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Impact of Corporate Taxes on Capital Structure Decisions: European Evidence from Covid-19 period

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Resumo

A teoria financeira indica a existência de uma relação positiva entre as taxas sobre o rendimento das empresas e o seu nível de alavancagem. Com base em dados de um painel de 510 empresas, localizadas nos países na qual se verificaram alterações nas taxas de imposto sobre a renda das empresas no período após o aparecimento da COVID-19 assim como no período anterior, este estudo permite avaliar se a relação entre tais taxas e a estrutura de capital das empresas sofreu alterações devido à pandemia da COVID-19. Estudos anteriores sobre efeitos da COVID-19 focaram-se apenas na averiguação do impacto que a pandemia teve no nível de alavancagem. Similarmente, os resultados deste estudo demonstram que por um lado a dívida de curto prazo foi negativamente impactada pela COVID-19, enquanto a dívida de longo prazo foi impactada positivamente. Além disso, é demonstrado também que a taxa de imposto sobre o rendimento das empresas tem de facto impacto na dívida total, tendo-se verificado uma mudança na relação entre as variáveis devido à crise provocada pela COVID-19. Enquanto antes da pandemia o aumento das taxas de imposto sobre o rendimento corporativo gerava um efeito de redução da dívida pelas empresas, no período posterior o efeito gerado é contrário e, portanto, há um aumento da dívida total pelas empresas. Finalmente, os resultados revelam também que o impacto da crise da COVID-19 na alavancagem das empresas foi diferente em cada país, sendo negativo em alguns e positivo em outros. Os resultados obtidos com este estudo são relevantes na medida em que provam a significância das taxas de imposto sobre a renda corporativa, podendo elucidar os legisladores sobre a real importância das políticas fiscais para as empresas em uma situação de crise comparada à COVID-19, assim como quais as medidas eficientes a serem tomadas.

Palavras-chave: COVID-19; Estrutura de Capital; Alavancagem; Taxa de imposto sobre o rendimento das pessoas coletivas; Teoria Trade-off ; Teoria Pecking-order.

Abstract

Financial theory indicates a positive relationship between corporate tax rates and firms' indebtedness. Based on panel data from 510 companies, located in countries that underwent changes in corporate income tax rates in both periods before and after the outbreak of the COVID-19, this study assesses differences in the impact of the corporate income tax rate in the firms' leverage caused by the COVID-19 pandemic. Previous research on COVID-19 were only focused in understanding the impact on the leverage levels of firms. The results indicate that the short-term debt was negatively impacted by the COVID-19, whereas the long-term was positively impacted. Similarly, this study demonstrates that the corporate income tax rate impacts the total debt ratio, indicating a change in such relationship due to the COVID-19 crisis. While before the COVID-19 an increase in the corporate income tax rates got the total leverage to decrease, in the period after, it causes an increase of the firm's total leverage. Finally, the findings reveal that the impact of COVID-19 on leverage was different among countries, as the corporate income tax rate relationship with leverage varies between positive and negative impacts for each country under analysis. The results obtained in this research are of high importance insofar as it proved corporate income tax rates to be a significant variable, being able to enlighten legislators on the importance of fiscal policy measures for companies in a crisis as COVID-19, as well as the efficient measures to be taken.

Keywords: COVID-19; Capital Structure; Leverage; Corporate income tax rate; Trade-off theory; Pecking-order theory.

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1. Introduction

The COVID-19, which emerged in Wuhan City, China, in December 2019 rapidly spread across the globe, being the first cases of coronavirus detected in Europe in February 2020. This unprecedented global health crisis had a profound impact on both companies and day-to-day life of individuals, has disrupted economies, strained healthcare systems, and brought about significant changes in how individuals and organizations operate. Governments implemented strict measures such as lockdowns, "severely restricting economic activity as well as the personal movement of their citizens" (Pirlot et al., 2020), and social distancing protocols to curb the virus's spread. According to an OECD report[1], the global health crisis triggered by the COVID-19 led to "a sharp decline in economic activity that is without precedent in recent history", and rapidly turned into a global economic crisis with much more serious effects on GDP than the 2008 financial crisis.

Therefore, since the appearance of the COVID-19 a lot of literature have been worried about predicting or understanding the effects that COVID-19 pandemic had on companies and their value, individuals, and economies (Debata et al., 2020; Kalemli-Ozcan et al., 2020; Shen et al., 2020; Bose et al., 2021; Clemente-Suárez et al., 2021). Regarding companies' leverage, existing studies are concerned with understand the changes of leverage with the appearance of COVID-19 (Unalmis et al., 2022); determination of the speed of adjustment toward target leverage ratio (Vo et al., 2022), or the effect of a debt-heavy capital structure on firm's risk faced during the pandemic (Huang & Ye, 2021). To date, none has focused on analysing changes in corporate income taxes after the onset of COVID-19, and how they could make companies plan their debt differently. Even with the growing interest in the effects of the financial crisis on the firm's behaviour, it remains restricted to the effect on the capital structure of firms, focusing only on the change of leverage after periods of crisis (Demirguc-Kunt et al., 2015; Fachada & Fonte Santa, 2019; D'Amato, 2020; Demirguc-Kunt et al., 2020). In this way, this constitutes an opportunity to research motivating the purpose of this research.

[1] Tax and fiscal policies after the COVID-19-19 crisis. (2021). In OECD Policy Responses to Coronavirus (COVID-19-19). https://doi.org/10.1787/5a8f24c3-en

This dissertation intends to explore the impact of the COVID-19 pandemic on the effect of taxes on the leverage of firms. Using a sample constituted by European non-financial firms, the purpose of this research is to analyse whether the relationship between taxes and leverage underwent changes due to the period of crisis brought by the COVID-19 pandemic, seeking to answer the following question: Does the COVID-19 pandemic in Europe impacted the relationship of corporate income taxes on firm's capital structure?

Capital structure decisions and how companies find it's optimal debt/equity ratio, has been discussed among years for several authors. Nowadays, it remains ambiguous, and the fact is that some authors even believe that should not be expected a universal theory justifying an optimal capital structure (Myers, 2001). Withal, two traditional approaches have been used to explain such issue, in one side the trade-off theory suggesting that firms' managers carefully trade-off the tax benefits derived from borrowing against the potential costs associated with financial distress, until reached an optimal debt ratio (Modigliani & Miller, 1963; Myers, 1984) and in the other side the pecking order theory defending that are employed different financing strategies to alleviate issues stemming from information asymmetry, creating a pecking order of securities (Myers & Majluf,1984; Myers, 1993). In this way, the consideration of the importance of taxes in the capital structure for the first time, was due to Modigliani and Miller (1963), that based on their initial findings argued that the inclusion of corporate taxes would lead to a firm increase in value proportional to the tax shield of the debt portion. Thenceforth, different authors tried to confirm and test the theory (MacKie-Mason,1990; Graham,1996; Gropp,2002; Bauer,2004; Faccio & Xu,2015), or presented alternatives impacting the value of leverage, such the impact of personal taxation (Farrar & Selwyn, 1967; Miller, 1977) or other sources of interest deduction (DeAngelo & Masulis, 1980). With the elaboration of this study, it is also expected that it will be possible to match one of the theories of capital structure to the sample under study and confirm the importance of taxes in the companies' capital decisions.

The pandemic has caused widespread disruptions, unprecedented government interventions, and significant shifts in economic and firms dynamics. By exploring the impact of taxes on capital structure in a post-COVID-19 era, and simultaneously realizing whether this relationship has changed due to the period of crisis, it is relevant since can contribute and assists in developing more effective financial policies if a similar situation

occurs in the near future. This is because it makes it possible to analyse the reaction of companies to changes in corporate income tax rates, and thus foresee promptly the demand for debts of different maturities, if it is necessary further ahead. Also, it can contribute to optimize firms' capital allocation decisions in the future, promoting then business and economic resilience in the face of future crises.

Considering this initial idea, it is important to outline the structure that will be followed in this study. It is divided in 5 parts, with the first part mentioning the most relevant literature on the field of this study and presenting important concepts that will be frequently mentioned throughout this dissertation. Part 2 establishes the hypotheses that will be tested through the models that are developed in the third part entitled Methodology. This third part also includes the variables that are relevant and included in the models, justifying its importance to the leverage determination, a summary statistic about each one, and also mentioning the sources for the data. In the fourth part are presented and critical discussed the results for each one of the regressions, first in a full period perspective, and then considering individually the period before and after the emergence of the COVID-19 crises, also framing it with the theories of capital structure. Lastly, in part 5 are highlighted the most important results and conclusions obtained from this study, as well as its limitations and possible opportunities for future research.

2. Literature review

Decisions about the capital structure on the companies' financing are very important for their economic performance, making that throughout time different discussions on the capital structure decisions have been emerged and conducted to different research, resulting in a vast literature on the subject.

Modigliani and Miller (1958) triggered the research on capital structure with the assumption that the market is perfect. The authors presented the irrelevance theorem, suggesting that companies' financing does not matter, being its value independent of the equity and debt used to finance their investments. The consideration of markets in perfect competition on the theory resulted in inadequate assumptions, such the inexistence of taxes, agency, transaction, and bankruptcy costs that do not hold in the real world. Later, Modigliani and Miller (1963) included corporate taxes on revenues on their previous model, eliminating the preposition of irrelevance, and making them be the first authors to demonstrate the role of tax benefits of debt. Since debt creates tax savings by allowing companies to deduct interest payments, it consequently results in an increase in available after-tax cash flows. On the second preposition Modigliani and Miller (1963) suggested that companies should use the maximum level of debt, since the average cost of capital decreases with higher tax shields from debt, maximizing the firm value and turning relevant the capital structure choices.

Based on these first ideas, two different theories emerged as an attempt to solve the issue behind the firm's choice on debt. The trade-off theory defends the existence of an optimal capital structure achieved by balancing the benefits and the costs of debt. The pecking order theory, contrary suggests that there isn't a debt ratio followed by firms, and that capital structure decisions are impacted by asymmetry in disclosure of information.

2.1. Trade-off theory

Leland(1998) defended that the theories on the capital structure decisions of firms were shaped by two different insights, in one side that the optimal capital structure reflects a balance between the tax advantages and the potential costs associated with debt, while in the additional view, the costs may also include the agency costs that result from conflicts of interest. In fact, if a company takes on too much debt to finance its projects, this will result in an increase of its financial risk that can lead, in an extreme picture, to bankruptcy. This

idea merged with the second framework of Modigliani and Miller(1963), constructing the Trade-off theory that suggests that firms balance the value of the interest tax shields against the costs of bankruptcy or financial embarrassment (Myers, 1984). In this capital structure theory, firms are viewed as having an optimal debt ratio that is represented by a trade-off, which they tend to continuously make adjustments to achieve (Myers, 1984). Taking the idea that the debt-ratio must be chosen with the goal of maximize the firm value (Brealey & Myers, 2003), the firms borrow until the present value of the tax shield is maximized from the increasing debt, trading it off with the increase on the likelihood of financial distress or bankruptcy.

The assumptions of the Trade-off theory were built under the idea of inexistence of transaction costs of adjustments of capital structure towards the optimal ratio, and so as stated on Brealey and Myers (2003) paper, "each firm should always be at its target debt ratio", always trying to move towards it. However, considering the unrealism of the idea of non-existence of transaction costs, it led to a different version of the trade-off theory, a dynamic model that takes into account the costs of adjustments on the capital structure to achieve the target debt ratio. First mentioned on Myers (1984) research, the author argued that subjectivity at "large adjustment costs could possibly explain the observed wide variation in actual debt ratios", so Dudley (2007) stated that firms will only adjust their ratios when the accrue benefits offset these costs.

Jensen and Meckling (1976) and Myers (1977) added a new idea that created a distinct vision and impacted the capital structure ideas. As Booth et. al (2001) named The Agency Theoretic Framework, it suggests the existence of agency relationships that create costs and have impact on firm's debt ratios, mentioning the conflict between the managers and shareholders and the conflict between shareholders and debtholders. Regarding the first conflict, it may happen when managers don't act on the behalf of the shareholders and, consequently, on the behalf of the firm. By incurring in debt financing, it will "increase the manager's share of the equity and mitigate the loss from the conflict", decreasing the "cash available to managers" contributing to a lower engagement in pursuits less favourable for firms (Harris & Raviv, 1991). In this way, the issuance of debt can be used as a way to control the management (Jensen & Meckling, 1976) guaranteeing that Cash Flows will be used accordingly and thus minimize conflicts (Jensen,1986). The second conflict between shareholders and debtholders arises because of the underinvestment problem mentioned by Myers (1977) that occurs when equityholders invests suboptimal. Such rejection of

investments with positive Net Present Value happens because the resulting profits are directed to bondholders. Harris and Raviv (1991) stated that equityholders invest in value decreasing projects because it will "result in a decrease in the value of the debt", and it generates an agency cost with debtholders nominated "asset substitution effect". By incorporating this new factor, the optimal debt ratio of firms results from a trade-off between the agency costs and the interest tax benefits of debt (Jensen & Meckling, 1976).

2.2. Pecking-order theory

Myers and Majluf (1984) and Myers (1984) exposed another hypothesis that raised a new idea for the capital structure theory. The authors explained a common situation where managers know more about the company' assets value and the value and possible benefits of the investments took by the company, when compared with outside investors less informed. The drawn hypothesis relates a situation where exists information asymmetry between the different parties, and Myers and Majluf (1984) and Myers (1984) believes the capital structure is designed to mitigate the inefficiencies of investments took by companies, reflected in the pecking order theory. This theory discards the existence of a target debt ratio and support an order of preference in the use of financing sources (Myers, 1993), dividing the corporate financing decisions process. Firms prefer internal to external financing and in case of need to require for external financing, managers prefer the safest securities and then debt to equity to fund projects. In short, debt ratios only change when investment opportunities with positive Net Present Value arise and there's no internal funds available. In such case, companies seek for external financing following a pecking order of securities, from the safest to the riskiest, with the equity issues the last resort. Nevertheless, as stated in Myers (1993) paper "the attraction of interest tax shields and the threat of financial distress are assumed to be second order" on the pecking order theory.

However, since the focus of this paper is based on the role that taxes play in firms' capital structure decisions, small relevance will be given to the foundations of this theory and instead relevant theoretical and empirical evidence on effect of tax statues on corporate debt usage will be reviewed in the following section.

2.3. Taxes and Capital Structure Relationship

As mentioned before on this literature review, Modigliani and Miller (1963) were the first researchers mentioning how taxes can impact the firms and the capital structure choice. Starting from their previous assumptions that were constructed under a perfect market, the authors conclude that the inclusion of corporate taxes would lead to a firm increase in value, when compared to a scenario in which it was unlevered, in an amount equal to the tax shield of the debt portion incurred by the firm. Following the predictions of this theory it would be expected that companies would take the full advantage of the tax shield and so prefer debt to finance their projects, since with higher corporate income tax rate, the deductions in the pre-tax earnings are higher and lead to a larger tax saving effect.

Miller (1977) suggested another broader version of the previous models by including personal income taxation to the discussion. When concentring all taxes in the decisions on capital structure, such as the corporate and personal tax rates on income, the author concluded that the personal taxes can be associated with large costs to use debt. In fact, the extreme idea of Miller (1977) considers that the gains of the tax shield of debt can be completely offset by the personal taxes in capital structure models, and so "the advantage of deductibility at the one level thus merely serves to offset the disadvantages of includability at the other", upraising the previously mentioned irrelevance theorem of capital structure. Farrar and Selwyn (1967) were the first authors studying the relationship of debt and the different types of corporate, personal and capital gains taxation. The findings predict that dividend taxes have an effect similar to that of corporate tax rates in encouraging the use of debt, so that personal income tax rates on dividend income are expected to have a positive relationship with leverage of firms. However, the taxation of interest payments at personal level is expected to have a contrary relationship with debt. As mentioned by Graham (2003) from the investors point, it is disadvantageous to hold debt instead of equity, making them require higher returns on debt and consequently eliminating the tax savings advantage of firms in preferring debt.

DeAngelo and Masulis (1980) by including other possible sources of interest deduction on their model, brought another contribution for the capital structure theory. According to the theoretical model, the tax shield benefit of debt is moderated by non-debt tax shields, creating a substitutability hypothesis. Also, the theory suggest that firm uses only the deduction on interest recurring from the debt, only after considering all the other sources

of tax shields substitutes for debt. Additionally, the framework of De Angelo and Masulis (1980) defends the idea of existence of a "unique interior optimum leverage decision with or without leverage related costs".

Turning to the empirical evidence, different studies were developed addressing the influence of taxes on the corporate debt choice. MacKie-Mason (1990) was among the first researchers trying to solve this issue and providing us with "clear evidence of substantial tax effects on the choice between issuing debt or equity". The author used discrete choice analysis to study incremental financial decisions while other previous research focused on the debt/equity ratio on cumulative result of the past years separate financing decisions, because author believed are "likely to have low power for effects at the margin". Using a sample of 1747 observations of American registrations of securities for public offering since 1977, the results confirm the theory and showed that the choice of debt to finance firms is positively correlated with the effective marginal tax rate, entitled the debt tax shield effect. Accordingly, the tax benefit of using the company's debt tax deduction increases as the corporate tax rate rises. Also, Graham (1996) uses the marginal tax rate to test its impacts on capital structure choice of a sample of more than US 10,000 firms. The author confirmed previous results, finding a positive effect of marginal tax rate on the debt used by firms, noting that firms with high tax rates tend to use more debt than those with low tax rates. Examining a dataset of Italian companies, Alworth and Arachi (2001) analysed incremental financing decisions to test the veracity of the role of taxes in encouraging the "excessive" indebtedness of firms, finding results that provide strong evidence of the impact of corporate taxes on companies' debt decisions. Additionally, the research results suggest also that the tax effects can be differential depending on the source of the indebtedness of the company. Cheng, Y., and Green, C. J. (2008), analysed the impact of tax policy on firms' leverage ratios in a balanced panel of 129 medium-sized listed European companies, suggesting that the effective tax rate is significant and positive in the debt equation, although they do not find such impact so much large.

We may find also literature contrasting two bets of study, investigating in one side the effects of corporate tax rates in a regional context and in the opposite side under international tax data. Gropp (2002) investigates the effects of taxes on debt-equity choice in German, due to the relative tax burdens on debt and equity vary greatly across the different communities in Germany. Including local business taxes on the model, Gropp

(2002) shows that taxes provide substantial incentives to German firms use debt financing. Also, in a study focused on the German corporate income tax reform in 2008, Doina and Michael (2010) shown that when the tax rate decreases due to a reform, there is a corresponding decline in the corporate debt ratio. Rajan and Zingales (1995) conducted research on a dataset composed of companies from the seven most advanced economies of the world. According to their results, only two countries don't confirm a positive correlation between tax advantages and leverage changes, against five firms demonstrating a positive relationship between both variables.

Furthermore, there are several empirical studies on the determinants of capital structure whose results despite not being directly related with the tax models presented on this literature review, may offer support indirectly. Bauer (2004) in a analyse of the determinants of capital structure of listed companies in the Czech Republic, found that in the sample in analyse, the leverage is positively correlated with taxes. Also, using a multitude of corporate tax changes in 29 OECD countries Faccio and Xu (2015) examined on their paper the effect of taxes on corporate capital structure, finding also that corporate taxes are significant determinants of capital structure choices, and that firms tend to increase their leverage with the increase of corporate taxes. As stated on their paper "across all OECD countries, taxes appear to be as important as other traditional variables in explaining capital structure choices". Examining a cross-section of firms in 39 developed and developing countries, Fan, Titman and Twite (2010), found that a country's legal and taxation system, explain a significant portion of the variation in leverage. However, in accordance with their results, the authors considered such relationship not as strong and pervasive as other influences on capital structure. Derashid and Zhang (2003) on their research concluded that the positive correlation between the corporate tax rate and the debt ratios is weak significant, or not significant. Contrary, Feld, Heckemeyer and Overesch (2013) on their meta-study results, support the view that taxes are an important determinant of capital structure choices, and the predicted tax effect is large when compared to other capital structure determinants.

Booth et. al (2001) were one of the authors who developed research to try to find if the impact of taxes on debt differs across countries whit different institutional structures, directing a study on the differences of the capital structure theory between European and United States countries and the countries in development. Their results found different

from all of research presented before and it shows a negative correlation between debt ratios and the tax rate. Also, it demonstrates that despite the differences in the institutional factors of these different countries, "debt ratios in developing countries seem to be affected in the same way" as in developed countries.

Looking for empirical evidence of the non-debt tax shield in the capital structure theory, there are different research that confirm or refute the hypothesis of DeAngelo and Mausilis (1980), while some empirical evidence refutes the idea presented. DeAngelo and Masulis (1980) substitutability hypothesis advocate that the non-debt tax shields have a negative relationship with the level of debt of firms, and it's supported by the Graham and Tucker (2006) research. The authors used a sample of tax shelter cases that causes non-debt tax shields, and investigated if the participation in a shelter is related to the firm's corporate debt policy, finding results that reveals a negative relationship between the two variables. On their sample, the firms engaged in tax sheltering exhibited lower levels of debt. Also, on a research mentioned before on this literature, Cheng, Y., and Green, C. J. (2008) stated that "non-debt tax shields are a substitute for debt in companies activities". In the same line, Givoly et al. (1992) research' findings indicate a substitution effect between debt and nondebt tax shields. Contrary, Bradley, et al. (1984) found a positive relationship between leverage and the level of non-tax shield, contradicting the traditional DeAngelo and Mausilis (1980) argument.

Concerning the capital structure model that considers the personal income taxation introduced by Miller (1977), the existent empirical research seems to be controversial with the theory. First, Givoly et al. (1992) analysed US firms and drew a different conclusion from the irrelevance framework proposed by Miller (1977), concluding that the firm's leverage is negatively impacted by personal taxes. Graham (1996) on his paper referred that the taxation at a personal level "does not seem to affect corporate debt policy in the manner anticipated" by the theoretical predictions. In this way, focusing later directly on this issue, Graham (1999) set a regression controlling personal taxes on and his results are indicative of a negative relationship between the personal taxes and the firm's debt usage. Also, Faccio and Xu (2015) on their study about the determinants of capital structure and analysing personal tax changes have concluded that the personal taxes on interest income have a negative effect on leverage. Contrary, Gordon and Lee (2001) confirmed the predicted by the theory and conclude that the benefits of the corporate taxes rates on the

average debt to asset ratio of firms is completely offset by the effects of personal tax rates, having effect's coefficients similar in value and of opposite signs.

2.4. Influence of previous crisis on firms' capital structure

Returning to theoretical assumptions, first Modigliani and Miller(1963) with the inclusion of taxes on their first irrelevance preposition demonstrated the benefits on the use of debt, created by the decrease in the cost of capital due to the higher tax shield related with the higher levels of debt in the capital structure. Encouraged by such preposition, Myers (1984) presented the trade-off theory and remembered that the decision of firms to increase their leverage ratios due to the tax deductibility should be taken under the notion that it also increases the risk of bankruptcy. Taking this into consideration, it's expected that in a situation of financial crisis the costs associated with the incurrence in debt will surpass the tax shield that favours the use of debt, making firms decrease leverage. On the Demirguc-Kunt et al. (2015) research to the World Bank group on the 2008-2009 period of the financial crisis and on the aftermath of 2010-2011, the authors confirmed the assumption and found "evidence of a widespread deleveraging of firms in developing countries and in high income countries", particularly a reduction on long-term debt financing. As Demirguc-Kunt et al. (2015) stated, the uncertainty and rise of risk during crisis make that "both lenders and borrowers become reluctant to lock-in capital in long-term investment", and in the end, this period turned "an important opportunity to study how financial and macroeconomic instability affect the capital structures of firms". Also, a study about the capital structure decision of UK, French and German firms revealed a similar impact of the world financial crisis, mentioning that despite the increase in the pre-crisis and during the crisis period in the leverage, the post-crisis years were remarked with a decrease in the overall debt ratios.

Demirguc-Kunt et al. (2020) focused on SME's and non-listed firms, and covering firms across 75 countries found similar results, with a decline in the firm leverage and debt maturity in both advanced economies and developing countries. Also, in an analyse of Portuguese SME'S, the results show a negative impact of the financial crisis on the total debt ratio, with the biggest decrease happening in the after-crisis period (Fachada & Fonte Santa, 2019). Finally, in the Italian SME's research, D'Amato (2020) showed that similar with past results, firms have decreased their corporate leverage during and following the financial crisis.

All the above-mentioned research has focused on the impact of the crisis period on the leverage taken by firms and consequently on the structure of the firm's capital to finance their projects. However, this dissertation will deepen and fill the gap on the literature focused on the impact of taxes change on the capital structure, in a crisis period.

3. Hypothesis for empirical testing

Different research mentioned before about the influence of previous crisis on firm's capital structure as well as studies on the COVID-19 effects, are focused on the movements of the leverage levels in periods of crisis. Hence, before testing for the impact of COVID-19 on relationship between the corporate taxes and leverage, it will be analysed if the trend of increase in corporate leverage after the 2008 crisis also occurred in the period after the onset of COVID-19.

H1: COVID-19 negatively impacted the companies' leverage.

Returning to the theory, it is stated a positive impact of taxes on the decisions about the debt choices, at times confirmed by empirical research. Accordingly, a change in the corporate tax rates will lead to change in the firms' capital structures, more precisely, an increase in the corporate tax rates will lead managers to increase firm's leverage ratios. Since the COVID-19 induced changes in the corporate tax structures of firms, it constitutes an opportunity to analyse the relationship between leverage and corporate tax rates under financial and macroeconomic instability. In this way, the second hypothesis to test on this research concerns with the relationship of corporate tax rates and the leverage, dipping into the possibility that COVID-19 impacted the magnitude in which changes in corporate tax rates cause changes in leverage of firms:

H2: The impact of corporate income taxes on the capital structure has changed after COVID-19.

Considering that the previously presented studies on the 2008 financial crisis were carried out considering different types of countries, revealing a similar effect of the crisis on leverage ratios, this investigation will also test whether the impact of COVID-19 was similar across countries whether in the leverage ratios, or the magnitude with which changes in corporate tax impact the leverage of companies:

H3: The impact of COVID-19 was similar among countries.

4. Methodology

Similar to other studies on the impact of interest rates on firm's capital structure, in the development of this dissertation it is estimated a panel model regression, in order to analyse if the COVID-19 changed the impact of corporate tax rates on the firms' leverage. In this way, this study uses a yearly panel data for different countries, whose selection criteria and search restriction will be presented later. Additionally, the results obtained will be used to assess compliance with different capital structure' theories.

Different theories and empirical research determining the relationship between taxes and the optimal capital structure of firms have using and underlying the importance of inclusion of both firm-specific (Givoly et al., 1992; Rajan & Zingales, 1995; Graham, J. R., 1996; Gropp, R.E., 2002; Cheng, Y., & Green, C. J., 2008; Faccio, M., & Xu, J., 2015) and macroeconomic variables (Gajurel, 2006; Frank & Goyal, 2008; Alufar Bokpin, 2009). In this way, in the following subtopic will be introduced different variables that will be used in the model to be applied in this dissertation.

4.1. Firm Leverage and Control Variables

As the purpose of this study relates to the analyse of firm's capital structure, the dependent variable used on this dissertation is **Leverage**, differentiating in short-term leverage, long-term leverage, and total leverage. In this way, the distinguishing of three forms of the dependent variable makes it possible to interpret if the impact that taxes have on capital structure varies accordingly with different maturities of debt. All the company-level data is expressed in book values and it is withdrawn from the annual financial information disclosed. Thus, short-term leverage is represented by the ratio of current loans and borrowings divided by the firm's total assets, while long term leverage divides the long-term interest-bearing debt by total assets. Finally, the total leverage ratio includes both types of debt relative to the amount of the firm's total assets.

Based on a judgement of different analysed researches, is notorious the importance of inclusion of different variables to control, that have been considered as determinants or potentially influencing the choices of the firm's capital structure, and thus affecting the costs or benefits of leverage. Accordingly, this section is dedicated to detail each one of the firm-specific and country-specific variables to include in the models to test the hypothesis previously described.

The **Size** have been mentioned as one of the variable impacting leverage, since it can have impact on the risk firms can take and, consequently, on their capacity to bear debt on the capital structure. Relating with the trade-off theory, the size of the firms may impact the costs associated with taking debt financing. Since big firms are expected to have a lower probability of financial distress or bankruptcy, this imply a positive relationship between the size and the leverage of the firms (Rajan & Zingales, 1995). Contrary, on the work by Myers and Majluf (1984), the pecking-order theory suggests that companies have a preferred hierarchy or "pecking order" of financing sources. Rottschaefer et al. (1945) provide some research on small firms, indicating that it is "extremely difficult or impossible to raise outside capital on reasonably favourable terms", resulting that most of them have to rely on retained earnings to finance themselves. However, retained earnings normally are not sufficient to cover the total financial needs of companies, making that firms may resort to debt financing as a less costly and available option compared to issuing new equity, this helping them maintaining their desired investment levels despite the limitations in accessing equity markets. In this way, the pecking-order theory e helps to believe in a possible negative relationship between the size of companies and the availability and use of debt. Following the Rajan and Zingales (1995) research, the company's size will be represented in this study by the logarithm of the total sales of companies.

Rajan and Zingales (1995) underlined the incorporation of Tangible Assets as important determinants of leverage. The willingness of lenders to give loans should be higher with the increasing value of the tangible assets, that may consequently increase leverage (Rajan & Zingales, 1995). Also, analysing in a perspective of the trade-off theory, since assets can be used as a collateral in case of bankruptcy as mentioned by Rajan and Zingales (1995), firms with higher tangibility are subject to lower costs of financial distress, and thus, a positive relationship between the fixed assets and the use of debt should be expected. Myers and Majluf (1984) refers to the existence of information asymmetries as responsible for the formation of a prioritization of the financing sources. Given the ease to assess the value of tangible assets compared to intangible assets, higher tangibility may help firm valuation. Thus, it contributes to increasing transparency and lower information asymmetry, reducing the cost of equity (Frank & Goyal, 2007) and resulting in a negative relationship with leverage. As in Rajan and Zingales (1995) research, **Tangibility** will be represented by a division of fixed assets by total assets.

The relationship between **Profitability** and leverage is controversial. In profitable firms, managers tend to do inadequate use of the free cash flows and incur in not so worthy investments, and so in the trade-off theory perspective of the agency relationships, Jensen (1986) mentioned that the firms will use debt to monitor their managers. In this way, it suggests a positive relationship between profitability and the use of debt by firms. On the other side, the Myers and Majluf (1984) theory of a Pecking order, by advocating the use by firms of the retained earnings as the first source of financing, the idea suggests an inverse relationship between both profitability and leverage. Also, Faccio and Xu (2015) agreed that profitable firms are more likely to incur in debt, mentioning profitability as crucial to measure the importance of the corporate taxes for firms. Following Faccio and Xu (2015) standards, profitability should be measured by the ROA ratio, dividing the operating income by the firm's beginning-of-the-year total assets.

As with profitability, the **Liquidity** of firms can have different impacts on leverage. Firms with large liquidity may have to control for managers investments, and as mentioned by Jensen (1986) the use of debt can help monitoring managers, and it can result in a positive relationship between liquidity and leverage. However, if firms have more liquidity means that will have more internal sources to finance their projects, and as in the pecking order theory of Myers and Majluf (1984), it will be used first as source of financing consequently decreasing the use of debt and turning the relationship between liquidity and leverage negative. Cheng, Y., and Green, C. J. (2008) results showed both positive and negative relationships according to different debt maturities, observing that liquidity have significant negative signs for total and short-term debt, but have a positive impact on long-term debt. Accordingly, as in Cheng, Y., and Green, C. J. (2008) liquidity is represented by the ratio between the value of current assets and the current liabilities.

Firm's **Growth** has been also considered a variable to control on studies about leverage since it may impact its values. As mentioned by Cheng, Y., and Green, C. J. (2008), firms that have high growth prospects and are heavy leveraged tend to ignore profitable investments, and so a negative relationship between growth opportunities and leverage is expected. Also, such underinvestment problem first mentioned by Myers (1977), is responsible for the emergence of agency costs between shareholders, mentioning the author that creation of limits to debt issue as the way to attenuate the conflict. Additionally, as a company experiences growth, it requires additional funds to finance its expansion

plans, and despite Myers and Majluf (1984) pecking order theory advocate the use in the first place of internal funds, it will become insufficient to meet the financing and growth needs. Consequently, firms will need of need external financing to bridge the funding gap, leading to an increase in leverage and a positive relationship between the variables. Accordingly, and consistent with the big majority of analysed studies as in Cheng, Y., and Green, C. J. (2008) research, the Market-to-Book ratio will be used to measure the growth of firms on this dissertation.

Beyond the firm-specific variables above mentioned, the macroeconomic conditions of the countries where the companies to be analysed are located must be considered. As in Faccio and Xu (2015) research, the regression model of this dissertation will control for **GDP Growth** and **Inflation**. Capital structure theories don't provide lots of consensual evidence to conclude about both variables impact on leverage. De Angelo and Masulis (1980) research stated that the higher inflation could be reflected on a lower value of non-debt tax shield, consequently promoting an increase in leverage by firms. In a contrary perspective, as noted by Taylor (1993), Interest rates are determined by a positively correlated function of inflation rates, meaning that in inflationary environment central banks often respond by increasing interest, turning debt financing more expensive for companies and consequently reduce their debt levels, and making them rely more on their retained funds. Also, an increase in GDP growth is normally associated with an increase of firm's profitability, consequently retaining more earnings. A possible interpretation from the perspective of the pecking-order theory of Myers and Majluf (1984), is that it will decrease the use of leverage because of the hierarchy in the use of financing source, predicting a negative relationship with leverage. Frank and Goyal (2009) on their research trying to determine the more important factors affecting leverage of firms, stated that high inflation levels encourage firms to increase their leverage. Different authors conducting empirical researches and focusing on the impact of macroeconomic conditions found contradictory results. While Gajurel (2006) results showed a negative relationship between leverage of Nepalese firms and inflation rate, Alufar Bokpin (2009) research results on emerging market economies stated a positive impact of inflation on the choice of short-term debt. Regarding GDP impact on leverage, the results found more consensual, defending a negative relationship between GDP growth rate and capital structure choices (Gajurel, 2006; Alufar Bokpin, 2009).

Non-debt tax shields must also be controlled considering the contributions of DeAngelo and Masulis (1980) to the capital structure theory. The proposal of the authors was that the tax shields from non-debt sources such as depreciations deductions decrease the leverage of firms because it can act as a substitute for the debt interest deduction. The pecking-order theory of capital structure, proposed by Myers and Majluf(1984) suggest that companies prioritize their financing choices based on the cost and availability of the funds. Despite non-debt tax shield is often see as a substitution for debt financing, generally it is less reliable and uncertain compared to interest expense deductions and thus, firms may be less inclined to heavily rely on it as a primary means of reducing taxes. Accordingly, although not certain, the two theories of capital structure lean more towards a negative relationship between the variables. As in Cheng, Y., and Green, C. J. (2008) research, the non-debt tax shield is considered in this dissertation by the division of the sum of depreciation charges amount by the total assets of the firm.

Contributions of Miller (1977) have showed us the importance of inclusion of **Personal Taxation** on the capital structure research regarding the impact that this may have on the costs of equity and interest payments. The author stated that the consideration of tax rates on personal income may completely offset the benefits of deductibility of corporate debt. The findings presented on literature predicted a positive effect of personal taxes rates on dividend income on the leverage of firms and a negative relationship regarding the tax rates of personal interest income. As in Faccio and Xu (2015), to control for personal taxation two variables will be considered, namely Personal Interest Tax (PIT) rate applied to interest income from corporate bonds in each country, and Dividend Tax (DIV) that is the Top Statutory Dividend Tax Rate Paid at the Shareholder Level.

4.1.1. Corporate Income Tax

It remains to include the key variable of this research in the model. As mentioned, the main focus of this research is based on the impact that taxes have on capital structure. More strictly, it is focused on the analysis of a possible change in the percentage of this impact when looking at a period prior to the COVID-19 pandemic. The fact that the imposition of taxes to companies comes together with the possibility to deduct the expenses with the interest, can be a reason to build a theoretically positive relationship between the amount of taxes incurred by companies and their leverage (MacKie-Mason,1990; Graham,1996; Gropp,2002; Bauer,2004; Faccio & Xu,2015). However,

research didn't mention if such impact prevails, or it's affected by periods of crisis, only focusing on the change of leverage after periods of crisis (Demirguc-Kunt et al., 2015; Fachada & Fonte Santa, 2019; D'Amato, 2020; Demirguc-Kunt et al., 2020). To control for the corporate income tax rates in the different years of this research it is considered the combined corporate income tax rate, that takes into account the statutory central corporate income tax rate of the central government less deductions for subnational taxes and plus the statutory subcentral corporate income rate.

4.2. Data and Summary Statistics

For the construction of the sample used in this study, it was first analysed which countries suffered changes on statutory corporate income tax rates in both periods pre and after the COVID-19. In result, this study will fall into the analysis of four countries: France, Germany, Greece and Sweden. The full sample of this analyse refers to the years between 2017 and 2022, where the first period (pre-COVID-19 period) covers information for 2017, 2018 and 2019, while the data for 2020, 2021 and 2022 is collected to analyse the period of COVID-19 (second period). It is important to underline that the effects of COVID-19 have not yet been completely overcome, so the data collected may not capture all the effects of the pandemic.

Regarding the firm-level variables, the financial accounting data for this study is collected from Orbis database, of which data of the annual reports of non-financial public listed companies from France, Germany, Greece and Sweden. The restriction of the research to companies that are non-financial is due to the fact of other companies as banks or insurance companies are not comparable in terms of the capital structure. The analysis falls on these 4 countries since they are the only ones that saw their corporate interest taxes change after and before the appearance of COVID-19. France and Germany are the countries that more changed its CIT. While Germany changed its CIT throughout all the analysed period with the exception of the last year 2022, the CIT in France didn't vary only in 2019. Interestingly, Greece and Sweden changed the CIT in the same years, which were 2019 and 2021. Considering all country-period of this sample, the income tax rates decreased more times than increased, being such shifts detailed in Graph3 for each country under analysis.

Concerning the need to control for macroeconomic conditions of the different countries, the data for both GDP growth rate and inflation rate is collected from Euro Statistics

Database[2]. Regarding the different possibilities to account for inflation, on this research it is considered the harmonized index of consumer prices since it is the index used by the European central bank to measure "the change over time in the prices of consumer goods and services purchased by euro area households"[3]. Lastly, data about the corporate income tax rates and dividend tax rates were gathered from the OECD statistics database[4], while the personal interest tax rates' collected data came from the European Commission database[5]. Different articles from KPMG, PWC and Deloitte were useful to confirm the data on the different taxes applicable in each country.

Considering that the sample used for the analyse compacts data from hundreds of companies over 6 years, some datasets suffer from data shortages because some companies do not publicly share some of the sections of their financial statements, which are crucial to calculate some variables' values. In this way, to deal with the lack of accounting information and prevent a bias derived from an incomplete data sample, it was only considered firms that release data which allows the calculation of all variables throughout the analysed period. The sample considered for this study incorporates data for 510 companies, totalizing 3060 observations. Despite the reduced sample, it will allow to take more accurate results and conclusions.

Table 1 reports the descriptive statistics for all the variables included in the model for the full sample, Table 2 refers to the pre-COVID-19 period, and Table 3 is restricted to the summary statistics in the COVID-19 period. As noticed, the mean for the dependent variable LEV_Total in the full sample period is 25.52 percent and most of the leverage incurred is in the form of long-term debt which represents 19.54 percent against 5.98 percent of short-term debt. Analysing the values in a pre and post COVID-19 crisis perspective, the mean of Total Leverage changed from 24.81 percent to 26.23 percent from one period to another. Such change was accompanied by opposite variations in the two types of debt, as the mean for the short-term debt decreased 0.27 percent, from 6.12 to 5.85 percent, and the long term suffered an increase of 1.70 percent. The variations of the

[2] Data about GDP Growth collected from: Database - National accounts - Eurostat. (n.d.). Eurostat. https://ec.europa.eu/eurostat/web/national-accounts/database ; Data about inflation rates collected from: Database - Harmonised Indices of Consumer Prices (HICP) - Eurostat. (n.d.). Eurostat. https://ec.europa.eu/eurostat/web/hicp/database

[3] European Central Bank. (2023, January 6). Measuring inflation – the Harmonised Index of Consumer Prices (HICP). https://www.ecb.europa.eu/stats/macroeconomic_and_sectoral/hicp/html/index.en.html

[4] OECD Statistics. (n.d.). https://stats.oecd.org/Index.aspx?DataSetCode=CTS_CIT

[5] Taxes in Europe Database v3. (n.d.). https://ec.europa.eu/taxation_customs/tedb/taxSearch.html

mean pooled results are too small and cannot be used to conclude, and therefore the study of the impact of COVID-19 on leverage should be done through a careful analysis. Regarding the variations of the leverage among firms, either total or long-term or short-term, the values of the ratio for the standard deviation also remain very similar comparing all periods.

For the firm specific variables, in both periods of analyse it's notorious that the average values reveal also a limited change when contrasting the pre and COVID-19 period. In the COVID-19 period, the ratio for profitability, liquidity, tangibility and non-debt tax shield increased while size and growth decreased from 5.73 percent to 5.78 and from 0.39 to 0.29 percent correspondingly. The largest variation occurred on liquidity ratio which could be associated with the decrease in short-term leverage referred above. Furthermore, the range of ratio values is the highest for this variable. While on a pre-COVID-19 period the maximum liquidity ratio was 39.03 in the COVID-19 period this value was of 485.71 that can be evidence of increase on liquidity and improvement of outstanding debt coverage for some companies. Interestingly, the maximum corporate leverage in the full sample period or even for short and long-term decreased after the COVID-19 pandemic. The possible reason to explain such movement is that firms that were previously more leveraged had to reduce these ratios in order to survive the abrupt crisis.

Looking for the macroeconomic variables in Table 1, the GDP growth is evidence that the period of this study is of great volatility, since the standard deviation for GDP growth (3.31 percent) is higher than its average value of 1.31 percent. As expected, the COVID-19 period is marked by high values of average inflation and a decrease in GDP growth rate, which went from 1.87 percent to 0.76 percent in the previous period. However, not only did it decline, but the GDP growth ratio suffered the greatest variations, with a minimum value of -9 and a maximum of 8.4 percent due to the beginning of the recovery from the lowest values of 2020. Allied to the decline in GDP growth[6], the most outstanding change is on the average inflation rate that increased almost 46 percent from one period to another (from 1.63 percent to 3.56 percent)[7].

With regard to tax variables, as expected the CIT decreased its mean value and the maximum and minimum values from a pre-COVID-19 period to the COVID-19 period,

[6] Graph 1 shows the GDP Growth rate between 2017 and 2022 for the different countries.
[7] Graph 2 shows the variation of inflation rate between 2017 and 2022 for the different countries.

since a decrease in the CIT may help companies to face the pandemic, as it decreases the tax burden. Taxes on dividends at shareholders level also suffered decreases on all descriptive statistics, while the taxes on personal income from corporate bonds remained unchanged in both periods.

Lastly, in Table 4 is presented a correlation matrix between the firm-specific factors, the macro-economic variables and the tax variables for the full sample, the pre-COVID-19 period and the COVID-19 period. According to the results, the correlation between the majority of the independent variables is low. However, the correlation between size and profitability, between the CIT with the PIT and DIV taxes, and the DIV and PIT correlation with each other present high values, and so may deserve a special attention.

A degree of correlation between size and profitability should be expected, because if a company does not show profitable results, it is unlikely to grow and increase its size. However, such degree of correlation is not so high, to be cause for concern. Also, it's not strange the high value of correlation between DIV and PIT since in most of the countries tax regime, the income from corporate bonds and the dividends shared by the company to its shareholders are taxed at similar rates. Lastly, the correlation between CIT with PIT and DIV could be pointed to double taxation problem. When a company decides to distribute dividends, it have already paid taxes on such earnings before deciding to proceed with the distribution. Once distributed, individuals when using the amount received will have to pay taxes on it, the same may happen for bond interest. The problem related with multicollinearity is that it overinflates the standard errors of the independent variables, and consequently results that some significant variables turn statistically insignificant (Akinwande et al., 2015). In conclusion, regarding the correlations mentioned before, the model will be tested for multicollinearity to ensure its capacity to handle all variables and obtain viable results.

4.3. Empirical Model

To explore whether COVID-19 has impacted the relationship between corporate taxes and firms' capital structure, the following models are regressed and account for differences in leverage across different maturities. Formally, the following models will allow testing the hypothesis that the impact of corporate income taxes on the capital structure has changed after COVID-19, as well as the H1 hypothesis that defends that COVID-19 negatively

impacted the companies' leverage, and the hypothesis H3 which claims a similar effect across countries, by restricting each model to the hypothesis to be tested.

$$(4.3.1)\ LEV\_Total_{it} = \alpha_0 + \beta_0 Covid_t + \sum_{J=1}^{n} \beta_j FM_{j,it} + \beta_{j+1} CTAX_{it} + \beta_{j+2} NDTS_{it} + \beta_{j+3} PIT_{it} + \beta_{j+4} DIV_{it} + \alpha_i + \varepsilon_{it}$$

$$(4.3.2)\ LEV\_Shortterm_{it} = \alpha_0 + \beta_0 Covid_t + \sum_{J=1}^{n} \beta_j FM_{j,it} + \beta_{j+1} CTAX_{it} + \beta_{j+2} NDTS_{it} + \beta_{j+3} PIT_{it} + \beta_{j+4} DIV_{it} + \alpha_i + \varepsilon_{it}$$

$$(4.3.3.)\ LEV\_Longterm_{it} = \alpha_0 + \beta_0 Covid_t + \sum_{J=1}^{n} \beta_j FM_{j,it} + \beta_{j+1} CTAX_{it} + \beta_{j+2} NDTS_{it} + \beta_{j+3} PIT_{it} + \beta_{j+4} DIV_{it} + \alpha_i + \varepsilon_{it}$$

where variables are different in time (t) and across different companies (i). The difference between each of the regressions falls on the dependent variable, defined in book values and intends to represent the company leverage. Each of the dependent variable represents the three different maturities under analysis, as which short-term debt ($LEV\_Shortterm_{ti}$) , long-term debt($LEV\_Longterm_{ti}$), and total debt(LEV_Total_{ti}). Each of the different debt ratios are calculated by a division whose denominator refers to the firms' total assets. With respect to the numerator, the loans and borrowings section of the balance sheet is considered for the short-term leverage, total long-term interest-bearing debt is considered for the long-term debt, and the total debt ratio numerator is obtained by the sum of the short-term and long-term numerators. In this way, it is possible to analyse different results and impacts in the different debt maturities.

FM_{Jti} is a set of control variables and includes all the firm-specific and macroeconomic variables detailed above as size, tangibility, profitability, liquidity, firm growth, GDP growth and Inflation. CIT_{ti} is the main control variable representing the corporate income tax rate that is also detailed on the control variables subsection. The non-debt tax shield affecting leverage are represented by $NDTS_{ti}$ in the model, and PIT_{ti} and DIV_{ti} are the two variables controlling for the impact of the personal tax rates, namely for taxes on debt income and taxes on dividends. In order to mitigate the potential bias caused by time-invariant heterogeneity specific to each firm, the model incorporates firm fixed effects (α_i), enabling to control for unobserved effects that may vary across firms but remain constant over time, thus addressing the issue of omitted variable bias. Lastly, ε_{it} represents the error term of the regression.

Additionally, to be possible to conclude about a different impact caused by COVID-19 on the relationship between corporate tax rates on the firms' capital structure, the model must incorporate a new dummy variable $Covid_t$ to control for the period of analyse. The variable will exhibit the value of 0 if analysing the pre-COVID-19 period and exhibit the value 1 after the outbreak of pandemic.

Restricting all models according to each hypothesis to be tested, it will be possible to use them to answer each one individually.

4.3.1. Types of Model and Robustness Tests

Before proceeding with the estimation of the models it was first needed to perform some tests, in order to decide about the most correct type of model. First, to test for the Random Effects (RE) model, it was performed a Breusch-Pagan Lagrange Multiplier test the test that underlines the preference of the RE model over the OLS model. In this way, to support the use of RE model it was performed the Hausman test. The result reflects that the RE model was rejected by the Hausman test after comparison of the coefficients of both models, and consequently the equation it's better estimated using a Fixed Effect (FE) model.

Additionally, to prove the robustness of each of the models presented, it was performed different tests on multicollinearity, heteroskedasticity and cross sectional independency. First, as mentioned before about multicollinearity, through the analyse of the correlation matrix it was detected moderate values of correlation between size and profitability, and CIT with PIT and DIV taxes, and a higher correlation that deserves more carefulness between DIV and PIT. To try to solve this issue all the variables was centered at mean values, and despite it changed the correlation values, they remained too high. As a result, to improve the model's fit the only solution would be to eliminate one of the highly correlated variables or aggregate the two variables, being this last option not possible to apply, due to the opposite effect of the variables in the leverage. Thus, the rule chosen for elimination of one of the variables was to choose the one that had a higher correlation with the other tax variable CIT, namely PIT. Despite this variable have been proved to be important impactful on leverage, its exclusion will allow to more accurate results. Finally, considering the centered value of the variables and eliminating the PIT variable, the correlation matrix has adequate and lower values.

To test for the presence of heteroskedasticity it was carried out a Wald test, in order to guarantee the existence of a constant variance of the errors. Since the test revealed the presence of heteroskedasticity, it has to be corrected on the standard errors to make possible to conclude about the statistical significance of each of the independent variables.

Serial correlation is another problem affecting regressions, contributing to the biase of the standard errors and turning results to be less efficient (Drukker, 2003). Thus, a Wooldridge test was performed to ensure that autocorrelation is not present in the model, rejecting the hypothesis stating the inexistence of first order correlation with a 5% level of significance.

Lastly, it is necessary to analyse the dependence of the cross-sections in the data. In that sense it was performed a Pesaran's test that rejected the null hypothesis and confirmed a cross-sectional relationship between the units. However, Baltagi et al. (2012) states that cross-sectional dependence is a problem that deserves more attention in macro panels with long time series, as it can reduce the efficiency of the results, than in short time series just like the dataset that will be used for this research.

Accordingly, after mitigating the effects of multicollinearity, the model have to be controlled for heteroskedasticity and serial correlation. In this way, to control for the bias on the standard errors and their variable variance, they errors were clustered, turning the Hausman test not available, since it only allows for default standard errors. Finally, it was performed a test of overidentifying restrictions for a panel data using the artificial regression approach that was presented by Arellano (1993) as a way to test the suitable of the random effects model against the fixed effects model. The results indicate that fixed effect is the best model to proceed with the estimation, so a fixed effect model with robust standard errors clustered at the firm level was regressed and the results are analysed in the next topic.

5. Results discussion

This section is dedicated to the discussion of the empirical results and it is divided in three dimensions: first it is analysed the average effect of taxes and the remaining explanatory variables in firm's capital structure in the full period between 2017 and 2022; then, each of the subperiods is analysed individually, namely a pre-COVID-19 period between 2017 and 2019 and the period from 2020 to 2022 (COVID-19 period). For each one of the three dimensions mentioned it is regressed the three models mentioned in the empirical model section, considering the total, short-term and long-term debt. All the regressed models are significant at 5% level. Additionally, to allow for a more in-depth analysis it is analysed such relationship between the corporate tax and other explanatory variables with the different debts also in an economic perspective, through the calculation of elasticities, allowing to investigate the percentage movements of the leverage for each percentage increase of the variables. Finally, a last subsection is dedicated to the analysis restricted to each of the countries included in the sample.

The coefficients for all the analysis drawn in the subsequent subsections are obtained by regression of the previously presented models, that regresses the leverage in the end of each year on the level of the tax rates, including the factors impacting leverage intrinsic to the characteristics of companies, and also macroeconomic and other tax' variables also influencing leverage.

5.1. Full sample results

The results for the models considering the complete sample for the period 2017-2022 are shown in Table 5.

First, analysing the average coefficients of the covid dummy variable, the results show that Covid-19 seems to have only a significative impact on the short- and long-term debt, although it is the opposite for each of the maturities. According to the regression results, the impact of COVID-19 on the short-term debt is significantly negative (β=-0.0064 and p-value$\leq$0.05) indicating, on average, a decrease in the short-term debt with the appearance of COVID-19, and it is higher and positive for long-term leverage (β=0.0101 and p-value$\leq$0.05). In fact, one of the consequences associated with the COVID-19 is the uncertainty that firms with which companies had to deal. Thus, the prioritization of the stability and financial security may justify the preference for long-term debt over short-

term debt, as long-term debt is normally associated with more stable and fixed interest rates. Also, firms may have faced liquidity constraints, or just decreased short-term leverage to preserve it, resorting then to long-term debt to face the economic changes of the pandemic.

Regarding the corporate taxes coefficient, the results show that the coefficient is statistically significant only for both total and long-term leverage. However, the most accepted theoretical prediction of a positive coefficient for CIT, is only verified for short-term leverage (β=0.0011), in the period between 2017 and 2022. However, since the coefficient for CIT on the short-term leverage is not significant (p-value>0.05), such results confirm a negative relationship between the corporate income tax rates and the leverage when taking into account the period between 2017 and 2022. Contrary, the DIV variable although not statistically impactful for any of the three types of leverage, have a positive effect on total and long-term leverage as predicted by theory and a negative impact on short-term leverage.

Regarding the macroeconomic factors included in the model, according to the results both inflation and GDP growth are significant to the leverage values in the majority of regressions. GDP Growth is just not significant for the short-term debt, while inflation does not seem to be considered significant in a total debt perspective. Regarding the sign of the relationship between the macroeconomic variables and the leverage, the theory does not confirm neither a positive nor a negative relationship for inflation, being the results of this research in agreement with these disparate conclusions. However, the positive relationship between inflation and the short-term leverage concluded on Alufar Bokpin (2009) research was confirmed on the results by the positive beta coefficient of 0.1013. Lastly, the theoretical predictions of a negative relationship between GDP growth and leverage is confirmed by this model, since an increase in the growth of GDP come with a decrease in the values of any type of leverage.

The results for the company-specific variables revealed to be equivalent for the three types of leverage analysed, with regard to the direction of the relationship. Only the size variable showed different effects on different types of leverage, with higher firms related with higher values for total and short-term leverage, but smaller values of long-term leverage. Regarding the significance of the variables, profitability is the only variable that is highly significant for all of the three types of leverage considered. Tangibility, growth and non-

debt tax shields seems to be also significant for the firm's total leverage. Regarding short-term leverage, growth is the only additional variable with a significant impact for the leverage value whereas tangibility and non-debt tax shield are the additional ones significant for the firm's leverage of long-term.

Lastly, the non-debt tax shield variable show an higher coefficient for total and long-term regressions, implying that this is the variable that most impacts the value of these types of leverage. The corporate income tax rates and the firm's tangibility are also highly impactful for total leverage, while for long-term leverage the more impactful variables, following to non-debt tax shield, are tangibility and the countries' inflation. Regarding the short-term leverage, despite the impacts of the variables being similar, inflation is the variable whose impact stands out the most.

5.2. Pre-COVID-19 period results

Table 6 report the results for the three models considering the period before COVID-19, when the dummy variable takes the value 0.

Analysing the results of the three regressions at the same time, it may find that the significant variables are similar for the majority of the variables considered. From a pr-COVID-19 perspective, in the period before 2020 only tangibility, firm growth, non-debt tax shields, inflation and gdp growth are highly significant to the values of leverage in all of its three maturities. The only differences lie in the regression for the short-term leverage, whose coefficients of inflation, gdp growth and tangiblity have not sufficient evidence to infer an effect on the short-term leverage of firms.

The results suggest that tax rates are not significant to explain variations in any type of leverage, either CIT or DIV tax rates. Even so, consistent with the full sample results the coefficient for the CIT is negative for total and long-term leverage, and also contrary to what would be expected by the theory. Regarding the personal taxes on dividend income, contrary to the results of the full sample, the signal of the coefficient is consistent with the theory, indicating a decrease in leverage when there is an increase on the rate on dividend income.

Analysing the coefficients for the firm-specific variables, the signal for tangibility is the same either for total leverage or long-term leverage, verifying a positive relationship. The positive sign for tangibility suggests that, on average, firms with higher tangible assets incur

in more debt. By having more tangible assets, firms will have lower bankruptcy costs, making it easier to obtain resources and loans (Rajan and Zingales, 1995). Consequently, this possibility may be the explanation for the positive relationship between tangibility and leverage. Despite in the short-term leverage regression the sign for tangibility is the opposite, the variable is not considered statistically significant for its model.

Similarly, that happens with the impact of firms' growth. The results suggest that companies with higher growth prospects tend to contract less total and long-term. As mentioned by theoretical predictions, such relationship can be attributed such relationship to an underinvestment problem. On the other hand, the prospects for greater growth are associated with an increase in short-term leverage. There can be many reasons for the difference in sign between debts of different types of maturities. For example, high-growth companies normally are more exposed to market uncertainties and volatility, and by keeping the total and long-term leverage low, they can deal more easily with financial risks that are associated with unexpected events. However, such market uncertainties may come associated with unexpected opportunities, and so high-growth firms will need the flexibility to respond quickly. Thus, by having access to funds on a short notice they can adapt their financing structure to align with their evolving growth strategies, thus justifying the positive relationship between firm's growth and short-term leverage. Additionally, short-term debt typically carries lower interest rates compared to long-term debt, especially for companies with strong growth prospects considered of high-risk profiles. These lower costs can be an attractive option for firms seeking to finance their growth initiatives. The impact of firm's growth opportunities and profitability on leverage can have contrasting effects, and the overall outcome will depend on which factor has a stronger influence. It turns out that company growth has more impact on leverage, making the impact on profitability negligible for the tree considered leverage.

The sign of the coefficients for non-debt tax shield is the same in the results of the three regressions, but it is contrary to the idea presented by the theory. According to DeAngelo and Masulis (1980), these tax benefits can act as a substitute for the deduction of debt interest, therefore, a decrease in leverage could be expected. However, while it can reduce a firm's tax liabilities, firms would not fully utilizing the available tax benefits on their own. The interest expense from additional debt can complement the non-debt tax shields, allowing the firm to maximize tax savings by reducing taxable income even further. By

taking more debt, having the tax shield from the two sources, firms may amplify their overall tax shield benefits.

In this period, the macroeconomic variables seem to be only significant to total and long-term leverage, revealing negative regression coefficients. In accordance with empirical research of Gajurel(2006), Alufar Bokpin(2009), increases of GDP growth rate revealed negatively related to leverage ratio. Normally, when countries have higher GDP growth rates, it is associated with an improvement in overall economic conditions. Thus, firms may experience stronger cash flows from their operations, which can provide them with the necessary funds to finance their activities, contributing to the reduction of the need to rely on external debt. Also, a higher GDP growth rate can contribute to increased sales, higher profit margins, and improved profitability for firms, enabling them to finance their activities more easily through retained earnings.

Regarding inflation, as in the theoretical and empirical lack of agreement on its impact on leverage, the results also indicate in one side, a negative relationship for total and long-term leverage and, in the other side, a positive impact for short-term leverage. However, such positive impact is not statistically significant for the regression. Usually, an inflation rate increase is often accompanied by an increase in interest rates by central banks, as a way to control inflationary pressures. In this way, this can turn debt financing more expensive for firms, and consequently reducing their willingness to increase leverage. Additionally, high inflation rates introduce uncertainty and risk into the business environment, making firms more concerned about their ability to manage the interest payments and more cautious about taking on debt.

5.3. COVID-19 period results

Tables 7 report the results for the tree models in the COVID-19 period, when the dummy variable takes the value 1, namely for the total leverage regression, short-term leverage, and long-term leverage, which correspond to columns 1, 2, and 3 respectively. It is verified that problems of multicollinearity remained when restricting the data to this singular period, so the variable DIV is omitted from the model and thus allows for more reliable results. However, should be noted that the total leverage and short-term leverage regressions have a very low r squared, and so the explanatory power of the models is reduced, and therefore the explanatory variables considered are not sufficient to explain all the variations in leverage. This is due to the immense special economic and fiscal policies applied differently

in each of the countries to face the adversities of COVID-19, not included in the models under analysis in this dissertation.

In this period between 2020 and 2022, a small number of the explanatory variables have a statistical impact on the regressions and leverage variations. After the appearance of COVID-19, the firm's profitability become significant for the total and long-term leverage, when compared with a pre-crisis period. Together with growth, these are the firm-specific variables impacting the total and long-term leverage of firms. The impact of inflation lost its statistical significance for the total leverage, while the GDP growth rate remained significant to both long-term and total leverage regressions. Interestingly, the only variable that is significantly impactful for the short-term leverage regression in the COVID-19 period is the inflation rate. In line with the verified in the pre-COVID-19 period, the coefficient for the corporate income taxes is not significant for the regression and became positive for total leverage.

Considering the regression for total leverage, seems that GDP growth, profitability, and firm growth, are the only important variables that have impact on the total debt ratio. As result of the COVID-19, the economy suffered a slowdown that was reflected in the in the drop in GDP growth. During such periods, overall economic activity slowed down and firms were adversely affected by lockdown obligation, lower sales, declining revenues, and shrinking profit margins, that adversely impacted the firm profitability. In this way, to overcome financial challenges, most firms resorted to increasing leverage by taking on more debt, thus justifying the negative profitability coefficient in the regression for total and long-term leverage. Also, some companies tried to explore new alternatives and opportunities brought by the COVID-19, as investment in new markets that are related with products needed to combat the pandemic or in the market of technologies needed to ensure remote work and school. To pursue and finance whatever firm growth initiative, firms needed to resort to leveraging, increasing their debt levels that can be a possible reason to the positive impact of firm growth prospects on leverage.

Long-term debt typically carries fixed interest rates, that under an inflationary environment has been verified during COVID-19 period, may become less attractive for firms. Contrary, short-term debt allows firms to borrow money at current interest rates. Thus, due to rising inflation, firms may opt for short-term debt, as it allows them to renegotiate interest rates more frequently and better account for changing inflation rates. In this way, inflation rates

increase revealed important variables impacting short- and long-term leverage in the period starting in 2020.

5.4. Compliance with capital structure theories

Table 8 shows a summary of the compatibility of the different company-specific variables with the two capital structure theories deepened in the literature review of this research for the full period, pre-COVID-19 and COVID-19 period. In one side, the trade-off theory which firms aim to strike a balance between the tax benefits associated with borrowing and the potential costs arising from financial distress, and in the other side, the pecking-order theory that defends an order in the choice for the financial instruments to mitigate the problems arising from asymmetric information. Table 9 represents the expected signs for the explanatory variables' coefficients for the opposing trade-off and pecking-order theories.

Regarding the macroeconomic variables, no type of compatibility with the theories can be indicated, since this depends on the interpretation made. These macroeconomic variables can also impact the firm-specific variables and consequently, their coefficients" signal depends in which of the impacts has more strength on leverage.

Concerning the full period between 2017 and 2022, the accordance of the coefficient signs with the capital theories is a mix of agreement with both theories. Nonetheless, the pecking-order is the theory in which the majority of the capital structure determinants are in line with, and if considered only the signs for the variables significant for the model, the pecking order theory finds much more support than the trade-off theory. It should be noted that the signs of the coefficients, and consequently the theories in which they agreed, are similar for the three types of leverage. The difference falls on the variable size, which for the long-term leverage regression exhibit a negative coefficient that is more in line with the pecking-order theory. Additionally, the profitability, liquidity and growth variable are the variables more compatible to the pecking-order theory, while firms' tangibility is more compatible with the trade-off theory.

In the pre-COVID-19 period, the determinants of the total leverage are also consistent with both theories of capital structure. Specifically, profitability, tangibility and growth are the three variables that are more in line with the trade-off theory, while liquidity and the firm's size exhibit coefficients with signs that are more in agreement with the pecking-order

theory. With respect to the short-term leverage, the coefficients are in general more coherent with the pecking-order theory, with a negative signal for profitability, liquidity, tangibility and size, and a positive sign for firm growth. The opposite is verified for the long-term leverage, since the majority of the coefficients demonstrates to be in line with the trade-of theory, the size variable being the only exception. However, considering only the variables that are statistically significant for the model, in the pre-COVID-19 period the trade-off theory could be the one that better explains capital structure decisions.

During the COVID-19 period, the compatibility of the variables with the two theories remains identical. If considering only the coefficients' signal for the profitability on the total leverage regression, and for the firm' growth variable on total and long-term leverage, it may be concluded that after the pandemic the capital structure theory that could better explain the firm's financial decisions is the pecking-order theory. In fact, the immediate impact of the pandemic was felt on short-term financial stability and liquidity. In this way, firms focused on managing their short-term obligations, so this short-term financial stress led companies to prioritize internal financing and conservative financial management, in line with the principles of pecking-order theory.

Thus, considering that the relationships between the explanatory variables and leverage are mostly in accordance with the pecking-order theory, it can be inferred that this theory is the most explanatory for the capital structure decisions of the European companies under analysis since 2017.

5.5. COVID-19 average impact on leverage by country

The three models for the different types of leverage were re-estimated for the period between 2017 and 2022 for each one of the countries included in the full sample: France, Greece, Germany, and Sweden. It's expected that the impact of COVID-19 will be different between countries, being analysed further below, with results for the individual country regressions being found in Table 10,11,12 and 13. It should be noted that for some countries as Greece, there are a small sample of firms with available information for all the variables, and for that reason, it could not be an excellent representative of the most real effects of COVID-19 in the country.

According to table 10 for France, despite the COVID-19 dummy revealed negative for each one of the types of leverage, it is small and not considered statistically significant for any

of the regressions, as it happens for the full period results analysed before. Also, for Sweden, the dummy variable although not statistically significant, is smaller than for France, implying a smaller effect of the pandemic on this country. However, it should be noted that the effect of COVID-19 on total leverage is very close to becoming impactful, since the p-value is very close to 0.05.

The results for Germany and Greece indicate that the long-term leverage in Germany was positively affected by the COVID-19, while in Greece the significant positive effect fell on short-term leverage. The coefficients for the dummy variable regarding the other leverage types have no grounds to indicate a significant effect.

Lastly, it remains to analyse the impact of corporate taxes on the capital structure of different countries.

In France, the CIT rate is only a determinant of the total leverage ratio, having a negative effect on it, which is in accordance with the full sample results. However, despite not significant, according to the results the impact of the CIT rate in France is negative also for short- and long-term individually.

In Greece, the CIT rate is significantly positive to the short-term leverage ratio and comparing with the significance of the CIT variable in the leverage of other countries, this has the most significant impact. The personal tax rate on DIV is also statistically significant, impacting positively the short-term leverage in Greece.

In Germany an increase in the CIT rate makes the leverage increase, namely long-term leverage. This country is the most affected by changes in the CIT, since it has the highest coefficient for this variable.

Finally, Sweden is the only country for which the corporate income tax rate coefficient does not significantly impact any type of leverage.

5.6. Economic relevance of corporate income tax rates on leverage

In this subsection, the relationship between the corporate income tax rate variable and leverage is explored from an economic outlook, employing a computation of elasticities. Following the formula of Faccio and Xu (2015) to calculate elasticities, it is obtained by multiplying the regression coefficient for CIT variable by the division of the mean values of CIT rate over the leverage values. The results will represent how many percentage

points the leverage increases when the corporate income tax rate increases by 1%, following:

$$\left(\frac{dy}{dx}\right) \times \left(\frac{x}{y}\right)$$

Table 14 reports the elasticities for each of the different leverages. In the columns 1, 4 and 7 may be found the elasticities for the total leverage, in the columns 2,5 and 8 the elasticities for the short-term leverage and the 3rd, 6th and 9th columns reports the elasticities for long-term leverage.

Taking into consideration the values of elasticities between 2017 and 2022, interesting conclusions can be found about the determinants of capital structure that are economically important. Despite the corporate tax rates appear to be an important determinant of capital structure, other included control variables seem to heavily impact the leverage. Considering the total leverage, while a 1% increase in corporate tax rates lead to a decrease of 26% in the total leverage, the biggest impact on the leverage's change is attributable to inflation, that makes total leverage decrease by almost 88%. Also for short-term and long-term leverage, the inflation is the major determinant of their values, and liquidity is the variable that almost have no impact on the change of leverage. The elasticity of short-term leverage per change in corporate income tax rates is almost negligible, changing the direction and increasing leverage in 0.6% when CIT increases by 1%.

Nevertheless, the columns 4 to 9 are the most important to answer the main issue of this research, and understand to what extent the impact that corporate income tax rates have on leverage values suffered changes with the beginning of COVID-19 pandemic. Looking for the elasticity values for the total leverage, it may be concluded interesting impacts triggered by COVID-19. The change in leverage per change in the corporate income taxes changed it's direction, and so while in the period pre-COVID-1919 period an increase of 1% in corporate tax rates produces a 18,3% decrease in the total leverage, between 2020 and 2022 the scenario is the opposite, and a 1% increase in corporate tax rates lead leverage to increase 7%. Regarding short-term leverage, it went from increasing 142.3% to 63.8% when the CIT increases 1%, thus reduced its economic impact. Long-term leverage was also less impacted by changes in the corporate tax rates after the beginning of the pandemic, decreasing 70.9% for 1% increases in CIT before the COVID-19, and 9.3% after that.

An interesting change concerns the sharp drop on the impact of the macroeconomic variables in all types of leverage. However, even with that decline these variables continue to be economically the most important determinants for the leverage ratios, that lead to more pronounced changes whenever they increase or decrease in percentage. For the pre-COVID-19 period the variables of profitability and growth were the less important determinants for any type of leverage, having an impact close to 0. Lastly, in the COVID-19 period the only variable that have an almost null impact on leverage is liquidity, despite growth also have a very minor impact, together with the non-debt tax shield impact in the total and long-term leverage.

6. Conclusions

Based on a sample of 510 non-financial public companies from France, Germany, Greece and Sweden, this research examines the changes caused by the COVID-19 on the impact of the corporate income tax rates on firms' capital structure. In this way, to guide this research objective, three research hypotheses were elaborated, such as the analysis and confirmation of the negative impact of COVID-19 on corporate debt, whether the impact of corporate income tax rates remained similar after the appearance of COVID-19, and finally whether such impact was identical for different countries.

First, the results show that the COVID-19 pandemic was not so significant and impactful for the companies' leverage as a whole, but it did impact short-term and long-term leverage individually. In this way, the changes in the companies' total leverage ratios were mainly due to factors other than the beginning of the pandemic. In general, the COVID-19 caused a decrease in short-term leverage and an increase in long-term debt ratios. As a result, this research shows that the short-term leverage was on average more sensitive to the fiscal and economic challenges brought by COVID-19 than the long-term debt, since the absolute value of this coefficient is more than six times higher. In this way, contrary to studies on the impact of the 2008 crisis on leverage, COVID-19 not only revealed a different impact on different debt maturities, as it is not concluded that its impact is mostly negative. Also, through model regression for total leverage, can be concluded that GDP growth, profitability, tangibility, firm's growth, non-debt tax shield and the CIT rates are the mainly determinants influencing the corporate total leverage. Regarding debt maturity, the long-term debt is mainly affected by the determinants just mentioned, together with the inflation rates, while short-term debt is only significantly affected by profitability, firm growth, and inflation rate.

Taking into account the significant determinants and the signs of their coefficients, it was inferred that the firms' capital structure during the period of this analysis, it is better explained by the pecking-order theory rather than the trade-off theory. Accordingly, while before the COVID-19, the results suggest that firms are more worried with the balance of the tax advantages and financial distress costs, the relationship between the various explanatory variables and leverage after COVID-19 suggest a shift of focus to the internal financing preference and the costs associated with external financing.

Second, the results show that the corporate income tax rate is a significant determinant of the firm's capital structure as stated previously by the literature, impacting the total leverage ratio. However, the CIT is not significant for any of the leverage ratios of short-term and long-term individually. To deepen into the economic significance of the CIT in the firms' capital structure and conclude on the impacts of COVID-19 on this relationship, it was calculated the elasticities of the leverage ratios, and it was found that in fact the impact of the CIT on total leverage suffered some changes after the COVID-19. In the period between 2017 and 2019 (pre COVID-19) an increase of 1% in the corporate income tax rates produces a decrease of 0.183% in total leverage in the pre-COVID-19 period, while contrary between 2020 and 2022 (COVID-19 period), an increase of 1% in the corporate income tax rates increase total leverage by 0.079%. It turns out that COVID-19 actually changed the impact that taxes have on companies' total leverage, not only numerically but also in the direction of such relationship, confirming the main question that triggered this research.

Accordingly, the regressions' results for which the impact of CIT is significant, allow to conclude on a negative relationship between the CIT rate and the firms' capital structure. Theoretical predictions state that the relationship between the corporate income taxes and the leverage of firms is positive, but other empirical research previous mentioned on the literature review also confirm a negative relationship, and so this relation remains without a consensus. Besides, according to regression results, the personal taxation on income from corporate dividends is not significant for any of the regressions and periods, not verifying the theoretical statement of Miller (1977). Regarding the non-debt tax shield, the results suggest that it highly positively impacts the total and long-term leverage values, however, its relevance is lost after the COVID-19. Such conclusion contradicts the conclusions of DeAngelo and Masulis (1980), and so while non-debt tax shields can provide some tax advantages, the amount generated even if increasing, may not be sufficient to meet the funding needs of firms. Contrary, if there is a reduction of non-debt tax shield it will result in increase of the firm's tax liability, and may be related to a decrease in debt, as companies attempt to minimize the tax burden.

Third, contrary to what states the third hypothesis test, the COVID-19 pandemic impacted differently the different countries included in this analysis. Through analysis of the dummy variable on the total leverage regression for each one of the countries individually, only the

impact of COVID-19 on long-term leverage in Germany and the short-term leverage in Greece is statistically significant and positive. Besides, in France and Sweden, the COVID-19 impacted negatively all the debt maturities, but it is weaker for Sweden. However, and although there is not enough evidence to conclude that COVID-19 has a significant relationship and impact on the variation in total leverage in any country, such an impact is only negative for France and Sweden, with a positive impact on Germany and Greece.

When considering the CIT relationship with leverage, the impact of corporate taxes is different for each country. While in France the CIT negatively impacts the total leverage, in Germany and Greece this impact is positive on long- and short-term, correspondingly. In Sweden, the company's capital structure and consequently the financing decisions do not take CIT rates into account as the main impact.

Understanding what are the effects that an unexpected situation as the COVID-19 had on the financing behaviour of firms, could draw some insights about precautionary actions that firms should consider to alleviate and surpass the impact of crisis. The results of this study suggest the need to analyse and plan capital structures decisions that will be sustainable in the face of a situation like that of COVID-19. As concluded, the short-term leverage is more sensitive to change in the economic and financial conditions. In this way, it can be concluded that this maturity of leverage is the reflective means of a crisis situation, and so its monitoring will allow the early detection of crisis situations, allowing early action that will alleviate further ahead the impacts of the crisis. In this way, it's important that firm's managers acquire skills that will allow them to predict it and plan in time more adequate financial decisions. Also, it should be considered the different relationship between the firm-specific and macroeconomic variables for the different countries when planning such financial decisions. Additionally, the fact that this study proved corporate income tax rates to be a significant variable impacting the firm's total leverage, this could enlighten legislators on fiscal policy measures to take in a crisis situation, in order to efficiently help companies to overcome it.

It should be considered that this study suffered from some limitations. Since it was only considered companies that had available all the necessary information of the variables, the sample size used is smaller. Additionally, the fact that the personal tax rates on income from corporate bonds and from dividends were similar for many of the years, the PIT variable had to be eliminated because of multicollinearity problems and also the DIV

variable in the COVID-19 period was not taken into account. Also, special regulations as moratoriums and guarantees applied differently by countries during COVID-19 were not considered in the models of this dissertation. This may influence the results and variables' relationships obtained with this study. Future research could focus on these special regulations and identify if these cause changes in the results obtained with this dissertation. Lastly, another starting point for future research could be to identify whether, in the remaining countries where there were no changes to the CIT rate, the impact of corporate income tax rates on leverage was also affected by COVID-19 pandemic.

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Appendix

Table 1- Descriptive statistics of the variables for the Full Sample

Variable	Obs	Mean	Std. Dev.	Min	Max
LEV_Total	3,060	0.2552	0.1582	0	1.2650
LEV_Short-term	3,060	0.0598	0.0716	-0.0008	0.6794
LEV_Long-Term	3,060	0.1954	0.1464	0	1.2383
Profitability	3,060	0.0388	0.1381	-2.1823	2.2359
Liquidity	3,060	1.9946	10.3325	0.0200	485.7143
Tangibility	3,060	0.5574	0.2121	0.0104	0 .9970
Size	3,060	5.7602	1.1393	0.5560	8.4740
Growth	3,060	0.00341	0.0319	-0.0392	1.7257
NDTS	3,060	0.0328	0.0388	-0.0122	1.5129
Inflation	3,060	2.5955	2.4253	-1.3	9.3
GDP Growth	3,060	1.3134	3.3089	-9	8.4
Tax Variables					
CIT	3,060	29.0315	5.6770	20.6	44.4333
PIT	3,060	29.3645	4.3345	15	34
DIV	3,060	29.7223	6.1654	5	44

Source: Own elaboration using data obtained through the Stata program

Table 2- Descriptive statistics of the variables for the pre-COVID-19 period

Variable	Obs	Mean	Std. Dev.	Min	Max
LEV_Total	1,530	0.2481	0.1578	0	1.2650
LEV_Short-term	1,530	0.0612	0.0716	-0. 0008	0.6794
LEV_Long-Term	1,530	0.1869	0.1469	0	1.2383
Profitability	1,530	0.0374	0 .1572	-2.1823	2.2359
Liquidity	1,530	1.7570	1.6662	0.02	39.0313
Tangibility	1,530	0.5559	0.2162	0.0104	0.9970
Size	1,530	5.7306	1.1564	0.5560	8.4530
Growth	1,530	0.0039	0.0447	-0.0302	1.7257
NDTS	1,530	0.0300	0.0459	-0. 01217	1.5129
Inflation	1,530	1.6315	0.3466	0.5	2.1
GDP Growth	1,530	1.8662	0.5863	1	2.7
Tax Variables					
CIT	1,530	30.7753	6.5504	21.4	44.43333
PIT	1,530	29.3645	4.3352	15	34
DIV	1,530	30.4527	6.4721	10	44

Source: Own elaboration using data obtained through the Stata program

Table 3- Descriptive statistics of the variables for the COVID-19 period

Variable	Obs	Mean	Std. Dev.	Min	Max
LEV_Total	1,530	0.2624	0.1583	0	1.0771
LEV_Short-term	1,530	0.0585	0.0715	-0. 0006	0.6133
LEV_Long-Term	1,530	0.2039	0.1454	0	0.9264
Profitability	1,530	0.0401	0.1159	-0. 9261	0.7737
Liquidity	1,530	2.2322	14.5155	0.0311	485.7143
Tangibility	1,530	0.5588	0.2080	0.0173	0.9940
Size	1,530	5.7898	1.1216	1.6893	8.4740
Growth	1,530	0.0029	0.0060	-0. 0391	0.11
NDTS	1,530	0.0356	0.0297	0	0. 3643
Inflation	1,530	3.5594	3.1286	-1.3	9.3
GDP Growth	1,530	0.7607	4.5771	-9	8.4
Tax Variables					
CIT	1,530	27.2876	3.9351	20.6	32.023
PIT	1,530	29.3645	4.3352	15	34
DIV	1,530	28.9919	5.7527	5	34

Table 4- Correlation matrix

Variable	PRO	LIQ	TAN	SIZE	GWT	NTS	INF	GDP	CIT	PIT	DIV	COV
PRO	1.000											
LIQ	-0.007	1.000										
TAN	0.021	-0.018	1.000									
SIZE	0.384	-0.088	0.051	1.000								
GWT	-0.004	-0.003	-0.042	-0.053	1.000							
NTS	-0.305	-0.030	-0.016	0.008	0.025	1.000						
INF	0.029	0.016	-0.021	0.016	-0.014	0.026	1.000					
GDP	0.048	0.018	-0.015	-0.020	0.005	-0.059	0.346	1.000				
CIT	0.056	-0.006	-0.039	0.158	0.005	0.003	-0.236	-0.131	1.000			
PIT	-0.041	0.013	-0.035	0.031	0.012	-0.061	-0.091	0.039	0.482	1.000		
DIV	-0.039	0.013	-0.032	0.031	0.011	-0.068	-0.107	0.051	0.522	0.976	1.000	
COV	0.010	0.023	0.007	0.026	-0.016	0.072	0.398	-0.167	-0.307	-0.119	-0.113	1.000

This table reports the correlation between the variables: Profitability(PRO), Liquidity(LIQ), Tangibility(TAN), Size(SIZE), Growth(GWT), NDTS(NTS), Inflation(INF), GDP Growth(GDP), CIT(CIT), PIT(PIT), DIV(DIV) and Dummy_Covid(COV).

Source: Own elaboration using data obtained through the Stata program

Table 5- Regression results for the Full period (2017-2022)

	FULL PERIOD		
	LEV_Total	LEV_Shortterm	LEV_Longterm
Control variables(centered)			
Profitability	-0.1417*	-0.0681*	-0.0736*
	(-3.09)	(-2.62)	(-2.37)
Liquidity	-0.0002	-0.00007	-0.0001
	(-1.12)	(-0.49)	(-0.90)
Tangibility	0.2082*	0.0202	0.188*
	(3.85)	(0.74)	(4.45)
Size	0.0078	0.0168	-0.009
	(0.30)	(1.69)	(-0.41)
Growth	0.0876*	0.0702*	0.0166
	(4.61)	(6.76)	(1.07)
NDTS	0.4955*	0.0408	0.4547*
	(5.24)	(0.81)	(6.61)
Inflation	0.0864	0.1013*	-0.1877*
	(-1.28)	(2.18)	(-2.90)
GDP Growth	-0.1577*	-0.0558	-0.1019*
	(-5.08)	(-1.47)	(-2.59)
Dummy_Covid	0.0037	-0.0064*	0.0101*
	(0.80)	(-2.11)	(2.38)
Constant	-0.0018	0.0032*	-0.0051*
	(-0.80)	(2.11)	(-2.38)
Tax Variables			
CIT	-0.2287*	0.0011	-0.2298*
	(-2.21)	(0.02)	(-2.23)
DIV	0.0497	-0.0123	0.0619
	(0.48)	(-0.12)	(0.53)
sigma_u	0.1275	0.0609	0.1161
sigma_e	0.0742	0.0491	0.0697
rho	0.7471	0.6061	0.7351
No. observ.	3,060	3,060	3,060
R^2 Within	0.1522	0.0250	0.1286
R^2 Between	0.1801	0.0282	0.2149
R^2 Overall	0.1727	0.0068	0.1932

Table reporting the regression results of the model (1), (2) and (3) for the full period. Robust standard errors clustered at the firm-level. In parenthesis are reported the t values.
*significance at 5% level.
Source: Own elaboration using data obtained through the Stata program

Table 6- Regression results for the pre-COVID-19 period (2017-2019)

	PRE-COVID-19 PERIOD		
	LEV_Total	LEV_Shortterm	LEV_Longterm
Control variables(centered)			
Profitability	0.0296	-0.0115*	0.0411
	(1.09)	(-0.45)	(1.62)
Liquidity	-0.0050	-0.0078	0.0028
	(-1.48)	(-1.71)	(0.99)
Tangibility	0.2322*	-0.0166	0.2488*
	(3.81)	(-0.45)	(4.32)
Size	-0.0262	-0.0063	-0.0199
	(-0.97)	(-0.44)	(-0.67)
Growth	-0.0807*	0.0388*	-0.1194*
	(-3.95)	(2.46)	(-6.18)
NDTS	0.5053*	0.1119*	0.3934*
	(11.56)	(2.29)	(6.64)
Inflation	-2.2681*	0.0172	-2.2853*
	(-4.25)	(0.04)	(-3.55)
GDP Growth	-0.6665*	-0.0651	-0.6014*
	(-2.69)	(-0.38)	(-2.47)
Dummy_Covid	-	-	-
Cons.	-0.0222*	-0.0029	-0.0193*
	(-4.16)	(-0.63)	(-3.07)
Tax Variables			
CIT	-0.1476	0.2830	-0.4306
	(-1.10)	(1.38)	(-1.92)
DIV	-0.0976	-0.2688	0.1711
	(-0.73)	(-1.33)	(0.78)
sigma_u	0.1340	0.0615	0.1235
sigma_e	0.0553	0.0421	0.0565
rho	0.8545	0.6811	0.8268
No. observ.	1,530	1,530	1,530
R^2 Within	0.2033	0.0548	0.1557
R^2 Between	0.1989	0.0399	0.2029
R^2 Overall	0.1991	0.0424	0.1974

Table reporting the regression results of the model (1), (2) and (3) for the pre-COVID-19-19 period. Robust standard errors are clustered at the firm-level. In parenthesis are reported the t values.
*significance at 5% level.Source:
Own elaboration using data obtained through the Stata program.

Table 7- Regression results for the COVID-19 period (2020-2022)

	COVID-19 PERIOD		
	LEV_Total	LEV_Shortterm	LEV_Longterm
Control variables(centered)			
Profitability	-0.1983*	-0.0636	-0.1347*
	(-3.42)	(-1.82)	(-3.02)
Liquidity	0.0001	-3.74e-06	0.0001
	(0.39)	(-0.04)	(0.42)
Tangibility	0.0625	-0.007	0.0695
	(0.99)	(-0.17)	(1.48)
Size	0.0234	0.0179	0.0055
	(0.54)	(1.36)	(0.13)
Growth	2.4592*	0.4142	2.0450*
	(4.64)	(1.32)	(3.86)
NDTS	0.0003	0.1070	-0.1067
	(0.00)	(0.73)	(-1.02)
Inflation	-0.0515	0.1116*	-0.1631*
	(-0.74)	(2.26)	(-2.45)
GDP Growth	-0.1221*	-0.0276	-0.0946*
	(-3.56)	(-0.79)	(-2.63)
Dummy_Covid	-	-	-
Cons.	0.0088*	-0.0007	0.0095*
	(3.67)	(-0.48)	(3.94)
Tax Variables			
CIT	0.0671	0.1369	-0.0946
	(0.50)	(1.44)	(-0.56)
DIV	0 (omitted)	0 (omitted)	0 (omitted)
sigma_u	0.1471	0.0664	0.1323
sigma_e	0.0579	0.0466	0.0550
rho	0.8659	0.6695	0.8528
No. observ.			
R^2 Within	0.1110	0.0225	0.0905
R^2 Between	0.0415	0.0209	0.1070
R^2 Overall	0.0484	0.0091	0.0967

Table reporting the regression results of the model (1), (2) and (3) for the COVID-19 period. Robust standard errors are clustered at the firm-level. In parenthesis are reported the t values.
*significance at 5% level.
Source: Own elaboration using data obtained through the Stata program

Table 8- Compatibility with the two capital structure theories for the 3 periods

	FULL PERIOD		
Variable	LEV_TOTAL	LEV_Shortterm	LEV_Longterm
PROFITABILITY	**P.O.***	**P.O.***	**P.O.***
LIQUIDITY	**P.O.**	**P.O.**	**P.O.**
TANGIBILITY	**T.O.***	**T.O.**	**T.O.***
SIZE	**T.O.**	**T.O.**	**P.O.**
GROWTH	**P.O.***	**P.O.***	**P.O.**
NDTS	**+**	**+**	**+**
INFLATION	**T.O./P.O.**	**T.O./P.O.***	**T.O./P.O.***
GDP GROWTH	**T.O./P.O.***	**T.O./P.O.**	**T.O./P.O.***
	PRE-COVID-19 PERIOD		
Variable	LEV_TOTAL	LEV_Shortterm	LEV_Longterm
PROFITABILITY	**T.O.**	**P.O.**	**T.O.**
LIQUIDITY	**P.O.**	**P.O.**	**T.O.**
TANGIBILITY	**T.O.***	**P.O.**	**T.O.***
SIZE	**P.O.**	**P.O.**	**P.O.**
GROWTH	**T.O.***	**P.O.***	**T.O.***
NDTS	**+***	**+***	**+***
INFLATION	**T.O./P.O.***	**T.O./P.O.**	**T.O./P.O.***
GDP GROWTH	**T.O./P.O.***	**T.O./P.O.**	**T.O./P.O.***
	COVID-19 PERIOD		
Variable	LEV_TOTAL	LEV_Shortterm	LEV_Longterm
PROFITABILITY	**P.O.***	**P.O.**	**P.O.**
LIQUIDITY	**T.O.**	**P.O.**	**T.O.**
TANGIBILITY	**T.O.**	**P.O.**	**T.O.**
SIZE	**T.O.**	**T.O.**	**P.O.**
GROWTH	**P.O.***	**P.O.**	**P.O.***
NDTS	**+**	**+**	**T.O.**
INFLATION	**T.O./P.O.**	**T.O./P.O.***	**T.O./P.O.***
GDP GROWTH	**T.O./P.O.***	**T.O./P.O.**	**T.O./P.O.***

*indicates the variables significant at the 5% level.
Source: Own elaboration

Table 9- Expected signs for the explanatory variables' coefficients for the opposing trade-off and pecking-order theories

	Theory	
Variable	**Trade-off**	**Pecking-Order**
PROFITABILITY	+	-
LIQUIDITY	+	-
TANGIBILITY	+	-
SIZE	+	-
GROWTH	-	+
NDTS	-	-
INFLATION	+/-	+/-
GDP GROWTH	+/-	+/-

Source: Own elaboration

Table 10- Regression results for France (Full period)

	FRANCE		
	LEV_Total	LEV_Shortterm	LEV_Longterm
Control variables(centered)			
Profitability	-0.1712*	-0.0345	-0.1368*
	(-2.38)	(-1.13)	(-2.13)
Liquidity	-0.0004*	-0.00003	-0.0003*
	(-2.04)	(-0.66)	(-2.02)
Tangibility	0.2007	0.0121	0.1886
	(1.40)	(0.31)	(1.47)
Size	-0.0422	0.0036	-0.0458
	(-1.26)	(0.69)	(-1.42)
Growth	0.0898*	0.0628*	0.0270358
	(3.22)	(5.37)	(1.16)
NDTS	0.5234*	0.1155*	0.4079*
	(4.20)	(2.35)	(3.59)
Inflation	-2.1512*	0.0063	-2.1575
	(-2.06)	(0.01)	(-1.84)
GDP Growth	-0.4497*	-0.1128	-0.3369
	(-2.27)	(-1.10)	(-1.57)
Dummy_Covid	-0.0930	-0.0067	-0.0863
	(-1.49)	(-0.22)	(-1.23)
Constant	0.0440*	0.0021	0.0418*
	(3.25)	(0.41)	(2.85)
Tax Variables			
CIT	-2.4308*	-0.0947	-2.3360
	(-2.01)	(-0.16)	(-1.70)
DIV	2.1783	0.1019	2.0764
	(1.91)	(0.17)	(1.61)
sigma_u	0.1303	0.0543	0.1195
sigma_e	0.0703	0.0427	0.0694
rho	0.7745	0.6183	0.7478
No. observ.	1,056	1,056	1,056
R^2 Within	0.2811	0.0468	0.2218
R^2 Between	0.1865	0.0139	0.1908
R^2 Overall	0.2061	0.0252	0.1966

Table reporting the regression results of the model (1), (2) and (3) for the full period in France. Robust standard errors are clustered at the firm-level. In parenthesis are reported the t values.
*significance at 5% level.
Source: Own elaboration using data obtained through the Stata program

Table 11- Regression results for Germany (Full period)

	GERMANY		
	LEV_Total	LEV_Shortterm	LEV_Longterm
Control variables(centered)			
Profitability	-0.2885*	-0.2071*	-0.0814
	(-3.84)	(-4.12)	(-1.49)
Liquidity	-0.0122*	-0.0251*	0.0129
	(-2.91)	(-4.92)	(2.84)
Tangibility	0.2260*	-0.1578*	0.3838
	(2.58)	(-2.87)	(6.52)
Size	0.0646	0.0313	0.0333
	(1.01)	(1.06)	(0.63)
Growth	-0.3599*	-0.2128*	-0.1471
	(-2.10)	(-3.20)	(-1.10)
NDTS	0.6806*	0.1137	0.5670
	(2.59)	(0.62)	(2.54)
Inflation	-0.1910	-0.0168	-0.1743
	(-1.71)	(-0.19)	(-1.64)
GDP Growth	-0.1980	0.0967	-0.2947
	(-1.27)	(0.94)	(-1.98)
Dummy_Covid	0.0105	-0.0018	0.0123
	(1.63)	(-0.51)	(2.12)
Constant	-0.1571*	0.0145	-0.1716
	(-1.97)	(0.28)	(-2.45)
Tax Variables			
CIT	14.2742	-3.1700	17.4442
	(1.64)	(-0.56)	(2.22)
DIV	0 (omitted)	0 (omitted)	0 (omitted)
sigma_u	0.1478	0.0734	0.1082
sigma_e	0.0698	0.0412	0.0656
rho	0.8175	0.7607	0.7311
No. observ.	1,230	1,230	1,230
R^2 Within	0.2205	0.2223	0.1908
R^2 Between	0.0666	0.0006	0.2945
R^2 Overall	0.0838	0.0154	0.2721

Table reporting the regression results of the model (1), (2) and (3) for the full period in Germany. Robust standard errors are clustered at the firm-level. In parenthesis are reported the t values.
*significance at 5% level.
Source: Own elaboration using data obtained through the Stata program

Table 12- Regression results for Greece (Full period)

	GREECE		
	LEV_Total	LEV_Shortterm	LEV_Longterm
Control variables(centered)			
Profitability	-0.7724*	-0.1411	-0.6312*
	(-5.38)	(-1.09)	(-4.65)
Liquidity	-0.0190	-0.1043*	0.0853*
	(-0.97)	(-2.42)	(2.16)
Tangibility	-0.0199	-0.4458*	0.4259*
	(-0.14)	(-2.84)	(2.16)
Size	0.1269	-0.0220	0.1488
	(1.98)	(-0.40)	(2.07)
Growth	-2.0648*	-11.1812*	9.1164*
	(-2.21)	(-8.65)	(6.74)
NDTS	-0.8353	0.01390	-0.8492
	(-1.97)	(0.02)	(-1.94)
Inflation	0.4527*	-0.2564	-0.1963
	(-2.87)	(-1.42)	(-1.08)
GDP Growth	0.0747	0.2030	-0.1283
	(0.90)	(1.45)	(-0.83)
Dummy_Covid	0.0215	0.0651*	-0.0437
	(0.81)	(2.55)	(-1.20)
Constant	0.1320*	0.0852*	0.0468
	(3.08)	(2.13)	(1.13)
Tax Variables			
CIT	-0.0668	0.7449*	-0.8117
	(-0.25)	(2.56)	(-2.08)
DIV	0.2976	0.5228*	-0.2252
	(1.54)	(2.72)	(-0.98)
sigma_u	0.1724	0.0792	0.1320
sigma_e	0.0472	0.0649	0.0634
rho	0.9304	0.5980	0.8128
No. observ.	114	114	114
R^2 Within	0.3065	0.4411	0.4442
R^2 Between	0.0609	0.1625	0.2303
R^2 Overall	0.0723	0.2419	0.2624

Table reporting the regression results of the model (1), (2) and (3) for the full period in Greece. Robust standard errors are clustered at the firm-level. In parenthesis are reported the t values.
*significance at 5% level.
Source: Own elaboration using data obtained through the Stata program

Table 13- Regression results for Sweden (Full period)

	SWEDEN		
	LEV_Total	LEV_Shortterm	LEV_Longterm
Control variables(centered)			
Profitability	-0.0593	-0.0243	-0.0350
	(-1.69)	(-0.90)	(-1.51)
Liquidity	-0.0064	-0.005	-0.0014
	(-1.51)	(-1.30)	(-0.71)
Tangibility	0.1149	0.0488	0.0662
	(1.38)	(1.16)	(1.08)
Size	0.0240	0.0029	0.0211
	(0.91	(0.19)	(0.98)
Growth	2.2731*	0.7043	1.5689*
	(4.68)	(1.67)	(2.24)
NDTS	-0.2153	-0.3155	0.1002
	(-0.74)	(-1.65)	(0.50)
Inflation	0.1826	0.1905	-0.0079
	(1.19)	(1.66)	(-0.06)
GDP Growth	-0.4317*	-0.1343	-0.2974
	(-2.11)	(-1.01)	(-1.64)
Dummy_Covid	-0.0315	-0.0149	-0.0166
	(-1.94)	(-1.29)	(-1.27)
Constant	-0.0912	0.0065	-0.0977
	(-0.67)	(0.07)	(-0.82)
Tax Variables			
CIT	-1.323012	-0.1256	-1.1974
	(-0.74)	(-0.11)	(-0.76)
DIV	0 (omitted)	0 (omitted)	0 (omitted)
sigma_u	0.1096	0.0607	0.1131
sigma_e	0.0807	0.0555	0.0699
rho	0.6486	0.5447	0.7236
No. observ.	660	660	660
R^2 Within	0.0946	0.0661	0.0442
R^2 Between	0.1356	0.0061	0.1607
R^2 Overall	0.1226	0.0046	0.1278

Table reporting the regression results of the model (1), (2) and (3) for the full period in Sweden. Robust standard errors are clustered at the firm-level. In parenthesis are reported the t values.
*significance at 5% level.
Source: Own elaboration using data obtained through the Stata program

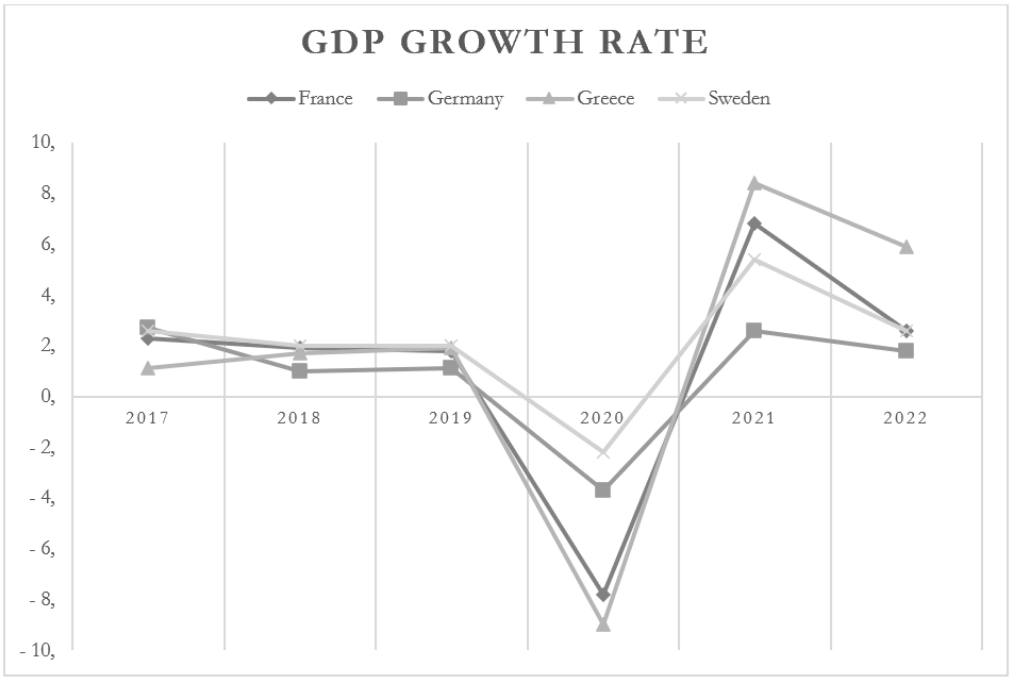
Table 14- Elasticities for total, short-term and long-term leverage

	Elasticities								
	Full period			Pre-COVID-19 period			Covid period		
	1	2	3	4	5	6	7	8	9
Control variables									
Profitability	-0,063	-0,044	-0,011	0,004	-0,007	0,008	-0,030	-0,044	-0,026
Liquidity	-0,001	-0,002	-0,001	-0,036	-0,225	0,027	0,001	0,000	0,001
Tangibility	0,455	0,188	0,411	0,520	-0,151	0,740	0,133	-0,067	0,191
Size	0,175	1,614	-0,203	-0,605	-0,589	-0,610	0,516	1,767	0,157
Growth	0,001	0,004	0,000	-0,001	0,002	-0,002	0,027	0,021	0,029
NDTS	0,064	0,022	0,058	0,061	0,055	0,063	0,000	0,065	-0,019
Inflation	-0,879	4,397	-1,909	-14,92	0,460	-19,95	-0,699	6,788	-2,848
GDP Growth	-0,812	-1,225	-0,525	-5,013	-1,985	-6,005	-0,354	-0,359	-0,353
Tax Variables									
CIT	-0,260	0,006	-0,261	-0,183	1,423	-0,709	0,070	0,638	-0,093
DIV	0,058	-0,061	0,072	-0,120	-1,337	0,279	-	-	-

Table reporting the percentage change in each type of leverage with changes in the explanatory variables.

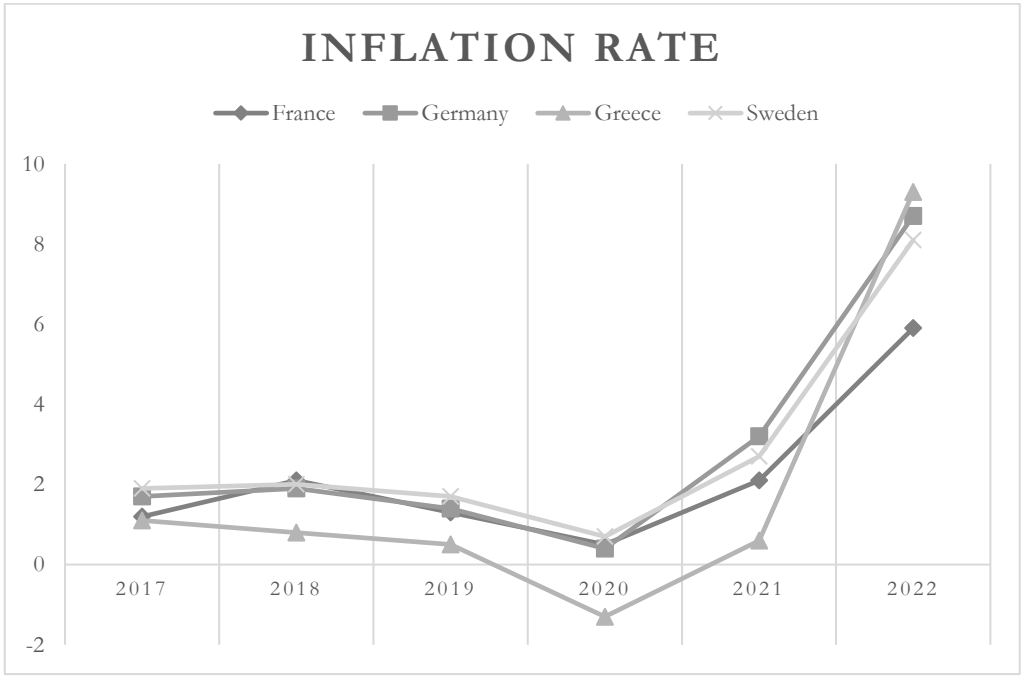
Source: Own elaboration using data obtained through the Stata program

Graph 1- GDP Growth rate between 2017 and 2022 for the countries in the sample



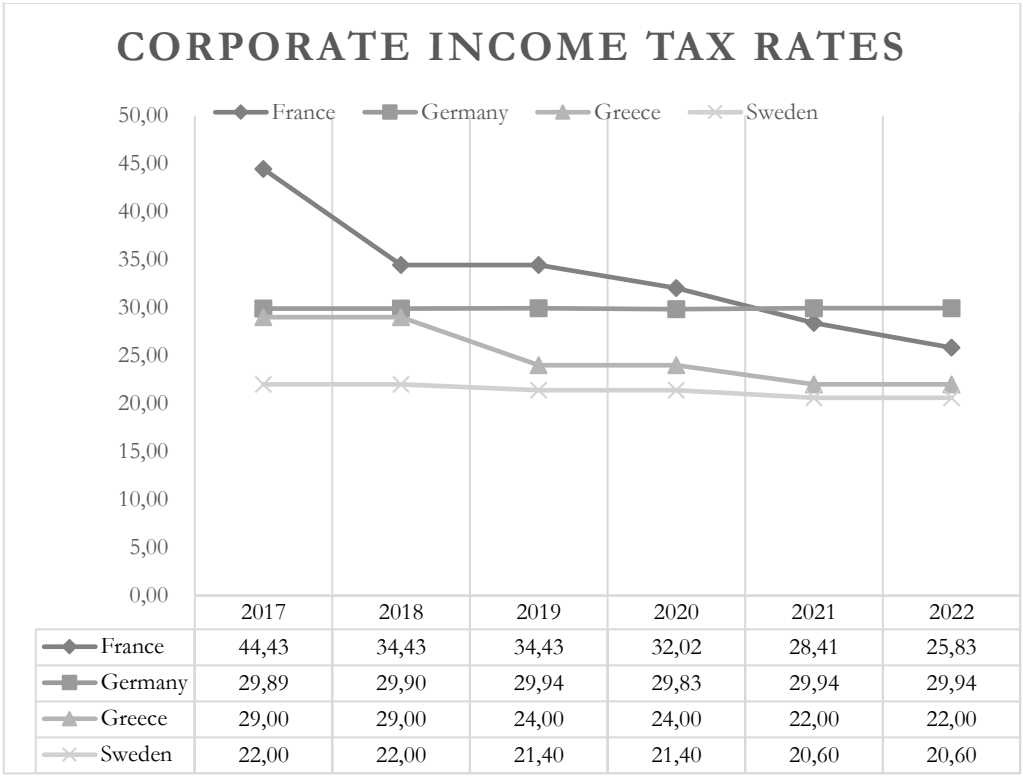
Source: Own elaboration using data obtained from Euro statistics database: Database - National accounts - Eurostat. (n.d.). Eurostat. https://ec.europa.eu/eurostat/web/national-accounts/database

Graph 2- Inflation rate changes between 2017 and 2022 for the countries in the sample



Source: Own elaboration using data obtained from Euro statistics database: Database - Harmonised Indices of Consumer Prices (HICP) - Eurostat. (n.d.). Eurostat. https://ec.europa.eu/eurostat/web/hicp/database

Graph 3- Corporate Income Tax rate between 2017 and 2022 for the countries in the sample



	2017	2018	2019	2020	2021	2022
France	44,43	34,43	34,43	32,02	28,41	25,83
Germany	29,89	29,90	29,94	29,83	29,94	29,94
Greece	29,00	29,00	24,00	24,00	22,00	22,00
Sweden	22,00	22,00	21,40	21,40	20,60	20,60

Source: Own elaboration using data obtained from OECD Statistics Database: OECD Statistics. (n.d.). https://stats.oecd.org/Index.aspx?DataSetCode=CTS_CIT

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