLS model. It is worth noting that the maximum values of long–term and total debt ratios do not exceed 1. This is due to the exclusion of firms with more liabilities than assets from the sample, as outlined in section 3.1. Including firms with leverage ratios exceeding 100% would imply that these firms are heading to insolvency. Their presence in this study would result in a sample containing outliers displaying atypical financial behavior.

The second set of variables in this study are the independent variables, namely the macroeconomic factors. The average GDP growth rate among EU countries is 2.7%. This result is lower than the mean value of 5.4%, which was found by Namara et al. (2017), whose sample had fewer countries included, and lower than 3.1%, which was found by de Jong et al. (2008), who have a relatively a higher number of countries included in their sample. Hence, the difference in the mean values of GDP growth rates may result due to the variation of the countries between the studies. Moreover, the countries that record on average the highest GDP growth rate are Cyprus (5.3%) and Romania (5%). On the contrary, the lowest average growth rate is exhibited by Greece (0.5%) and Italy (1.1%). Namara et al. (2017) report a similar growth rate for Greece and Italy of 0.6% and 1.7% respectively. Although this study and the aforementioned research are subject to different sample periods, an interesting insight, that can be extracted from this comparison, is that both these countries appear to have a slow economic development rate throughout the years.

Regarding the stock and bank markets, both appear to be developed among EU countries. This study finds similar means of stock market development when compared to the study of de Jong et al. (2008). For instance, they report a stock market development average of 64%, almost the same as this study (63.2%), both much lower than the results of Kayo and Kimura (2011), who find a mean of 104% and whose sample period is much larger. While, regarding the banking sector development, this study reports an average development rate of 87.4% among EU countries, which is slightly higher than the reported mean of 74.28% by Namara et al. (2017). Notably, in this study, in average Denmark has the most developed banking sector (164.8%), while Sweden has the highest developed stock market (135.3%).

Moreover, the pooled descriptive statistics show that the inflation level among the selected EU countries in this study is on average 1.5%. This outcome was expected because as mentioned in section 3.1, the sample period excludes the year when COVID occurred and the subsequent period, which were marked by elevated inflation rates. Notably, Romania scores the highest average inflation rate (4.1%) among the countries. Jõeveer (2013) similarly observe exceptionally high inflation rates in Romania, which remained high throughout their study period of 1995-2002. Nevertheless, although in their study inflation rates exhibit a downward trend, the principle remains the same, Romania has historically recorded some of the highest inflation rates. In contrast, Greece reports negative mean inflation rate (-0.1%), differently known as deflation, which is associated with lower customer spending, leading to an economic slowdown. Such an outcome makes sense and is coherent with the fact that the GDP growth of Greece is also the lowest among the countries in this study.

In terms of tax, the descriptive statistics show an average corporate tax rate of 24.1%, for the pooled sample. From the descriptive statistics by country, it can be noticed that the variation in corporate tax is relatively moderate, where the country with the highest average corporate tax is France (33.2%), whereas Cyprus has the smallest average corporate tax rate of 12.5%. Such a moderate variation can be explained by the similar economic policies that EU countries employ generally.

The last set of variables included in this thesis are the control variables, although not of main interest of this study. From Table 4 it can be seen that the firms of the pooled sample have a mean profitability of 6.0%. The statistics indicate that the profitability of firms is relatively concentrated around the mean and median. In addition, the interquartile range provided a good sense of the typical profitability levels of the firms in the sample, from which it can be extracted that, 50% of the firms have on average a profitability between 2.3% and 10%. It is also worth noting that the sample involves not profitable firms, as long as they are not heading to insolvency. The documented minimum profitability of -92.0% further supports this. Moreover, the descriptive statistics show that firm tangibility, volatility, and size (when measured as the natural logarithm of total assets) are on average 27.3%, 3.9%, and 12.43% respectively. These outcomes are almost aligned with the results of Namara et al. (2017). For instance, for the firm-specific variables, including profitability, tangibility, and size, Namara et al. (2017) find average values of 5.9%, 26.2%, and 11.61% respectively. Hence, it is reasonable to assume that their sample includes firms with similar characteristics as the one in this study.

Additionally, to capture other effects, industry is added as a control variable in the form of a dummy. Table 13 in Appendix 2 describes the distributions of firms across the SIC industry categories. Notably, the distribution of firms across industries is diverse. The sector of agriculture, forestry, and fishing, accounts for only 1.61% of the firms. Firms in the mining industry represent 2.15% of the sample, followed by retail, which accounts for 3.67%. Construction and wholesale represent respectively, 5.70% and 6.31%. Finally, the transportation and communication sector accounts for 7.64%, while the prevalent industry with the highest number of firms is manufacturing, which represents 54.39% of the final sample. The dominance of the manufacturing industry share in the final sample can be also found in the study of Mateev et al. (2013), but not in the study of Dasilas and Papasyriopoulos (2015), whose firm distribution across SIC industries is more uniform. Such differences in the distribution of firms across industries can result from the research setting and the types of firms included. For instance, unlike this study, Dasilas and Papasyriopoulos (2015) focus solely on one country context and restrict their research to SMEs, which perhaps may have influenced the firms' distribution across industries. Nevertheless, to understand whether the dominance of the manufacturing industry significantly impacts the results, a robustness test is performed. Therefore, to further verify the robustness of the results, two additional regressions were conducted, one excluding the manufacturing industry and another focusing exclusively on the manufacturing industry.

Finally, table 14 in the Appendix, describes the dependent variables statistics at an industry level. It summarizes the average debt used across SIC sectors. Notably, the transportation and communications sector has the highest long-term (18.80%) and total debt (23.63%), whereas wholesale is the industry that makes the most use of short-term debt (8.94%). The agriculture, forestry, and fishing sector, appears to use long-term debt the least (12.09%), followed by services which make the least use of total debt (17.46%) and mining which has the lowest short-term debt ratio of 3.09%.

Table 4: Descriptive Statistics

VARIABLES	MEAN	S.D.	MIN.	25th PERCENTILE	MEDIAN	75th PERCENTILE	MAX.
DEPENDENT VARIABLES							
LONG TERM DEBT	0.135	0.137	0	0.015	0.101	0.211	0.988
SHORT TERM DEBT	0.065	0.085	0	0.005	0.035	0.091	0.855
TOTAL DEBT	0.200	0.160	0	0.068	0.184	0.301	0.988
INDEPENDENT VARIABLES							
GDP GROWTH	0.027	0.016	-0.004	0.016	0.023	0.031	0.081
STOCKM	0.632	0.420	0.053	0.295	0.509	0.985	1.437
BANK	0.874	0.372	0.255	0.591	0.831	1.058	2.442
INFLATION	0.015	0.012	-0.007	0.008	0.0132	0.020	0.062
TAX	0.241	0.057	0.125	0.200	0.229	0.297	0.340
CONTROL VARIABLES							
PROFIT	0.060	0.099	-0.920	0.023	0.059	0.100	0.851
TANG	0.273	0.235	0	0.076	0.214	0.416	0.996
SIZE (Log Assets)	12.43	2.55	5.48	10.65	12.19	14.21	21.13
SIZE (in million dollars)	11.92	25.61	1.152	4.456	7.213	9.588	360.2
VOL	0.039	0.052	0.000	0.010	0.021	0.046	0.640

Note: This table reports the descriptive statistics for the pooled sample. The statistics report the results for the period of 2016 to 2019. Firm size is reported in its original form in million dollars and as the natural logarithm of total assets. The logarithmic transformation of size is used to run the regressions. The outliers are eliminated before the calculation of descriptive statistics. Definitions of all the variables are reported in section 3.3.

4.2 Pearson correlation matrix

The Pearson correlation matrix in Table 5 describes the observed relationships between the variables in this study. Substantial research (Fan et al., 2012; Khan and Qasem, 2024; Namara et al., 2017) appears to use 0.70 and 0.80 as a cut-off point to decide whether the variables suffer from multicollinearity. Coefficients higher than these cut-off points imply a near multicollinearity issue, while coefficients that equal 1, imply that there is a perfect multicollinearity issue between variables, which can bias the estimations. Table 5 shows that the correlation values in this study are generally under 50%, indicating that multicollinearity is not a concern among the chosen variables. Nevertheless, some correlations show some collinearity issues. Notably, consistent with previous studies (Dasilas and Papasyriopoulos, 2015; Khan and Qasem, 2024; Namara et al., 2017) total debt shows the highest positive correlation with long-term debt (0.844***) among the dependent variables. The reason why such a correlation is typical among research, is that total debt is composed of both long-term and short-term debt. As mentioned in section 3.3 total debt in this study is measured as short-term and long-term debt divided by the total assets. Since the long-term debt is a substantial part of total debt, changes in the previous debt will eventually affect the latter.

Negative and significant correlations are observed between GDP growth with both long-term debt (-0.179***) and total debt (-0.153***), confirming that as a country's GDP rate increases, the use of leverage decreases. Interestingly, there is no correlation between GDP growth and short-term debt. Namara et al. (2017) encounter exactly the same pattern, they observe no correlation between short-term debt and GDP growth. It may be that the short-term debt levels of a firm might be influenced by other factors than GDP growth.

As expected, there are positive and significant correlations between the banking sector with long-term debt (0.166***) and total debt (0.139***), implying that the more developed the banking sector, the higher the level of debt. The same type of correlation is observed between the stock market and the leverage proxies. In contrast, inflation appears to impact negatively long-term debt (-0.116**), short-term debt (-0.118***), and total debt (-0.162***), while tax shows a positive and significant correlation with long-term debt (0.154***) and total debt (0.114***), but the opposite is true for short-term debt (-0.032*).

The correlations with the highest values that were observed are among the independent variables. For instance, there is a highly positive and significant correlation for stock market with bank (0.674***), and inflation with GDP growth (0.434***). At the same time, tax and GDP growth (-0.644**) and inflation and bank (-0.416***) show the highest negative and significant correlations among the independent variables. Again, the aforementioned correlations are below the cut-off points of 0.70 and 0.80, except for the correlation between long-term and total debt, which is also justified by prior research. Nevertheless, to determine the presence of multicollinearity among the select variables, the variance inflation factor (VIF) was calculated. The outcomes of the VIF tests, which are reported in Table 12 in Appendix 1, show that all VIF values are below 3. Therefore, these results indicate that the correlation between the variables do not pose any issue of multicollinearity for the regression analysis.

Table 5: Pearson Correlation Matrix

	LTD	STD	TD	GDP	BANK	STOCKM	INFL	TAX	PROFIT	TANG	SIZE	VOL
LTD	1											
STD	-0.018	1										
TD	0.844***	0.519***	1									
GDP	-0.179***	0.000	-0.153***	1								
BANK	0.166***	-0.005	0.139***	-0.291***	1							
STOCKM	0.150***	-0.131***	0.058***	-0.271***	0.674***	1						
INFL	-0.116***	-0.118***	-0.162***	0.434***	-0.416***	-0.125***	1					
TAX	0.154***	-0.032*	0.114***	-0.644***	0.162***	0.243***	-0.324***	1				
PROFIT	-0.088***	-0.136***	-0.148***	-0.054***	0.077***	0.123***	0.005	0.05***	1			
TANG	0.119***	0.071***	0.140***	0.250***	-0.286***	-0.390***	0.149***	-0.275***	-0.140***	1		
SIZE	0.272***	-0.061	0.200***	-0.334***	0.220***	0.210***	-0.254***	0.365***	0.114***	-0.068***	1	
VOL	-0.080***	0.006***	-0.065***	0.080***	-0.015	-0.026	-0.038***	-0.115***	-0.232***	-0.081***	-0.233***	1

Note: This table reports the Pearson correlation coefficients and their statistical significance. The definitions of the variables' abbreviations are explained in section 3.3. The coefficient statistical significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.3 Regression results

This section presents the regression results using the pooled FGLS method. Specifically, the goal is to examine the impact of macroeconomic factors on the leverage decisions of firms operating in the EU. As discussed in section 3.3.1 the chosen leverage proxies are long-term debt, total debt, and short-term debt, thus the significance of the selected macroeconomic factors on these three proxies is discussed. Table 6 provides the estimation results using the main econometric model chosen for this thesis, FGLS, hence the hypotheses interpretations are based on this model. Additionally, the OLS estimates are also reported, which as mentioned in section 3.2.2, are mainly included to verify whether the results remain robust, but are not further discussed in this thesis since its assumptions are statistically violated.

The relationship between GDP growth rate and long-term debt is found to be significant and negative (−0.191*), confirming hypothesis 1. These results are also consistent with Kayo and Kimura (2011),Hanousek and Shamshur (2011), Kedzior (2012), Namara et al. (2017), Bokpin (2009), who employ a similar measure for leverage and find a significant negative relationship between GDP growth and debt. Beyond statistical significance, we do observe a moderate economic significance (−0.191), an effect which is higher when compared to −0.0026 found by Namara et al. (2017), but similar to the coefficient of −0.176 found by Kayo and Kimura (2011). It can be concluded that during economic growth, there is a reduction in long-term debt, implying that firms rely less on debt and more on equity financing, as predicted by pecking-order theory. On the other hand, notice that GDP growth loses its significance when it comes to short-term and total debt. Interestingly, the GDP growth shows a positive relationship with short-term debt but is not significant. One possible explanation for the positive relationship between GDP and short-term debt can be that firms take advantage of economic expansion to finance immediate operational activities through short-term debt. Namara et al. (2017) observe a similar case; high economic growth increases short-term debt. Nevertheless, because such activities may be temporary, the GDP growth effect becomes smaller (0.015) when compared to its effect on long-term debt, hence relationship between GDP growth and short-term debt is economically less stable and becomes statistically insignificant. Likewise, the relationship between GDP growth and total debt is not significant, consistent with Namara et al. (2017). Again, short-term debt is reflected in the total debt calculation, which may impact the association between GDP and total debt, leading to a less consistent pattern. Overall, the results found in this study, confirm hypothesis 1 for long-term debt, but not for short-term and total debt. The relationship of GDP growth with long-term debt is not the only statistically significant but when considering its coefficients, GDP growth appears to have the strongest impact on long-term debt. Therefore, building upon these findings, we can conclude that as hypothesized, EU firms prefer their retained earnings as financing means for their investments during economic expansion.

Furthermore, the stock market development is expected to have a negative relationship with leverage. However, the results appear to vary quite a bit across the leverage proxies. Opposing the findings of Kayo and Kimura (2011) and Kedzior (2012), the FGLS model shows a positive and significant correlation with long-term debt (0.054***) and a non-significant relationship with total debt (−0.004), in columns 2 and 6 respectively. In contrast to long-term debt, an inverse relationship is found between stock market development and short-term debt (−0.062) at a 1% significance level, consistent with Zafar et al. (2019). The difference in coefficient signs for long-term and short-term debt can be explained by the fact that the stock market is frequently seen as a mechanism to diversify risk, where firms use multiple financial intermediaries for their financial needs(de Jong et al., 2008). Hence, leverage can either increase as the stock market develops because as explained by (Zafar et al., 2019) developed stock markets, have more diversified investment opportunities, providing the investors with the chance to work on projects that in other circumstances would not have been feasible. As a result, an investor might be willing to buy corporate bonds (which contribute to a firm's leverage), enabling firms to take more debt to finance investments that require significant financing. Leverage can also decrease because firms located in countries with efficient capital markets have easier access to equity funding, hence there is less need to rely on short-term debt. When looking at the significant coefficients, the magnitude of the effect for short-term debt(−0.062) is slightly larger in absolute terms compared to long-term debt (0.054). Economically these findings, imply that as the stock market boosts, firms tend to be more aggressive in reducing short-term debt than increasing long-term debt. However, because the size of the effect between them is not large, it is challenging to conclude that the stock market has the strongest effect on short-term debt rather than long-term debt. Accordingly, these outcomes lead to the rejection of Hypothesis 2 for long-term and total debt as leverage proxies. We accept hypothesis 2 solely based on short-term debt.

Moreover, the development of the banking sector shows a statistically significant and positive impact across all leverage proxies, confirming hypothesis 3 that when the bank offers more credit supply, the firm's leverage also increases. When comparing the coefficients (0.056**, 0.049***, 0.102*** for long-term, short-term, and total debt respectively), it can be noticed that the effect on long-term debt is slightly bigger than on short-term debt. Again, considering that both short-term and long-term debt coefficients do not largely differ, it cannot be established with certainty whether the banking sector has the strongest impact on long-term or short-term debt. However, the effect of size on total debt is notably larger, indicating that the overall borrowing capacity of firms increases by 10.2% for each unit increase in the banking sector. The particularly strong effect on total debt shows the important role of a well-developed banking sector in providing financial resources. This increase in overall leverage can also be because short-term and long-term debt are reflected in total debt calculation. Therefore, because the banking sector development significantly provides better access to both short-term and long-term debt, firms substantially increase their total borrowing. Furthermore, Bokpin (2009) argues that the positive association is explained by the fact that banks exert a degree of control over the firms they lend to, in order to ensure that such firms use the borrowed money responsibly, leading to better financial outcomes. Therefore, borrowing becomes a secure and attractive solution for firms. Empirically, these results, find further evidence in the work of Kedzior (2012), and Zafar et al. (2019).

In terms of inflation, it can be noticed that inflation has a negative impact on leverage, consistent with many empirical studies including MacKay and Phillips (2005),Gungoraydinoglu and Özde Öztekin (2011), Kedzior (2012), and Jõeveer (2013). The negative sign and significance hold across all models (−0.091***, −0.424***, −0.332***, for long-term, short-term and total debt respectively), confirming hypothesis 4. Evidently, the negative impact on short-term debt is larger compared to long-term debt. This means that firms may be especially sensitive to the immediate cost pressures and risks tied to short-term borrowing, resulting in a sharp decrease in short-term debt. Notice that the FGLS coefficient estimates of inflation appear to be the highest significant coefficients among other variables, suggesting that inflation acts as a strong deterrent to debt. Although these coefficient estimates tend to be larger than the aforementioned studies, yet the relationship remains statistically robust at a 1% significance level. The negative relationship between inflation and leverage can be explained by the following reasons. First, as discussed in section 2.2.4, during high inflationary periods, the tax shield generated from interests, can lose its value. Hence, companies cannot be sure whether they will benefit from tax shields during inflationary periods, making them less willing to issue debt. Second, an inflationary environment is associated with increased uncertainty and unpredictability in interest rates. Hatzinikolaou et al. (2002) mention that inflation may distort firms' income. Subsequently, it is reasonable to conclude that due to uncertainty about future financial costs, inflation drives firms to deleverage across both short-term and long-term obligations.

Finally, in regard to corporate tax, as expected the results show that the corporate tax rate has a positive and significant impact on long-term debt (0.137***), consistent with the trade-off theory predictions, which indicate that firms may use debt to take advantage of the interest payments' tax deduction. This outcome conforms with several previous studies (Gungoraydinoglu and Özde Öztekin, 2011; Jõeveer, 2013; Zafar et al., 2019). The results do not hold across the two latter models, where the significance sign disappears. In fact, unlike long-term debt, the negative coefficient for short-term debt (−0.031) may indicate that higher taxes discourage short-term borrowing, though this effect is not strong enough to be statistically confirmed. Overall, these findings contradict Bas et al. (2010), who report the coefficient estimates to be in the opposite direction (−0.1626*** and 0.4011*** for long-term debt and short-term debt respectively). However, such differences in results can be due to the different types of countries involved in each sample (the sample of Bas et al. (2010) comprises developing countries as opposed to this paper). Additionally, the lack of significance for total debt implies that while the corporate tax rate influences the debt structure (favoring long-term debt over short-term), it might not significantly affect the overall debt levels. Turning to economic significance, the positive effect of tax on long-term debt suggests that firms can strategically use long-term debt borrowing to reduce their tax burden. Whereas the lack of significance between tax and short-term debt and total debt signifies that these types of debt are not impacted by tax considerations and but rather by immediate liquidity needs or other operational considerations. Again, it becomes difficult to decide whether hypothesis 5 should be rejected or confirmed. However, given these outcomes, we accept hypothesis 5 based on long-term debt.

Notably, it appears that some of the results hold for long-term debt but not for the two latter leverage proxies. Kedzior (2012) explains that one reason for such inconsistency between leverage measures is that macroeconomic factors have the greatest impact on long-term debt, whereas short-term and total debt are more dependent on firm-specific factors. Hence, it is understandable, why also in this thesis some of the macroeconomic determinants such as GDP growth and tax were significantly impacting long-term debt but not short-term and total debt.

Table 6: Regression results

	Dependent variables:					
	Long term debt		Short term debt		Total debt	
	Pooled OLS	Pooled FGLS	Pooled OLS	Pooled FGLS	Pooled OLS	Pooled FGLS
	(1)	(2)	(3)	(4)	(5)	(6)
GDPGROWTH	−0.518***	−0.191*	−0.067	0.015	−0.559***	−0.162
	(0.132)	(0.102)	(0.091)	(0.076)	(0.153)	(0.113)
STOCKM	0.068***	0.054***	−0.054***	−0.062***	0.016	−0.004
	(0.009)	(0.014)	(0.006)	(0.010)	(0.011)	(0.017)
BANK	0.039***	0.056***	0.036***	0.049***	0.071***	0.102***
	(0.013)	(0.018)	(0.009)	(0.012)	(0.015)	(0.021)
INFL	−0.289*	−0.091***	−0.986***	−0.424***	−1.190***	−0.332***
	(0.171)	(0.179)	(0.117)	(0.130)	(0.198)	(0.200)
TAX	0.107**	0.137**	−0.044	−0.031	0.055	0.076
	(0.044)	(0.061)	(0.030)	(0.041)	(0.051)	(0.071)
PROFIT	−0.102***	−0.047***	−0.066***	−0.016*	−0.160***	−0.053***
	(0.014)	(0.012)	(0.009)	(0.009)	(0.016)	(0.013)
TANG	0.156***	0.157***	0.017**	0.008	0.164***	0.154***
	(0.010)	(0.011)	(0.007)	(0.008)	(0.011)	(0.013)
SIZE	−0.098***	0.038	−0.062***	−0.044	−0.152***	−0.001
	(0.034)	(0.039)	(0.023)	(0.028)	(0.039)	(0.044)
VOL	0.009***	0.010***	−0.002***	−0.0005	0.007***	0.010***
	(0.001)	(0.001)	(0.0005)	(0.001)	(0.001)	(0.001)
Constant	−0.118***	−0.156***	0.119***	0.079***	0.001	−0.082**
	(0.020)	(0.030)	(0.014)	(0.020)	(0.024)	(0.036)
Industry Dummies	Included	Included	Included	Included	Included	Included
Year Dummies	Included	Included	Included	Included	Included	Included
Observations	5,192	5,192	5,192	5,192	5,192	5,192
R^2	0.178		0.084		0.143	
Adjusted R^2	0.174		0.081		0.140	
F Statistic (df = 19; 5172)	58.751***		24.948***		45.500***	

Note: This table reports the estimates of the pooled FGLS regression model for the three dependent variables. FGLS addresses the issues of heteroscedasticity and autocorrelation in the error terms while OLS does not. For clarification, OLS is only included to check if the results remain robust. The variables measurement is reported in section 3.3. The regressions include year dummies and SIC codes dummies, which are not reported. Independent and control variables are lagged by one year except for the year and industry dummies. The numbers in parentheses represent the standard errors of the estimated coefficients. The coefficient statistical significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

4.4 Robustness checks

In this section, additional analyses are conducted to observe whether the relationships between the macroeconomic variables and the leverage measures remain the same. The method of interest of this thesis is the FGLS method, which is therefore utilized to conduct the robustness checks.

As reported in section 4.1, the manufacturing industry was observed to represent the largest share (54.39%) of the sample. Therefore, the sample is split into two parts, one part involves only the observations for the manufacturing industry, while the other part excludes the manufacturing industries and comprises all remaining industries. Table 16 in the Appendix reports the pooled descriptive statistics for the two sub-samples. The regression results are shown in Table 7, which comprises two panels. Panel A reports the regression results for the sub-sample that includes all industries but excludes the observations for the manufacturing industry, whereas panel B shows the outcomes for the sub-sample that includes only the observations for the manufacturing industry. Generally, some of the relationships remain robust. The impact of stock market development remains robust across all models. Likewise, the relationship between banking industry development and leverage remains significant, although its impact on long-term debt is weaker and its significance decreases to 10% in both panels.

However, there are some variations of results worth mentioning. First, GDP growth impact on long-term debt remains for the manufacturing industry (-0.255*), but when excluded, it loses significance on long-term debt. GDP growth was only significant at the 10% level in the main pooled sample, and when eliminating the dominant industry from the sample, the significance disappeared. Thus, it makes sense to posit that the manufacturing industry drives the observed relationship in the aggregated data. Evidently, The results indicate that the negative effect of GDP growth on leverage persists for firms in the manufacturing industry, whereas it does not hold for firms in the pooled sample of non-manufacturing industries. Kayo and Kimura (2011) use the concept of industry munificence to show how the influence of economic growth on firm leverage can change per industry. They describe industry munificence as the external growth that increases a firm's opportunities to generate resources by accumulating substantial financial revenues. Additionally, Kayo and Kimura (2011) are the first to show that industry munificence has a negative role on leverage choices. Chen et al. (2017) study munificence-abundance through manufacturing firms, hence it is fair to categorize the firms in the manufacturing industry as munificence abundant when compared to the other remaining industries in our sample. Furthermore, firms operating in the manufacturing industry tend to be more sensitive to economic cycles because, during economic growth, this industry can experience higher revenues due to their heavy reliance on production and sales volumes. Therefore, by corroborating the results of Kayo and Kimura (2011), we can say that the significant negative impact of GDP growth on leverage only on the manufacturing industry, can be attributed to the abundance of financial resources available to these firms in the manufacturing industry (munificence-abundance). External growth (economic growth) facilitates higher sales and revenues for manufacturing firms, leading to increased retained earnings, which is an additional funding source. As a result, firms operating in the manufacturing industry might have the opportunity to rely more on internal funds, reducing their dependence on external debt.

Second, in panel A, the results hold for inflation in relation to short-term (-0.611***) and total debt (-0.586*). In panel B, inflation remains significant only for short-term debt (-0.306*). Accordingly, the firms in the non-manufacturing industry appear to be particularly sensitive to inflation rather than the firms in the manufacturing industry. A possible explanation for such inconsistency of results between the two sub-samples can be due to the different sizes of risk that the industries face in their respective environments. Again, Kayo and Kimura (2011) demonstrate that industry dynamism (defined as the business volatility and unpredictability) is a determinant of leverage. They find that increased industry dynamism is associated with reduced leverage. Further, Kayo and Kimura (2011) argue that just as individual firms that are considered riskier tend to have lower levels of leverage, an industry composed primarily of these riskier firms is likely to have a lower average level of leverage across all firms within that industry. In fact, these explanations find some evidence in this thesis, where the descriptives in Table 16 show that non-manufacturing firms have on average higher volatility than manufacturing firms (0.094 and 0.036 respectively). Additionally, when looking at the coefficients, it can be noticed that the effect of inflation on short-term debt for non-manufacturing industries is stronger than the effect in the manufacturing industry (-0.611*** and -0.306* respectively). As explained before inflationary environments are associated with a high degree of uncertainty in the future. In that sense, the pressure of inflation becomes even more important in industries with volatile firms, and less significant in industries with firms that exhibit lower volatility, which may be a possible reason why inflation yields varying results across the two sub-samples.

Third, when excluding the manufacturing industry from the sample (panel A), the tax rate is not significantly correlated with any of the leverage proxies. Whereas for the manufacturing industry, the tax relationship with long-term debt (0.225^{***}) remains robust. Hence, it can be concluded that tax considerations are not important leverage determinants for non-manufacturing firms. In contrast, they play a more crucial role for manufacturing firms in relation to their long-term debt decisions. The underlying rationale can be due to the fact that the manufacturing industry frequently comprises heavy capital investments in fixed assets. Therefore, it might be that the tax benefits for long-term debt are more attractive for this industry category because they can help compensate for the initial costs of capital investments.

The second robustness test is performed for the fixed effects regression. In total three regressions were executed. Table 8 reports the regression results of the FE model. The FGLS model is included in Table 8 for comparison reasons. Since FE controls for time-invariant characteristics (M.Wooldridge, 2014) the industry dummies are dropped. The industry does not vary over time for firms, hence any variable that remains constant is dropped from the FE method. The results demonstrate that most of the relationships remain robust, with some exceptions. GDP growth remains negatively correlated with long-term debt at 10% significance level. The negative effect of GDP growth on long-term debt is slightly stronger in the FGLS model (-0.191^{*}) compared to the FE model (-0.163^{*}). In contrast, the results do not remain exactly robust for the stock market development. For instance, the relationship between STOCKM and long-term debt remains robust when accounting for fixed effects (0.018^{**}). Evidently, the STOCKM impact is more pronounced in the FGLS model. Nevertheless, variations are noticed for STOCKM with short-term debt and total debt. When using FGLS, STOCKM has a significant negative relationship (-0.062^{***}) with short-term debt at 1% significance level, whereas when utilizing the FE model the significance and the nature of the relationship disappear (0.015). The opposite occurs between STOCKM and total debt, where the coefficients are (-0.004) for FGLS and (0.033^{**}) for FE.

In regards to the correlation between BANK and leverage proxies, the significance found in the FGLS model does not hold for the fixed effects. Notably, under fixed effects, the BANK coefficients in columns 1 and 5 turn negative, although they remain statistically insignificant. Khan and Qasem (2024), who employ both FE and FGLS models, also observe differences in the signs of coefficients across these models. While their findings remain largely robust, evidently it is not unusual for a coefficient sign to differ between FE and FGLS.

Furthermore, inflation consistently shows a negative and significant impact on long-term debt. Nevertheless, when accounting for fixed effects the negative effect of inflation on long-term debt becomes slightly weaker, where the coefficient in the FE model is (-0.085^{***}) compared to (-0.091^{***}) in the FGLS model. The results hold for the impact of the tax rate on the three leverage proxies.

Overall, some statistically significant results persist when accounting for fixed effects with some exceptions. The variation in significance between FE and FGLS could be attributed to the different approaches these methods handle heteroskedasticity and autocorrelation. Clearly, the FGLS model demonstrates more consistent and stronger relationships among the variables, indicating that it provides more reliable estimates when heteroskedasticity and autocorrelation are present. Regarding the effect size, a similar pattern is also reported by Khan and Qasem (2024), who find the effects of the independent variables to be larger in the FGLS model compared to the FE model.

Table 7: Regression results: Industry Sample

	Dependent variables		
	Long-term debt	Short-term debt Pooled FGLS	Total debt
	(1)	(2)	(3)
Panel A: Pooled FGLS for all industries excluding manufacturing			
GDPGROWTH	-0.123	-0.071	-0.192
	(0.159)	(0.108)	(0.172)
STOCKM	0.068***	-0.049***	0.023
	(0.021)	(0.012)	(0.023)
BANK	0.045*	0.054***	0.097***
	(0.026)	(0.015)	(0.029)
INFL	-0.200	-0.611***	-0.586*
	(0.284)	(0.183)	(0.310)
TAX	0.040	0.0001	0.036
	(0.095)	(0.055)	(0.105)
PROFIT	-0.023	-0.035***	-0.052***
	(0.017)	(0.011)	(0.018)
TANG	0.185***	0.022**	0.196***
	(0.016)	(0.010)	(0.018)
SIZE	0.087	0.001	0.080
	(0.057)	(0.036)	(0.062)
VOL	0.011***	0.0004	0.012***
	(0.001)	(0.001)	(0.001)
Constant	-0.167***	0.054**	-0.120***
	(0.038)	(0.022)	(0.043)
Industry Dummies	Included	Included	Included
Year Dummies	Included	Included	Included
Observations	2,368	2,368	2,368
Panel B: Pooled FGLS for Manufacturing Industry			
GDPGROWTH	-0.255*	0.109	-0.121
	(0.131)	(0.108)	(0.148)
STOCKM	0.038*	-0.073***	-0.033
	(0.020)	(0.015)	(0.025)
BANK	0.050*	0.053***	0.104***
	(0.026)	(0.020)	(0.032)
INFL	-0.008	-0.306*	-0.137
	(0.226)	(0.183)	(0.261)
TAX	0.225***	-0.055	0.110
	(0.078)	(0.059)	(0.097)
PROFIT	-0.081***	0.008	-0.055***
	(0.017)	(0.014)	(0.019)
TANG	0.113***	-0.014	0.088***
	(0.016)	(0.013)	(0.019)
SIZE	-0.038	-0.101**	-0.121*
	(0.054)	(0.043)	(0.063)
VOL	0.008***	-0.002*	0.008***
	(0.001)	(0.001)	(0.002)
Constant	-0.104***	0.111***	-0.001
	(0.026)	(0.020)	(0.031)
Industry Dummies	Omitted	Omitted	Omitted
Year Dummies	Included	Included	Included
Observations	2,824	2,824	2,824

Note: This table reports the estimates of the FGLS regression model for 2 sub-samples. Panel A reports the results for the sub-sample that includes all the industries but excludes the manufacturing industry. Panel B reports the results for the sub-sample that includes only the manufacturing industry. The regressions in Panel A include year dummies and SIC codes dummies, which are not reported. For clarification, in Panel B, the industry dummies are omitted as the sub-sample consists solely of firms from the manufacturing sector. Independent and control variables are lagged by one year except for the year and industry dummies. The numbers in parentheses represent the standard errors of the estimated coefficients. The coefficient statistical significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: Regression results: Fixed Effects

	Dependent variables:					
	Long term debt		Short term debt		Total debt	
	Pooled FE	Pooled FGLS	Pooled FE	Pooled FGLS	Pooled FE	Pooled FGLS
	(1)	(2)	(3)	(4)	(5)	(6)
GDPGROWTH	−0.163*	−0.191*	−0.005	0.015	−0.168	−0.162
	(0.100)	(0.102)	(0.077)	(0.076)	(0.108)	(0.113)
STOCKM	0.018**	0.054***	0.015	−0.062***	0.033**	−0.004
	(0.015)	(0.014)	(0.012)	(0.010)	(0.016)	(0.017)
BANK	−0.022	0.056***	0.012	0.049***	−0.010	0.102***
	(0.021)	(0.018)	(0.016)	(0.012)	(0.022)	(0.021)
INFL	−0.085***	−0.091***	0.041	−0.424***	−0.045	−0.332***
	(0.197)	(0.179)	(0.153)	(0.130)	(0.212)	(0.200)
TAX	0.092**	0.137**	−0.067	−0.031	0.024	0.076
	(0.092)	(0.061)	(0.071)	(0.041)	(0.099)	(0.071)
PROFIT	−0.053***	−0.047***	−0.010	−0.016*	−0.063***	−0.053***
	(0.017)	(0.012)	(0.013)	(0.009)	(0.018)	(0.013)
TANG	0.066***	0.157***	0.027	0.008	0.093***	0.154***
	(0.022)	(0.011)	(0.017)	(0.008)	(0.023)	(0.013)
SIZE	0.026***	0.038	0.014***	−0.044	0.041***	−0.001
	(0.005)	(0.039)	(0.004)	(0.028)	(0.006)	(0.044)
VOL	0.024***	0.010***	−0.048***	−0.0005	0.036***	0.010***
	(0.003)	(0.001)	(0.014)	(0.001)	(0.092)	(0.001)
Constant		−0.156***		0.079***		−0.082**
		(0.030)		(0.020)		(0.036)
Industry Dummies	Omitted	Included	Omitted	Included	Omitted	Included
Year Dummies	Included	Included	Included	Included	Included	Included
Observations	5,192	5,192	5,192	5,192	5,192	5,192
R^2	0.050		0.041		0.049	
Adjusted R^2	0.027		0.033		0.021	
F Statistic (df = 12; 3882)	17.029***		1.668*		16.646***	

Note: This table reports the estimates of the pooled FE regression model for the three dependent variables. The variables measurement is reported in section 3.3. The regressions include year dummies and SIC codes dummies, which are not reported. Independent and control variables are lagged by one year except for the year and industry dummies. The numbers in parentheses represent the standard errors of the estimated coefficients. The coefficient statistical significance levels are denoted as follows: * $p < 0.1$, ** $p < 0.05$, *** $p < 0.01$.

5 Conclusion and discussions

By performing multiple linear regression, this study was able to examine the relationship between the macroeconomic variables and the European firms' capital structure choices. To do so, I use a sample of 1298 firms across 16 EU member countries over the period of 2016-2019. Three measures of leverage are used, long-term debt, short-term debt, and total debt. In line with de Jong et al. (2008) and Kedzior (2012) evidence is found for significant correlations between macroeconomic variables and leverage for the firms operating within the EU.

The analysis shows that GDP growth negatively impacts long-term debt, as predicted by the pecking order theory. Interestingly, this adverse impact of GDP growth is statistically significant only for the long-term debt and not for the other two leverage proxies. It suggests that long-term debt is more sensitive to economic growth, rather than short-term and total debt, which is an indicator that firms appear to adjust their financing strategies differently depending on the type of debt. Notably, firms within the manufacturing sector appear to drive the observed relationship, indicating that manufacturing firms are more responsive to economic growth. This responsiveness is likely due to their ability to generate higher revenues and retained earnings, which reduces their reliance on debt.

Furthermore, the banking sector development was found to positively impact the firm leverage. The impact is significant across all three leverage proxies. The particularly strong effect on total debt conveys that a well-functioning bank enhances the overall borrowing capacity of firms. Empirically, this result confirms the findings of Bokpin (2009), Kedzior (2012) and Zafar et al. (2019). In economic terms, this correlation may arise because firms perceive developed and effective banks as reliable lenders, given their potential to monitor and help the firms lock in financial gains.

In addition, it has been shown that the stock market development increases long-term debt but the opposite happens for the short-term debt. This result is explained by the fact that the diversification opportunities, provided by efficient stock markets, mitigate the investor risk. In exchange, it encourages investors to purchase corporate bonds, thus supporting firms in raising long-term debt. Conversely, equity financing appears to be more attractive than short-term borrowing, as firms can raise capital through stock issuance to meet their immediate financial need, which does not require any immediate repayment.

Finally, it was found that tax positively influences long-term debt while inflation acts as the strongest deterrent to debt. Interestingly, the results obtained showed that the impact of inflation is stronger for the non-manufacturing industries, while the positive tax impact on debt is only applicable to the manufacturing industry. Given the variation of the results between the industries, these results must be viewed with careful consideration. For instance, it can be concluded that industries that are composed of riskier firms are more likely to decrease leverage during inflation since the pressure of inflation uncertainty and unpredictability is more pressing for high-volatile firms. At the same time, tax considerations seem to significantly impact only the leverage choices of the manufacturing industry, likely because interest payment deductions might provide greater advantages for firms within this sector.

5.1 Implications

5.1.1 Theoretical implications

This thesis comes up with several theoretical contributions. Theoretically, it provides up-to-date empirical evidence on how a set of macroeconomic variables impacts the leverage of non-financial listed firms operating under an economic and monetary union. To my utmost knowledge, the most recent macro-level literature, focused specifically on a few selected EU countries, is the study of Kedzior (2012), that analyzes the micro - and macro-related factors of capital structure among 13 EU countries including the UK, while other research is conducted within the context of developing and emerging economies (Agarwal and Mohtadi, 2004; Bas et al., 2010; Bokpin, 2009; Deesomsak et al., 2004) or international context (de Jong et al., 2008; Kayo and Kimura, 2011). In addition, this thesis underscores the importance of considering several leverage proxies when assessing the macroeconomic factors that impact firms' debt decisions. There is little research that examines the impact of macroeconomic factors across long-term, short-term, and total debt. Hence, it could be useful for other researchers to reflect on such differences. Furthermore, the descriptive statistics of this thesis can be of particular help to other cross-country capital structure studies, since they include macroeconomic data from 16 EU countries and microeconomic data for listed firms in their respective countries. Hence, the results of the descriptive statistics can offer valuable insights, particularly useful for comparison purposes.

5.1.2 Managerial implications

The results of this thesis have some important managerial implications. Examining the relationship between macroeconomic factors and capital structure provides managers with directions for effective financial management. A part of managers' attention should be focused on the macro environment when adjusting their capital structures. They can use the results of this thesis to optimize their financing costs. For instance, managers in manufacturing firms, might focus more on GDP growth and tax implications when making debt decisions, while those in other industries should pay closer attention to inflation by reconsidering whether the interest tax shield remains beneficial during inflationary periods. In addition, the findings of this thesis can be beneficial to managers to adjust their risk management strategies. Given the impact of each macroeconomic variable, managers can plan ex-ante how to proactively manage the risk by adjusting their debt level in response to inflationary dynamics. Finally, understanding how factors like stock market development, GDP growth development, and tax impact different types of debt, can help managers to make informed decisions on how to strategically use their short-term and long-term debt to align with the economic conditions.

6 Limitations and future research

This thesis is also bound to several limitations. First, it is not investigated how different industry sectors might impact the relationship between macroeconomic factors and firm leverage. Although this was partially addressed in the robustness tests by splitting the sample into two sub-samples for the manufacturing industry and the remaining industries, yet a further examination is needed. It could be valuable for future research to examine how the relationship between macroeconomic determinants and leverage varies across different sectors within the EU.

Second, the sample involves only EU-listed firms. The listed companies are exposed differently to the fluctuations of the stock market when compared to non-listed firms. Hence, the results might not be generalized to unlisted firms, especially in the context of the stock market. It might be interesting for the future to also include both privately held and public firms, if possible, when studying the relationship between the macroeconomic factors and leverage choices and test for statistically significant differences between these two categories.

Finally, this thesis showed that leverage proxies are influenced differently by macroeconomic factors. Several discussions were presented to address such differences, however, there is room for future research to empirically explore the underlying mechanisms driving these differences to provide a more comprehensive understanding.

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7 Appendixes

7.1 Appendix 1: Testing assumptions

7.1.1 Testing for heteroscedasticity

Table 9: Studentized Breusch-Pagan Test

Model	**BP Statistic**	**df**	**p-value**
Model 1	230.16	19	<2.2e-16
Model 2	230.84	19	<2.2e-16
Model 3	299.46	19	<2.2e-16

7.1.2 Testing for Serial Correlation

Table 10: Durbin-Watson Test

	DW Statistic	**p-value**	
Model 1	0.79652	<2.2e-16	Positive autocorrelation
Model 2	0.95072	<2.2e-16	Positive autocorrelation
Model 3	0.7239	<2.2e-16	Positive autocorrelation

7.1.3 FE vs RE: Hausman Test

Table 11: Hausman Test

	chisq	**df**	**p-value**
Model 1	61.473	12	<1.215e-08
Model 2	82.558	12	<1.339e-12
Model 3	127.59	12	<2.2e-16

7.1.4 Testing Normality

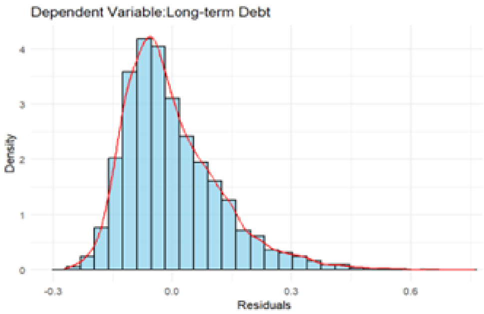

Figure 2: LTD distribution

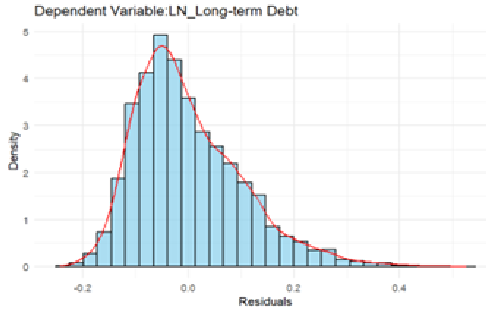

Figure 3: LTD logarithmic transformation

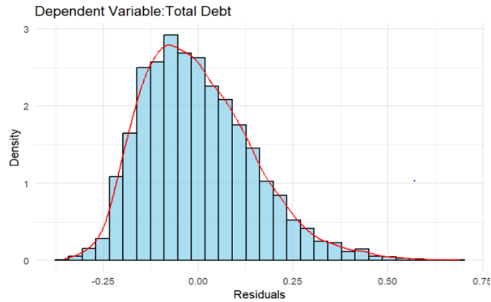

Figure 4: TD distribution

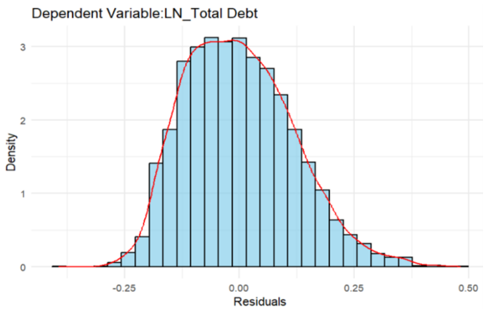

Figure 5: TD logarithmic transformation

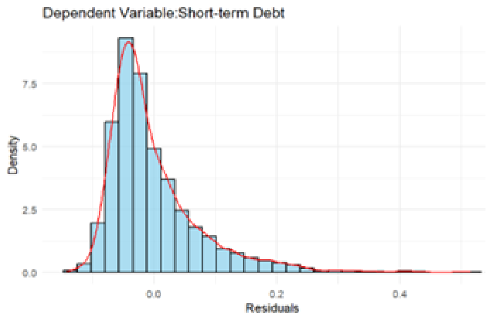

Figure 6: STD distribution

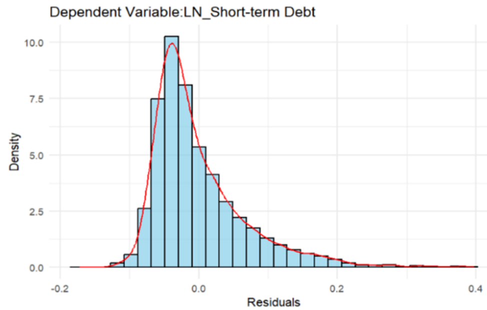

Figure 7: STD logarithmic transformation

7.1.5 Testing for multicollinearity

Table 12: Multicollinearity VIF results

	VIF
Panel A: Long-term debt model	
GDPGROWTH	1.894
STOCKM	1.442
BANK	1.434
INFL	1.372
TAX	1.116
PROFIT	1.070
TANG	1.070
SIZE	1.089
VOL	1.049
IndustryCategory	1.005
YEAR 2017	1.317
YEAR 2018	1.531
YEAR 2019	1.355
Panel B: Short-term debt model	
GDPGROWTH	1.213
STOCKM	1.480
BANK	1.496
INFL	1.373
TAX	1.147
PROFIT	1.032
TANG	1.088
SIZE	1.108
VOL	1.055
IndustryCategory	1.006
YEAR 2017	1.305
YEAR 2018	1.501
YEAR 2019	1.333
Panel C: Total debt model	
GDPGROWTH	1.180
STOCKM	1.424
BANK	1.403
INFL	1.373
TAX	1.103
PROFIT	1.027
TANG	1.061
SIZE	1.080
VOL	1.046
IndustryCategory	1.004
YEAR 2017	1.322
YEAR 2018	1.546
YEAR 2019	1.366

7.2 Appendix 2: Additional descriptive statistics

Table 13: Distribution of Firms by SIC Sector

SIC Sector	Number of Firms	Percentage of Firms (%)	N
Agriculture, Forestry, and Fishing	21	1.61	84
Mining	28	2.15	112
Construction	74	5.70	296
Manufacturing	706	54.39	2824
Transportation and Communications	100	7.64	397
Wholesale	82	6.31	328
Retail	48	3.67	191
Services	240	18.48	960

Table 14: Debt Composition by SIC Sector

SIC Sector	Long-Term Debt (%)	Short-Term Debt (%)	Total Debt (%)
Agriculture, Forestry, and Fishing	12.09	8.12	20.21
Mining	16.69	3.09	19.79
Construction	14.10	6.39	20.49
Manufacturing	13.01	7.16	20.18
Transportation and Communications	18.80	4.83	23.63
Wholesale	12.71	8.94	21.65
Retail	14.70	6.62	21.32
Services	12.47	4.98	17.46

Table 15: Descriptive Statistics per country

	LTD	STD	TD	GDPGROWTH	STOCKM	BANK	INFL	TAX	PROFIT	TANG	SIZE (Log Assets)	VOL
Austria												
Mean	0.185	0.063	0.248	0.019	0.293	0.844	0.017	0.250	0.048	0.324	13.73	0.019
S.D	0.133	0.071	0.141	0.005	0.044	0.009	0.004	0	0.047	0.167	1.88	0.015
Min	0	0	0	0.010	0.251	0.831	0.010	0.250	−0.113	0.002	9.25	0.001
Max	0.704	0.362	0.788	0.024	0.361	0.858	0.023	0.250	0.154	0.793	17.56	0.066
Belgium												
Mean	0.154	0.056	0.211	0.016	0.788	0.642	0.016	0.327	0.060	0.250	13.68	0.037
S.D	0.133	0.072	0.141	0.002	0.120	0.027	0.002	0.021	0.141	0.164	1.88	0.041
Min	0	0	0	0.012	0.591	0.606	0.013	0.290	−0.521	0.000	9.57	0.002
Max	0.596	0.368	0.597	0.020	0.896	0.680	0.019	0.340	0.429	0.722	19.36	0.140
Croatia												
Mean	0.158	0.088	0.245	0.030	0.372	0.582	0.008	0.195	0.030	0.523	12.58	0.044
S.D	0.137	0.094	0.179	0.004	0.026	0.034	0.008	0.008	0.085	0.255	2.15	0.055
Min	0	0	0	0.025	0.335	0.544	−0.0006	0.180	−0.627	0.030	8.98	0.003
Max	0.609	0.549	0.930	0.035	0.406	0.633	0.020	0.200	0.494	0.996	17.62	0.313
Cyprus												
Mean	0.132	0.124	0.257	0.053	0.127	1.576	0.001	0.125	0.022	0.464	10.86	0.047
S.D	0.169	0.120	0.202	0.011	0.006	0.399	0.008	0	0.073	0.287	1.49	0.040
Min	0	0	0	0.033	0.119	1.165	−0.007	0.125	−0.429	0	7.69	0.006
Max	0.814	0.437	0.910	0.064	0.135	2.442	0.010	0.125	0.187	0.945	13.35	0.187
Denmark												
Mean	0.117	0.043	0.161	0.025	1.154	1.648	0.006	0.223	0.071	0.232	12.74	0.056
S.D	0.125	0.068	0.145	0.004	0.077	0.035	0.003	0.006	0.170	0.216	2.37	0.076
Min	0	0	0	0.019	1.040	1.612	0.002	0.220	−0.920	0	6.57	0.003
Max	0.511	0.287	0.615	0.032	1.235	1.699	0.011	0.235	0.538	0.913	17.96	0.376
Finland												
Mean	0.166	0.054	0.221	0.019	0.935	0.940	0.011	0.200	0.059	0.181	12.95	0.045
S.D	0.143	0.071	0.157	0.011	0.064	0.004	0.007	0	0.107	0.164	2.34	0.051
Min	0	0	0	0.005	0.860	0.933	0.000	0.200	−0.480	0.003	8.51	0.003
Max	0.766	0.444	0.819	0.031	1.010	0.944	0.020	0.200	0.461	0.690	20.04	0.273

Table 15 (Continued). Descriptive Statistics per country

	LTD	STD	TD	GDPGROWTH	STOCKM	BANK	INFL	TAX	PROFIT	TANG	SIZE(Log Assets)	VOL
France												
Mean	0.158	0.065	0.224	0.015	0.909	0.995	0.007	0.332	0.049	0.201	13.43	0.029
S.D	0.117	0.065	0.136	0.005	0.087	0.035	0.002	0.001	0.104	0.165	2.33	0.045
Min	0	0	0	0.010	0.847	0.950	0.005	0.330	−0.680	0.001	8.75	0.000
Max	0.672	0.327	0.759	0.022	1.059	1.042	0.011	0.333	0.304	0.808	19.36	0.298
Germany												
Mean	0.138	0.041	0.180	0.018	0.515	0.778	0.016	0.298	0.074	0.224	13.04	0.028
S.D	0.136	0.057	0.156	0.006	0.062	0.003	0.002	0.001	0.082	0.193	2.41	0.341
Min	0	0	0	0.009	0.441	0.774	0.013	0.297	−0.389	0	6.62	0.000
Max	0.764	0.528	0.814	0.026	0.612	0.781	0.020	0.300	0.449	0.871	20.07	0.199
Greece												
Mean	0.171	0.142	0.314	0.005	0.210	1.035	−0.001	0.290	0.055	0.343	12.63	0.025
S.D	0.159	0.168	0.190	0.008	0.027	0.080	0.003	0	0.065	0.221	2.80	0.024
Min	0	0	0	−0.004	0.180	0.917	−0.005	0.290	−0.092	0.009	7.92	0.002
Max	0.669	0.855	0.855	0.016	0.253	1.127	0.002	0.290	0.199	0.881	21.13	0.128
Italy												
Mean	0.148	0.104	0.253	0.011	0.332	0.824	0.009	0.277	0.060	0.197	13.36	0.041
S.D	0.117	0.098	0.145	0.003	0.025	0.040	0.001	0.037	0.079	0.162	2.14	0.059
Min	0	0	0	0.007	0.307	0.767	0.007	0.240	−0.368	0.002	7.50	0.002
Max	0.701	0.593	0.781	0.016	0.368	0.873	0.011	0.314	0.600	0.773	19.67	0.288
Netherlands												
Mean	0.192	0.042	0.235	0.023	1.095	1.106	0.012	0.250	0.057	0.228	13.51	0.043
S.D	0.200	0.067	0.200	0.003	0.137	0.032	0.007	0	0.095	0.207	2.24	0.039
Min	0	0	0	0.019	0.951	1.054	0.004	0.250	−0.315	0.005	8.12	0.001
Max	0.988	0.468	0.988	0.029	1.319	1.145	0.024	0.250	0.279	0.806	17.71	0.148
Poland												
Mean	0.091	0.084	0.175	0.046	0.310	0.533	0.010	0.190	0.055	0.298	10.81	0.056
S.D	0.106	0.084	0.133	0.011	0.043	0.009	0.006	0	0.109	0.212	2.13	0.071
Min	0	0	0	0.029	0.272	0.524	0.000	0.190	−0.756	0.003	5.48	0.000
Max	0.731	0.738	0.789	0.059	0.383	0.547	0.017	0.190	0.645	0.906	18.30	0.569
Romania												

Table 15 (Continued). Descriptive Statistics per country

	LTD	STD	TD	GDPGROWTH	STOCKM	BANK	INFL	TAX	PROFIT	TANG	SIZE(Log Assets)	VOL
Mean	0.054	0.054	0.109	0.050	0.099	0.276	0.041	0.160	0.041	0.512	9.61	0.036
S.D	0.103	0.086	0.142	0.021	0.009	0.016	0.013	0	0.083	0.269	1.78	0.039
Min	0	0	0	0.028	0.085	0.255	0.026	0.160	−0.267	0.000	6.04	0.000
Max	0.609	0.532	0.922	0.081	0.112	0.299	0.062	0.160	0.602	0.990	17.21	0.235
Slovakia												
Mean	0.036	0.068	0.104	0.035	0.053	0.578	0.006	0.215	0.012	0.528	14.46	0.072
S.D	0.109	0.105	0.154	0.012	0.000	0.035	0.010	0.005	0.146	0.223	2.85	0.125
Min	0	0	0	0.019	0.053	0.524	−0.005	0.210	−0.692	0.000	6.70	0.002
Max	0.610	0.515	0.630	0.051	0.054	0.617	0.020	0.220	0.851	0.951	18.14	0.640
Spain												
Mean	0.216	0.072	0.288	0.030	0.603	1.090	0.008	0.257	0.064	0.254	13.99	0.029
S.D	0.147	0.105	0.169	0.005	0.067	0.072	0.005	0.010	0.063	0.198	2.55	0.043
Min	0	0	0	0.228	0.509	0.995	0.003	0.250	−0.135	0.017	7.101	0.002
Max	0.666	0.751	0.794	0.038	0.676	1.192	0.012	0.280	0.304	0.874	18.92	0.265
Sweden												
Mean	0.152	0.050	0.203	0.027	1.353	1.295	0.020	0.224	0.091	0.135	12.50	0.036
S.D	0.140	0.072	0.153	0.010	0.767	0.021	0.003	0.003	0.091	0.158	1.995	0.043
Min	0	0	0	0.019	1.230	1.266	0.015	0.220	−0.359	0.000	8.33	0.002
Max	0.778	0.594	0.932	0.044	1.437	1.318	0.023	0.229	0.591	0.941	17.78	0.265

Table 16: Descriptive Statistics

VARIABLES	MEAN	S.D.	MIN.	25th PERCENTILE	MEDIAN	75th PERCENTILE	MAX.
Panel A: Descriptive for the manufacturing industry sub-sample							
DEPENDENT VARIABLES							
LONG TERM DEBT	0.130	0.125	0	0.022	0.105	0.196	0.988
SHORT TERM DEBT	0.071	0.089	0	0.009	0.040	0.101	0.751
TOTAL DEBT	0.201	0.151	0	0.081	0.189	0.299	0.988
CONTROL VARIABLES							
PROFIT	0.065	0.094	-0.756	0.029	0.063	0.103	0.851
TANG	0.306	0.203	0.01	0.125	0.249	0.417	0.996
SIZE (Log Assets)	12.55	2.46	6.25	10.82	12.35	14.21	21.07
VOL	0.036	0.047	0.0003	0.010	0.020	0.041	0.56
Panel B: Descriptive for the sub-sample excluding manufacturing industry							
DEPENDENT VARIABLES							
LONG TERM DEBT	0.141	0.150	0	0.009	0.094	0.230	0.814
SHORT TERM DEBT	0.058	0.081	0	0.001	0.031	0.080	0.855
TOTAL DEBT	0.199	0.170	0	0.051	0.177	0.304	0.932
CONTROL VARIABLES							
PROFIT	0.054	0.105	-0.920	0.018	0.053	0.094	0.602
TANG	0.257	0.267	0	0.038	0.138	0.414	0.982
SIZE (Log Assets)	12.29	2.65	5.48	10.46	11.98	14.21	21.13
VOL	0.094	0.058	0.0004	0.011	0.022	0.050	0.640

Note: This table reports the descriptive statistics for the 2 sub-samples based on the industry sector. The descriptives for the macroeconomic variables are not reported because they remain the same and do not vary per industry. The statistics report the results for the period of 2016 to 2019. The outliers are eliminated before the calculation of descriptive statistics. Definitions of all the variables are reported in section 3.3.