



# **Firm-Specific Determinants of Capital Structure**

**Evidence from Listed, Western-European Firms**

*Bachelorscriptie economie en bedrijfseconomie*

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## ABSTRACT

This thesis seeks to explain the capital structure of listed, Western-European firms through firm-specific determinants. The researched firm-specific determinants are profitability, size, tangibility, liquidity, and growth. The expected effects are based on the two main capital structure theories: the Trade-off theory and the Pecking Order theory. The Trade-off theory focusses on balancing the costs and the benefits to find the best ratio of debt and equity. The Pecking Order theory reflects the tendency of firms to prefer financing the company or new projects in a certain order. Empirical evidence is presented on listed firms in France, Germany, Italy and the Netherlands over the period 2015-2021. Because of the recent period involving the Covid-19 pandemic, controls are added to correct for any biased effects of the determinants. Using the Fixed-Effects model for panel data, the results suggest that for all four countries both the Trade-off theory and the Pecking Order theory are required to be able to accurately describe the effects on the decisions on leverage. Some firm-specific determinants have the expected effect on leverage according to the Trade-off theory, and others according to the Pecking Order theory.

**Keywords:** capital structure, debt ratio, leverage, listed firms, firm-specific determinants, fixed-effects model, Western-Europe, France, Italy, Germany, the Netherlands

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# Table of Contents

1. Introduction .....	4
2. Literature Review .....	6
2.1 Capital Structure Theories .....	9
2.1.1 The Trade-off theory .....	9
2.1.2 The Pecking Order theory .....	9
2.2 Predictions of the Firm-specific Determinants of Capital Structure .....	10
2.2.1 Profitability .....	10
2.2.2 Size .....	10
2.2.3 Tangibility .....	11
2.2.4 Liquidity .....	11
2.2.5 Growth .....	11
3. Research Hypotheses .....	13
4. Data & Methodology .....	15
4.1 Data .....	15
4.1.1 Database .....	15
4.1.2 Variable identification .....	15
4.1.3 Sample and timeframe .....	17
4.2 Methodology .....	17
4.2.1 Model .....	17
4.2.2 Regression assumptions .....	18
4.2.3 Multicollinearity .....	19
5. Results .....	20
5.1 Descriptive statistics .....	20
5.2 correlation analysis .....	21
5.3 regression analysis .....	22
6. Discussion and future research .....	30
6.1 Discussion .....	30
6.2 Future research .....	30
7. Conclusion .....	31

# 1. Introduction

Capital structure is until this day an important research subject. Modigliani and Miller (1963), the authors of the pioneering article regarding capital structure, suggest that a company should employ as much debt as possible to maximise its value. However, in reality we see that firms do not follow this theory, because there are multiple other determinants that affect the decision on capital structure. A number of theories have been proposed to explain the variation in deciding on the leverage for a firm, and the determinants that seem to affect the decisions on the leverage of a firm. Research on capital structure has been dominated by two theories: the Trade-off theory and the Pecking Order theory (Fama & French, 2002; De Jong et al, 2011). The Trade-off theory argues that a firm should choose its ratio of debt and equity by balancing the costs and the benefits. The Pecking Order theory reflects that firms have a preference to finance the company or new projects in a certain order, due to the existence of asymmetric information. The financial hierarchy of the Pecking Order suggests to follow when financing a company has on the first place retained earnings, followed by debt and lastly equity.

This paper investigates the effects of five firm-specific determinants on the capital structure of listed firms in France, Germany, Italy and the Netherlands and links it to one of the two capital structure theories. The firm-specific determinants are profitability, size, tangibility, tangibility, and growth. The research is conducted over the time period 2015 until 2021. Using panel data, the Fixed Effects model is used to run the regression. In addition, to control for different effects of the determinants during the Covid-19 pandemic in 2020, interaction effects will be investigated.

The research is scientifically relevant because there has not been much research conducted for European firms in this recent time period. Most research has been done for an old period or for just one country. It is also scientifically relevant, because the effects of the Covid-19 pandemic on the effects of the firm-specific determinants on the leverage of a firm are investigated. This contributes to the literature on capital structure. In addition, The paper has practical benefits. It helps managers and decision makers in the understanding of the effects on leverage, especially for this new time period in Western-Europe.

The results of the research suggest that the firms in France, Germany, Italy and the Netherlands do not strictly follow one of the theories, but a combination of both. Support for the Trade-off theory was found with the positive effect of size, and the negative effect of growth on the leverage of a firm. Support for the Pecking Order theory was found with the negative effect of

profitability, tangibility and liquidity on the leverage of a firm. The effect of growth was not significant for both Italy and the Netherlands, and the effect of profitability was not significant either for the Netherlands. No evidence was found for different effects of the determinants during the pandemic.

The paper is organized as follows. In section 2, the literature review is presented, where previous research on the subject, the two capital structure theories and the predictions on the effects of the firm-specific determinants according to these theories will be discussed. In section 3 the research hypotheses will be presented. In the fourth section, the data of the research and the methodology will be discussed, where a closer look will be provided into the variable identification and the model used for the analysis. In section 5 the results will be presented. First the descriptive statistics and correlation analysis, followed by the regression results. In the sixth section, there will be a discussion and ideas for future research. Lastly, in section 7, the conclusion.

## 2. Literature Review

The pioneering article of Modigliani and Miller (1958) argued that capital structure is irrelevant in a world with a perfect capital market without taxes and bankruptcy cost. The theory shows that the value of a company relies on its assets to create value, and not on whether the company is internally or externally financed. Modigliani and Miller (1963) suggested in their other article where they took corporate taxes into account, that a company should employ as much debt as possible to maximise its value. Debt is preferred over equity because the interest on debt is tax-deductible. However, in reality we see that firms do not follow this theory, because there are multiple other determinants that affect the decision on capital structure.

Titman & Wessels (1988) analysed the impact of several determinants on the choice of corporate debt ratios. The attributes they researched are asset structure, non-debt tax shields, growth, uniqueness, industry classification, size, earnings volatility, and profitability. They introduced a factor-analytic technique for estimating the impact of these determinants on the leverage. They found that debt levels are negatively related to the uniqueness of a firm. They also showed that short-term debt ratios are negatively related to firm size, and that there is a negative relationship between measures of past profitability and current debt levels.

Wald (1999) studied the factors correlated with capital structure in an international context. He examined the differences in France, Germany, Japan, the United Kingdom and the United States. He found that although some variables have the expected signs and are consistent across countries, other variables differ across countries. Specifically, differences appeared in the correlation between long-term debt/asset ratios and the firm's riskiness, profitability, size, and growth. The author described that these differences may be explained by the different tax policies and agency problems in the five countries.

In their research paper, Rajan & Zingales (1995) investigated the determinants of capital structure choice by analysing the financial decisions of firms in the major industrialized countries. They found that leverage is more similar across the G7 countries than previously expected. The United States and Germany seemed to be relatively less levered. They also showed that even though there is a positive expected correlation between firm size and leverage, there is a negative and significant correlation observed. They pointed out that there is still little understanding of the effects of the determinants on the leverage and that more research is called for.

Psillaki & Daskalakis (2008) investigated the capital structure determinants of Greek, French, Italian and Portuguese small and medium-sized enterprises. They also focussed on whether these determinants tend to be country- or firm-specific. They used a balanced panel model to come to two conclusions. Their first conclusion was that there seem to be similarities in the determinants of capital structure across the countries in the sample. Their second and most important conclusion is that they provided evidence that in the case of Greece, France, Italy and Portugal firm-specific factors, rather than country-specific factors, explain the differences in the choice of capital structure.

Frank & Goyal (2003) examined which factors are important in capital structure decision making. Their sample consists of publicly traded American firms from 1950 to 2003. With the use of regression analysis, the authors concluded that there are significant positive relations between leverage and industry median, tangibility, size, and expected inflation. They found significant negative relations between leverage and the market-to-book assets ratio, and profits. They pointed out that the Trade-off theory accounts for most of the factors they researched in their American sample, such as industry leverage, firm size, tangibility and market-to-book ratio.

Antoniou et al. (2008) investigated in their paper how firms determine their capital structure in different economies. They made a distinction between capital market-oriented economies, represented by the U.K. and the U.S., and bank-oriented economies, represented by France, Germany and Japan. The authors applied a dynamic system-GMM method to the panel data. They found a positive relationship between leverage and tangibility and leverage and the firm size. On the other hand, they found a negative relationship between leverage and profitability, growth opportunities, and share price performance in both types of economies. They concluded that the strength and nature of the effect of firm-specific and market-related factors on the leverage of a firm depend on the economic and legal traditions of the country in which it is located.

Harisson & Widjaja (2014) investigated the effect of the 2008 financial crisis on the capital structure decisions of firms. They did the analysis in terms of three main theories of capital structure: Trade-off theory, Pecking Order theory, and Market Timing theory. They tested five determinants that are widely used in the empirical research on this topic: MTB ratio, profitability, liquidity, tangibility, and firm size. With the use of a random effects GLS model, they found that during the 2008 financial crisis, the coefficients of tangibility and market to book (MTB) ratio exert a stronger influence on capital structure choices than prior to 2008. On

the other hand, profitability exerts less influence on the leverage than before the crisis, and the effect of firm size is negative, which is the opposite of the situation before the crisis. According to their research, the Pecking Order theory has the most explanatory power.

The authors Graham & Leary (2011) reviewed the empirical research on capital structure. They focussed on the three dimensions of capital structure variation: cross firm, cross industry and within firm through time. They analysed how well the Trade-Off theory and the Pecking Order theory explain the variation, and they address their shortcomings. They grouped the explanations of the inadequate performance of the traditional capital structure models into seven categories: mismeasurement of important variables in empirical tests, importance of impact of leverage on non-financial stakeholders, the effect of the supply side of capital on leverage, too little research of richer features of financial contracts, modest value effects due to capital structure variation, biased estimates of leverage adjustment speeds and lastly, capital structure dynamics have not been adequately considered. They concluded by stressing that the papers they reviewed, collectively advance our understanding of corporate capital structure decisions, though none by itself addresses all the unanswered questions.

Gonzalèz & Gonzalèz (2012) analysed whether the determinants of firm leverage vary across firm size in a way that is consistent with the predictions of either the Pecking Order theory or the Trade-off theory, and whether the prediction of the Trade-off theory that firms have a target leverage has a different validity among small, medium-sized and large firms. They used dynamic panel data tests to find results that are partially consistent with both explanations but suggest greater validity for the Pecking Order theory in the case of small firms. There are stronger positive relationships between firm leverage with investment opportunities and intangible assets, and there is a stronger negative relation for firm profitability in small firms than in medium-sized and large firms. Their results reemphasized the convenience of controlling for firm size when testing the validity of explanatory theories of firm capital structure.

The paper of Deesomsak et al (2004) contributed to the capital structure literature by investigating the determinants of capital structure of firms in four different countries in the Asia Pacific region. They specifically investigated Thailand, Malaysia, Singapore and Australia. They found a positive effect of firms size and a negative effect of growth opportunities, non-debt tax shield, liquidity and share price performance on leverage. They also found that the importance of the determinants of the capital structure varies across countries in the region.



They concluded that the capital structure decisions is not only a product of the firm's own characteristics, but also the result of country-specific factors in which a firm operates.

## **2.1 Capital Structure Theories**

In general, the literature and research on capital structure has been dominated by two main theories: the Trade-off theory and the Pecking Order theory. The next section provides a brief explanation of these two theories of capital structure.

### **2.1.1 The Trade-off theory**

According to the Trade-off theory, a firm chooses its ratio of debt and equity by balancing the costs and the benefits. The theory was developed in the 1970s and it is still one of the most important theories of corporate capital structure. It grew out of the Modigliani-Miller Theorem. The original costs and benefits among others were deadweight costs of bankruptcy and the tax saving benefits of financing with debt (Kraus & Litzenberger, 1973). The tax benefits were particularly important in this theory, because this reduced the taxable income at the end of the year. But more debt also has its disadvantages, as it raises the costs of financial distress. This theory explains how to combine the sources of funding to maximize the firm value.

### **2.1.2 The Pecking Order theory**

The Pecking Order theory by Myers & Majluf (1984) reflects the tendency of firms to prefer financing the company or new projects in a certain order. The financial hierarchy regarding this theory to finance investments has on the first place retained earnings, followed by debt and finally equity. This order was created because of the existence of asymmetric information. Because shareholders do not have the same information as managers, they have to draw conclusions from the company's financing choices. Financing with the use of internal cashflows gives a signal to the market that the firm is doing well, and relies on its own funding. Debt financing may draw attention to the firm's financial strength, but it will still show that the company is confident to meet its obligations in the future. Since the interest paid on the debt is tax deductible, this is still seen as a preferred method of financing. The last option that a company has is equity financing. This method is more expensive because of the risk that is being taken by the equity holders. Using equity as a source of financing may signal to the market that the company is having trouble to fund itself.

## **2.2 Predictions of the Firm-specific Determinants of Capital Structure**

There are several determinants of capital structure that are shown to influence the leverage of companies in the academic literature and research. In the next paragraph will be explained why these factors tend to have an effect on the capital structure of a firm according to either the Pecking Order theory or the Trade-off theory and whether there is a negative or positive relationship.

### **2.2.1 Profitability**

There are different opinions regarding the effect of profitability on leverage. According to the Trade-off theory, profitable firms should prefer debt. Using more debt creates benefits from the tax shield. Even though some predictions are consistent with the Trade-off theory, research has shown that the negative relation with profitability and leverage is inconsistent with the model (Graham and Leary, 2011). There are a lot of firms that have low distress risk and a very low leverage even though they could have big advantages of the tax shield (Graham, 2000). Considering these deviations from the theory, it is interesting to consider the effects of this determinant on listed firms in Western-Europe. Following, the expected effect of profitability according to the Pecking Order theory. Profitable firms have more access to internal financing, and according to this theory this is the preferred funding method over debt and equity. So according to the Pecking Order theory there would be a negative relationship expected between profitability and leverage (Duran & Stephen, 2020; Titman & Wessels, 1988; Fama & French, 2002; Frank & Goyal, 2003).

### **2.2.2 Size**

The Trade-off theory hypothesizes a positive relation between firm size and debt, since larger firms have lower bankruptcy risk and relatively lower bankruptcy cost (de Jong et al, 2008). Another argument is that large firms also have lower agency costs of debt, smaller monitoring costs, less volatile cash flows, easier access to credit market, and require more debt to fully benefit from the tax shield (Deesomsak et al, 2004). Considering all these examples, firm size is expected to have a positive impact on leverage. The Pecking Order theory predicts a negative relationship between size and leverage. Larger firms are in general more profitable, which enables them to finance internally instead of externally. They are also expected to have more retained earnings over time (Frank & Goyal, 2009) The information asymmetry problem of the Pecking Order theory is argued to be related to size. Larger firms tend to have lower information

asymmetries (González & González, 2012). Larger listed firms are required to submit information to the stock exchange and financial analysts monitor these firms on a regular basis, whereas small, non-listed firms are only required to produce a simple annual report at the end of the fiscal year (González & González, 2012).

### 2.2.3 Tangibility

Tangible assets have a higher value compared to intangible ones in the case of bankruptcy. They decrease the cost of financial distress that comes with the use of debt. Another argument according to the Trade-off theory is that the agency costs between stockholders and creditors are smaller when the firm does offer tangible assets as collateral (González & González, 2012), because firms with greater tangible assets can more easily pay back their debt. Therefore firms with a higher tangibility are able to obtain more debt. So according to the Trade-off theory there is a positive relationship between tangibility and leverage (Deesomsak et al, 2004; Rajan & Zingales, 1994). Under the Pecking Order theory, it would be expected that firms with few tangible assets would have greater problems with asymmetric information. For this reason, Harris and Raviv (1991) expect firms that do not have many tangible assets, to accumulate more debt over time and obtain a higher leverage. Their view is actually an outlier in the results of most research. The more common idea of the effect of tangibility is based on the suggestion that tangible assets naturally serve as a collateral (Frank & Goyal, 2003). This suggest a positive relation between tangibility and leverage.

### 2.2.4 Liquidity

According to the Pecking Order theory, firms with high liquidity will borrow less. This is because their internal funds are larger, and gives them the opportunity to finance investments this way (de Jong et al, 2008). Another argument is that managers can manipulate liquid assets in favour of shareholders against the interest of debt holders, which increases the agency costs of debt (Deesomsak et al, 2004). Therefore a negative relationship between liquidity and leverage is expected (Harrison & Widjaja, 2014; Deesomsak et al, 2004; Graham, 2000).

### 2.2.5 Growth

For the firm-specific determinant growth, the predictions of the Pecking Order and Trade-off theory differ. According to the Pecking Order theory, there is a positive relationship between growth and leverage (Harris & Raviv,1991). Firms with lots of investment opportunities will

have strong financing needs which will lead to the issuing of more debt (Gonzalèz & Gonzalèz, 2012; Frank & Goyal, 2009). Companies prefer to use debt rather than equity when there are not enough internal financing possibilities. The Trade-off theory on the other hand, predicts a negative relationship between growth and leverage (Deesomsak et al, 2004). Firms with high growth opportunities will have increased costs of financial distress (Myers, 1984). Firms with growth opportunities have more agency conflicts and it worsens debt-related agency problems (Duran & Stephen, 2020). This will make firms more hesitant to issue debt, because they do not want to increase their likelihood of bankruptcy. Growing firms also place a greater value on stakeholder co-investment (Frank & Goyal, 2009).

### 3. Research Hypotheses

Following previous research on capital structure, this paper will investigate the effects of firm-specific determinants on the leverage of a firm specifically for listed companies in Western-Europe. Based on the literature of the relationship between the firm-specific determinants of a firm and the leverage of a firm, five hypotheses have been derived.

Firstly, the expected relationship between profitability and leverage. Since most research indicates that the relationship of the two variables is not in line with the Trade-off theory, a negative relationship according to the Pecking theory is expected (Duran & Stephen, 2020; Titman & Wessels, 1988; Fama & French, 2002; Frank & Goyal, 2003). This leads to the following hypothesis:

*H1: According to the Pecking Order theory, there is a negative relation between profitability and leverage of the firm for listed firms.*

Secondly, the expected relationship between size and leverage. The literature shows that the Trade-off theory hypothesizes a positive relation between firm size and debt, since larger firms have lower bankruptcy risk and relatively lower bankruptcy cost (de Jong et al, 2008; Deesomsak et al, 2004). The Pecking Order theory on the other hand expects a negative relation due to the higher profitability and retained earnings of larger firms and the information asymmetry (Frank & Goyal, 2009; González & González, 2012). As large, listed companies in Western-Europe will be researched, which are all publicly traded, it can be expected that information asymmetry will not be a substantial problem. The following hypothesis it derived:

*H2: According to the Trade-off theory, there is an expected positive relation between size and leverage for listed firms.*

Thirdly, the expected relationship between tangibility and leverage. Firms with a higher tangibility are able to obtain more debt. They have lower costs of financial distress and agency costs. Most research (González & González, 2012; Deesomsak et al, 2004; Rajan & Zingales, 1994;) results in a positive relationship between the variables, in line with the Trade-off theory. This leads to the following hypothesis for this determinant:

*H3: According to the Trade-off theory, there is an expected positive relationship between tangibility and leverage for listed firms.*

Fourthly, the expected relationship between liquidity and leverage. Firms with high liquidity will have larger internal funds. The Pecking Order theory expects these firms to borrow less,

because they can fund their investments internally. This results was found before in other academic research (Harrison & Widjaja, 2014; Deesomsak et al, 2004; Graham, 2000). The following hypothesis is derived:

*H4: According to the Pecking Order theory, there is an expected negative relation between liquidity and leverage for listed firms.*

Lastly, the expected relationship between growth and leverage. The predictions on issuance of debt differs between the two theories. The Pecking Order theory expects a positive relationship (Harris & Raviv, 1991; Gonzalèz & Gonzalèz, 2012; Frank & Goyal, 2009). Firms require more funding when they have more investment opportunities. The Trade-off theory expects a negative relationship (Deesomsak et al, 2004; Myers, 1984; Duran & Stephen, 2020). Firms with high growth will have higher costs of financial distress and more agency conflicts. This uncertainty will make companies more hesitant to issue debt, because of the risk of bankruptcy. Considering the facts that in this paper, listed companies will be investigated, the negative relationship seems more likely. The following hypothesis is derived:

*H5: According to the Trade-off theory, there is a negative relation between growth opportunities and leverage for listed firms.*

## 4. Data & Methodology

### 4.1 Data

#### 4.1.1 Database

The data is compiled from Amadeus by Bureau van Dijk. This database is accessed from the Wharton Research Database System (WRDS). The Amadeus database contains information about 21 million companies in both Western and Eastern Europe. The research uses data of firms from balance sheets, profit and loss statements, identification codes, reporting information and general information about companies from the Financials annual section of Amadeus.

#### 4.1.2 Variable identification

To indicate whether or not a firm is listed, the firm has to be quoted according to Amadeus.

The dependent variable in this research is Leverage. This variable is calculated by dividing the sum of the current and non-current liabilities by the total assets (Delcours, 2007). Leverage is expressed as a proportion in the regression. To calculate Leverage at time  $t$ , accounting data from time  $t$  is used. A requirement to be included in the sample, is that the leverage can not exceed one (Harrison & Widjaja, 2014).

The independent variables in this research consist of the firm-specific determinants that have an expected effect on Leverage. The first one is Profitability. The profitability of a firm indicates the degree to which a firm yields profit. To calculate Profitability we divide the Earnings Before Interest and Tax (EBIT) by the total assets (Harrison & Widjaja, 2014; Titman & Wessels; 1988; Wald, 1999). Profitability is expressed as a proportion in the regression.

The second independent variable is Size. To make an indication of the firm Size, the natural logarithm of total assets is used (Deesomsak et al, 2004; Rajan & Zingales, 1995; Harrison & Widjaja, 2014).

The third one is Tangibility. The tangibility of a firm indicates the ratio of tangible assets it has compared to its total assets. For example cash, machines, inventory and plant are listed as tangible assets. To calculate Tangibility the total fixed assets are divided by the total assets (Rajan & Zingales, 1995; De Jong et al, 2008; Harrison & Widjaja, 2014). Tangibility is expressed as a proportion in the regression..

The fourth variable is *Liquidity*. Liquidity refers to the possibility of a firm to convert its assets into liquid assets like cash. The variable *Liquidity* is indicated by the current ratio. This is calculated by dividing the current assets by the current liabilities (Deesomsak et al, 2004; De Jong et al, 2008). *Liquidity* is expressed as a proportion in the regression.

The last main variable that is expected to have an effect on the leverage of a firm is *Growth*. Company growth refers to firms that generate positive cashflows and seek for abilities to generate more profit. To calculate *Growth* we divide the difference between the total assets at time t and the total assets at time t-1 by the total assets at time t-1 (Titman & Wessels, 1988; Fama & French, 2002 ). *Growth* is expressed as a percentage in the regression.

To test the effect of *Profitability*, *Size*, *Tangibility*, *Liquidity* and *Growth* on the leverage at time t, accounting data from time t-1 is used. The data is lagged because the leverage that a firm is able to get at time t depends on the value of the main variables at time t-1.

To reduce noise in the sample, the main variables *Profitability*, *Size*, *Tangibility*, and *Growth* are winsorized at the 1<sup>st</sup> and 99<sup>th</sup> percentiles (Leary & Roberts, 2014). This is with the exception of *Liquidity*, which is winsorized at the 5<sup>th</sup> and 95<sup>th</sup> percentiles, because of several high outliers. Winsorizing is necessary to minimize the influence of outliers in the sample. Winsorizing instead of trimming is used to still be able to keep these observations in the sample.

Several control variables are included which have shown to have an effect on leverage. The first extra variable used in this research is *Industry*. Empirical research has shown that industry average leverage ratios are an important determinant of a firms capital structure (Welch, 2004; Frank & Goyal, 2009). This variable is used to control for industry related differences in capital structure. A dummy for every different industry is created. The sector of the firms is indicated by their SIC-code. Financial firms (SIC codes 6000-6999) were removed from the data, since these firms have different capital structure characteristics and different balance sheet structure (Harrison & Widjaja, 2014; Chang et al, 2014).

In addition to this, the *Year* dummy is added to the regression. By adding this variable, the year effects get filtered out. The Year variable is created by separating the year from the closing date of the accounting information. It is extra important to add this dummy to the regression because of the Covid-19 pandemic that has taken place during the timespan of this research. This had a severe effect on the economy, and could also have affected the capital structure of firms. The Covid-19 crisis created lockdowns which lowered the sales and net incomes of a lot of firms.



Due to this, companies may have issued more debt than they normally would have without the pandemic.

#### 4.1.3 Sample and timeframe

The sample for this research consist of data from four countries, namely France, Germany, Italy, and the Netherlands. The sample consists of 1,704 companies (678 French, 561 German, 347 Italian, and 118 Dutch firms), with in total 8,888 observations (3,879 for French, 2,771 for German , 1,779 for Italian, and 459 for Dutch Firms). The timeframe used for this research are the years 2014-2021, where 2014 is only used to calculate the lag variables.

## 4.2 Methodology

### 4.2.1 Model

To test for the effect of the firm-specific determinants on the leverage of a firm, a multiple linear regression will be performed. The analysis is conducted using the statistical software STATA. Two regressions are performed for the period between 2015 and 2021. The estimated regressions are as follows:

$$(1) LEV_t = \beta_0 + \beta_1 * PROF_{t-1} + \beta_2 * SIZE_{t-1} + \beta_3 * TANG_{t-1} + \beta_4 * LIQ_{t-1} + \beta_5 * GROWTH_{t-1} + \beta_6 * IND\_DUMMY + \beta_7 * YEAR\_DUMMY + \varepsilon_i$$

$$(2) LEV_i = \beta_0 + \beta_1 * PROF_{t-1} + \beta_2 * SIZE_{t-1} + \beta_3 * TANG_{t-1} + \beta_4 * LIQ_{t-1} + \beta_5 * GROWTH_{t-1} + \beta_6 * IND\_DUMMY + \beta_7 * YEAR\_DUMMY + \beta_8 * PROF_{t-1} * YEAR_{2020} + \beta_9 * SIZE_{t-1} * YEAR_{2020} + \beta_{10} * TANG_{t-1} * YEAR_{2020} + \beta_{11} * LIQ_{t-1} * YEAR_{2020} + \beta_{12} * GROWTH_{t-1} * YEAR_{2020} + \varepsilon_i$$

The first term, LEV, denotes the dependent variable Leverage. The next five terms (PROF, SIZE, TANG, LIQ and GROWTH) represent the main variables examined in this research: Profitability, Size, Tangibility, Liquidity and Growth, respectively. IND\_DUMMY and YEAR\_DUMMY represent the control variables Industry and Year to filter out the industry and year effects. Lastly,  $\beta_0$  and  $\varepsilon_i$  represent the intercept and the error term, respectively.

The difference between the first and the second regression is the addition of interaction terms between the independent variables and the year dummy for 2020. The first equation is employed for analysing the determinants of capital structure for all four countries per year. The second model is designed to gain more information about the role of the COVID-19 pandemic and if

this affected the effect of the firm-specific determinants on the leverage. To investigate whether there is a significant change in the effect of the capital structure determinants on the leverage of firms in the four countries, interaction terms are used.

#### 4.2.2 Regression assumptions

To conduct valid coefficient estimates using the Ordinary Least Squares (OLS) method, five assumptions were made (Brooks, 2008).

The first assumption requires that the average value of the errors are zero. To make sure that this assumption will not be violated, a constant term is included in the regression equation.

The second assumption requires that the variance of the errors is constant. This is also called the assumption of homoscedasticity. There are formal statistical tests to detect the presence of heteroscedasticity. To test for heteroscedasticity in the data, White's test is performed. Under the null hypothesis the variance of the errors are constant, and under the alternative hypothesis the variance of the errors are not constant. After conducting the White test on the regressions of the four different countries, there can be concluded that the variances of the errors are not constant, and that the assumption is violated. The results of the White test are provided in Table 4.1 to Table 4.4. in the Appendix. A possibility to solve the issue when the errors are heteroscedastic, is to transform the standard errors into heteroscedastic robust standard errors.

The third assumption to have valid coefficient estimates states that the covariance between the errors terms over time is zero. To test for autocorrelation in the data, a formal statistical test should be applied. In this research, the Wooldridge test is performed (Wooldridge, 2002; Drukker, 2003). Under the null hypothesis the errors are independent of one another, and under the alternative hypothesis the errors are autocorrelated. After conducting the Wooldridge test, there can be concluded that this assumption is also strongly violated by the four countries. The results of Wooldridge tests for each country are provided in Table 5.1 to Table 5.4 in the Appendix. Because of serial correlation, the standard errors will be smaller than the true standard errors of the data. So even though serial correlation will not affect the unbiasedness or consistency of OLS estimators, it will affect the efficiency. The null hypothesis might be rejected when it should not be rejected.

The fourth assumption is that the regressors are non-stochastic. The OLS method is unbiased and consistent in the presence of stochastic regressors, if it is provided that the regressors are not correlated with the error term of the estimated equation (Brooks, 2008).

Lastly, the fifth assumption. This assumption requires that the disturbances are normally distributed. This is required to conduct hypothesis tests about the model parameters. To check for normality, histograms of the residuals are plotted. Looking at the graphs of the distribution, this assumption is satisfied for France, Germany and Italy. The graph of the Netherlands does not look strictly normal, this may be because of the fewer firms and firm observations for this country. The graphs of the disturbances are provided in the Appendix in Figure 6.1.

In conclusion, since not all the assumptions are satisfied, the usage of the OLS estimator cannot be validated. The assumptions that are not satisfied, are the ones of homoscedasticity and zero covariance of errors over time. Given that the other assumptions are satisfied, there is another estimator that is considered BLUE (Best Linear Unbiased Estimator), namely Generalized Least Squares (GLS). Since the research consists of panel data, the most appropriate GLS options are the Fixed Effect model or the Random Effects model. To test which model is best, the Hausman test is performed. According to the results of the test, the Fixed Effects model is the most appropriate model. The results of the Hausmann Test are provided in the Appendix Table 7.1.

#### 4.2.3 Multicollinearity

Multicollinearity is the phenomenon that refers to the extent to which one or two variables are correlated with each other. Multicollinearity between the variables can lead to poor reflections of the relationship between the independent and dependent variable due to the combined prediction (Kraha et al, 2012). To test for multicollinearity in the data, the Variance Inflation Factor (VIF) test is used (Harisson & Widjaja, 2014). This test provides an indication of multicollinearity in the regression coefficient. The presence of the multicollinearity is stronger when the VIF is larger. When the value of the VIF is greater than 5, there is cause of concern. For none of the countries there is sign of multicollinearity in the variables. The results of the VIF test from the four countries imply that the multicollinearity among the variables in the model is relatively weak. For France, Germany, Italy and the Netherlands the highest VIF values are 1.46, 1.25, 1.55 and 1.41, respectively. The results of the test are given in Table 8.1 in the Appendix.

## 5. Results

### 5.1 Descriptive statistics

Table 1.1 to 1.4 summarize the descriptive statistics for the sample. The leverage of the total sample varies between a minimum of 0.39% and a maximum of 96.9%. The leverage is on average the highest Italy with a mean of 60.7%. The profitability of the total sample varies between -67.8% and 37.1%. Firm size is on average the highest for companies in the Netherlands. Tangibility varies between 0 and 1 and is on the average the highest in the Netherlands. The mean of liquidity is the highest in Germany and varies for the total sample between -75.9% and 298.4%. The last variable, growth, varies between -80.0% and 706.8% for the total sample and is on average the highest in France.

Table 1.1 Descriptive statistics for France

	Observations	Mean	Std. Dev.	Min	Max
LEV	4,758	0.548	0.215	0.004	0.969
PROF	4,743	-0.009	0.166	-0.678	0.317
SIZE	4,758	18.739	2.774	13.219	25.146
TANG	4,758	0.465	0.257	0	1
LIQ	4,719	0.517	0.723	-0.759	2.894
GROWTH	4,346	0.599	1.193	-0.800	7.068

Note: definitions of the variables can be found in section 4.2.1. Min= minimum, Max = maximum.

Table 1.2 Descriptive statistics for Germany

	Observations	Mean	Std. Dev.	Min	Max
LEV	3,869	0.491	0.237	0.004	0.969
PROF	3,869	0.020	0.145	-0.678	0.317
SIZE	3,869	18.793	2.599	13.219	25.146
TANG	3,869	0.498	0.268	0	1
LIQ	3,772	0.904	0.900	-0.759	2.894
GROWTH	3,411	0.557	1.243	-0.800	7.068

Note: definitions of the variables can be found in section 4.2.1. Min= minimum, Max = maximum.

Table 1.3 Descriptive statistics for Italy

	Observations	Mean	Std. Dev.	Min	Max
LEV	2,299	0.607	0.219	0.004	0.969
PROF	2,299	0.033	0.110	-0.678	0.317
SIZE	2,299	18.240	2.456	13.219	25.146
TANG	2,299	0.440	0.236	0	1
LIQ	2,299	0.408	0.643	-0.759	2.894
GROWTH	2,047	0.501	1.031	-0.800	7.068

Note: definitions of the variables can be found in section 4.2.1. Min= minimum, Max = maximum.

Table 1.4 Descriptive statistics for the Netherlands

	Observations	Mean	Std. Dev.	Min	Max
LEV	751	0.458	0.265	0.004	0.969
PROF	751	0.013	0.138	-0.678	0.317
SIZE	751	19.880	2.608	13.219	25.146
TANG	751	0.567	0.298	0	1
LIQ	745	0.662	1.001	-0.759	2.894
GROWTH	625	0.246	1.024	-0.800	7.068

Note: definitions of the variables can be found in section 4.2.1. Min= minimum, Max = maximum.

## 5.2 correlation analysis

In Table 2.1 to Table 2.4, the correlation analyses for the four countries are presented. Almost all the independent variables have a significant relationship with each other. Only profitability and leverage in all countries, liquidity and profitability in Germany, liquidity and growth in Italy and profitability and growth in the Netherlands do not seem to correlate significantly. Even though this could indicate an issue, the VIF tests performed in section 4.2.4 have shown that there is no multicollinearity issue in the data. This means that these variables can be used together in the regression analysis. The results of the VIF tests are given in Table 8.1 in the Appendix.

Table 2.1 Correlation analysis for France

	LEV	PROF	SIZE	TANG	LIQ	GROWTH
LEV	1.000					
PROF	-0.019	1.000				
SIZE	0.190***	0.304***	1.000			
TANG	-0.044**	0.143***	0.406***	1.000		
LIQ	-0.604***	-0.103***	-0.270***	-0.442***	1.000	
GROWTH	0.112***	0.150***	0.268***	0.095***	-0.109***	1.000

Notes: \*,\*\* and \*\*\* correspond to the significance level of 10%, 5% and 1%, respectively. Definitions of the variables can be found in section 4.2.1.

Table 2.2 Correlation analysis for Germany

	LEV	PROF	SIZE	TANG	LIQ	GROWTH
LEV	1.000					
PROF	-0.014	1.000				
SIZE	0.355***	0.259***	1.000			
TANG	-0.032**	0.049***	0.181***	1.000		
LIQ	-0.518***	0.026	-0.232***	-0.397***	1.000	
GROWTH	0.064***	0.058***	0.077***	0.042**	-0.071***	1.000

Notes: \*,\*\* and \*\*\* correspond to the significance level of 10%, 5% and 1%, respectively. Definitions of the variables can be found in section 4.2.1.

Table 2.3 Correlation analysis for Italy

	LEV	PROF	SIZE	TANG	LIQ	GROWTH
LEV	1.000					
PROF	-0.005	1.000				
SIZE	0.060***	0.136***	1.000			
TANG	-0.118***	0.145***	0.285***	1.000		
LIQ	-0.618***	0.067***	-0.044**	-0.420***	1.000	
GROWTH	0.056**	0.059***	0.039*	-0.039*	-0.001	1.000

Notes: \*,\*\* and \*\*\* correspond to the significance level of 10%, 5% and 1%, respectively. Definitions of the variables can be found in section 4.2.1.

Table 2.4 Correlation analysis for the Netherlands

	LEV	PROF	SIZE	TANG	LIQ	GROWTH
LEV	1.000					
PROF	0.060	1.000				
SIZE	0.329***	0.321***	1.000			
TANG	0.083**	0.208 ***	0.227***	1.000		
LIQ	-0.662***	-0.169***	-0.267***	-0.520***	1.000	
GROWTH	-0.078**	0.008	-0.062	-0.073*	0.071*	1.000

Notes: \*,\*\* and \*\*\* correspond to the significance level of 10%, 5% and 1%, respectively. Definitions of the variables can be found in section 4.2.1.

### 5.3 regression analysis

In the following section, the Generalized Least Squares regression results will be discussed for France, Germany, Italy and the Netherlands. First, the results of regression (1) will be investigated. This regression estimates the effects of the five main variables Profitability, Size, Tangibility, Liquidity and Growth on the dependent variable Leverage in the four sample countries. Second, the results of regression (2) will be discussed. This regression contains the same variables as regression (1) but in addition, interaction factors between the year 2020 and

the main variables are added. This way there can be investigated whether there is a significant change in the effect of the capital structure determinants on the leverage of firms in the four countries.

First, the results of the Fixed Effects regressions of France (Table 3.1) will be discussed. For regression (1), profitability has a significant negative effect on the leverage of a firm. As expected in the hypothesis, on average, a 1% increase in profitability results in a 0.224% decrease in the leverage. This is in line with the Pecking Order theory. Size has a significant positive effect on the leverage of a firm, as expected in the hypothesis. This is in line with the Trade-off theory. Tangibility seems to have a significant negative effect on the leverage of a firm. On average, a 1% increase in tangibility results in a 0.141% decrease in leverage. The hypothesis based on the Trade-off theory, is not in line with these results. This could be explained with the Pecking Order theory. Under this theory, it would be expected that firms with few tangible assets would have greater problems with asymmetric information. Firms that do not have many tangible assets, are expected to accumulate more debt over time and obtain a higher leverage. Liquidity has a significant negative effect on the leverage for French firms. This is as expected in the hypothesis, predicted by the Pecking Order theory. Lastly, it is concluded that growth has a significant negative effect on leverage, in line with the hypothesis and Trade-off theory. On average, 1% increase results in a 0.009% decrease in the leverage of a firm. Even though the effect may be small, it is still significant. Regression (2) tests whether the effect of the firm-specific factors on the leverage of French firms was different in the year 2020 due to the Covid-19 pandemic. Since only the interaction effect of the year 2020 with profitability is significant, only conclusions can be drawn about this determinant. The full effect of profitability on leverage in the year 2020 are the coefficients of  $\text{Profitability}_{t-1}$  and  $\text{Profitability}_{t-1} * \text{Year}_{2020}$ . Since it is a stronger negative relation, as expected in the hypothesis about the effect of profitability on leverage, it does not necessarily indicate that the pandemic had a specific effect. The results of the regressions for France provide evidence that both the ideas of the Trade-off theory and the Pecking Order theory explain the effects of firm-specific determinants on the leverage of a firm.

Table 3.1: Fixed Effects regression results for France

	Leverage (1)	Leverage (2)
Profitability $t-1$	-0.224 *** (0.035)	-0.204*** (0.033)
Size $t-1$	0.016*** (0.004)	0.016*** (0.004)
Tangibility $t-1$	-0.141*** (0.029)	-0.141*** (0.028)
Liquidity $t-1$	-0.082*** (0.018)	-0.083*** (0.018)
Growth $t-1$	-0.009*** (0.003)	-0.008** (0.003)
Profitability $t-1$ * Year <sub>2020</sub>		-0.131** (0.040)
Size $t-1$ * Year <sub>2020</sub>		0.001 (0.002)
Tangibility $t-1$ * Year <sub>2020</sub>		-0.007 (0.030)
Liquidity $t-1$ * Year <sub>2020</sub>		0.005 (0.008)
Growth $t-1$ * Year <sub>2020</sub>		-0.008 (0.011)
Industry	Yes	Yes
Year	Yes	Yes
Constant	0.370*** (0.072)	0.377*** (0.071)
R <sup>2</sup>	0.191	0.192
Observations	3,879	3,879

Note: in this table the results of the Fixed Effects regression for France. The dependent variable is Leverage. The independent variables are Profitability, Size, Tangibility, Liquidity, Growth, Sector and Year for regression (1) with in addition the interaction terms of the accounting variables with the year 2020 for regression (2). Each column gives the coefficients of the variables, where \*,\*\* and \*\*\* correspond to the significance level of 10%, 5% and 1%, respectively. The standard errors are shown in brackets below the coefficients.

Second, the results of the Fixed Effects regressions of Germany (Table 3.2). In regression (1), a significant negative relation between profitability and leverage was found. On average, an increase of 1% in profitability will lead to a 0.202% decrease in leverage, which is predicted by the Pecking Order theory and in line with the hypothesis. Size has a significant positive effect on leverage for German firms. Just like in the French sample, tangibility has a negative effect on leverage. For this country, the hypothesis has to be rejected as well. These results can be explained by the Pecking Order theory. Liquidity shows a negative effect on Leverage, which means that the hypothesis can be accepted. This effect is in line with the Pecking Order theory.



The last main variable is growth, and shows a negative effect on leverage that is significant at 5%. On Average, an increase of 1% in growth results in a 0.009% decrease in leverage. This result corresponds to the hypothesis stated for this variable. With regression (2) is tested whether the effect of the firm-specific factors on the leverage of German firms was different in the year 2020 due to the Covid-19 pandemic. Since neither of the interaction effects have a significant effect, there cannot be made any conclusions on the difference in effects of the firm-specific determinants due to the year 2020 with its pandemic. The results of the regressions for Germany provide evidence that both the ideas of the Trade-off theory and the Pecking Order theory explain the effects of firm-specific determinants on the leverage of a firm.

Table 3.2: Fixed Effects regression results for Germany

	Leverage (1)	Leverage (2)
Profitability $t_{-1}$	-0.202 *** (0.040)	-0.225*** (0.004)
Size $t_{-1}$	0.028*** (0.004)	0.027*** (0.004)
Tangibility $t_{-1}$	-0.122*** (0.022)	-0.119*** (0.021)
Liquidity $t_{-1}$	-0.066*** (0.006)	-0.064*** (0.006)
Growth $t_{-1}$	-0.009** (0.003)	-0.009** (0.003)
Profitability $t_{-1}$ * Year <sub>2020</sub>		0.107 (0.097)
Size $t_{-1}$ * Year <sub>2020</sub>		0.004 (0.004)
Tangibility $t_{-1}$ * Year <sub>2020</sub>		-0.019 (0.030)
Liquidity $t_{-1}$ * Year <sub>2020</sub>		-0.005 (0.012)
Growth $t_{-1}$ * Year <sub>2020</sub>		-0.002 (0.015)
Industry	Yes	Yes
Year	Yes	Yes
Constant	0.149*** (0.066)	0.161*** (0.075)
R <sup>2</sup>	0.222	0.213
Observations	2,771	2,771

Note: in this table the results of the Fixed Effects regression for Germany. The dependent variable is Leverage. The independent variables are Profitability, Size, Tangibility, Liquidity, Growth, Sector and Year for regression (1) with in addition the interaction terms of the accounting variables with the year 2020 for regression (2). Each column gives the coefficients of the variables, where \*,\*\* and \*\*\* correspond to the significance level of 10%, 5% and 1%, respectively. The standard errors are shown in brackets below the coefficients.

Third, the results of the Fixed Effects regressions of Italy (Table 3.3) will be discussed. In regression (1), a significant negative relation between profitability and leverage was found. On average, an increase of 1% in profitability will lead to a 0.127% decrease in leverage, which is predicted by the Pecking Order theory and in line with the hypothesis. The results indicate that size also has a significant positive effect on leverage for Italian firms. Tangibility has a significant negative effect on leverage, just like in the French and German sample. For this country, the hypothesis has to be rejected as well, which can be explained by the Pecking Order theory. According to the reasoning of Harris & Raviv (1991), firms with fewer tangible assets tend to obtain more debt over time, since they have greater problems with asymmetric information. Liquidity shows a negative effect on Leverage, which means that the hypothesis is accepted. This effect is in line with the Pecking Order theory. On average, a 1% increase in the liquidity of a firm will result in a 0.138% decrease in the leverage. The last main variable is growth, and shows a negative effect on leverage that is significant at 5%. This result corresponds to the hypothesis stated for this variable. Regression (2) tests whether the effect of the firm-specific factors on the leverage of Italian firms was different in the year 2020 due to the Covid-19 pandemic. Only the interaction with size is positive and significant. But because the effect of independent variable Size is significant and positive as well, it does not provide any evidence for the change in choosing leverage because of the Covid-19 pandemic in 2020. The results of the regressions for Italy provide evidence that both the ideas of the Trade-off theory and the Pecking Order theory explain the effects of firm-specific determinants on the leverage of a firm.

Table 3.3: Fixed Effects regression results for Italy

	Leverage (1)	Leverage (2)
Profitability $t-1$	-0.127* (0.074)	-0.165* (0.085)
Size $t-1$	0.016*** (0.005)	0.013** (0.005)
Tangibility $t-1$	-0.276*** (0.076)	-0.283*** (0.076)
Liquidity $t-1$	-0.138*** (0.024)	-0.136*** (0.024)
Growth $t-1$	-0.009 (0.006)	-0.009 (0.006)
Profitability $t-1$ * Year <sub>2020</sub>		0.128 (0.132)
Size $t-1$ * Year <sub>2020</sub>		0.017*** (0.004)
Tangibility $t-1$ * Year <sub>2020</sub>		0.020 (0.034)
Liquidity $t-1$ * Year <sub>2020</sub>		-0.010 (0.014)
Growth $t-1$ * Year <sub>2020</sub>		-0.009 (0.019)
Industry	Yes	Yes
Year	Yes	Yes
Constant	0.5210*** (0.0929)	0.586*** (0.087)
R <sup>2</sup>	0.290	0.298
Observations	1,779	1,779

Note: in this table the results of the Fixed Effects regression for Italy. The dependent variable is Leverage. The independent variables are Profitability, Size, Tangibility, Liquidity, Growth, Sector and Year for regression (1) with in addition the interaction terms of the accounting variables with the year 2020 for regression (2). Each column gives the coefficients of the variables, where \*,\*\* and \*\*\* correspond to the significance level of 10%, 5% and 1%, respectively. The standard errors are shown in brackets below the coefficients.

Lastly, the results of the Fixed Effects regressions of the Netherlands (Table 3.4) will be discussed. For regression (1), profitability does not seem to have a significant effect on the leverage of a firm. Therefore the hypothesis of a negative effect on leverage can neither be accepted or rejected. But this is not useless, since it provides evidence for both capital structure theories. The Trade-off theory predicts a positive relation and the Pecking Order theory predicts a negative relation. Size has a significant positive effect on the leverage of a firm, as expected in the hypothesis. According to the Trade-off theory larger firms have relatively lower bankruptcy risk and lower bankruptcy cost. Tangibility seems to have a significant negative

effect on the leverage of a firm. On average, a 1% increase in tangibility results in a 0.133% decrease in leverage. The hypothesis based on the Trade-off theory, is contrary to the results. This could be explained with the Pecking Order theory. Firms with fewer tangible assets, are expected to accumulate more debt over time and obtain a higher leverage. Liquidity has a significant negative effect on the leverage for Dutch firms as well. This is as expected in the hypothesis, predicted by the Pecking Order theory. Lastly, the results show that growth does not have a significant effect on leverage for the Dutch sample. Therefore the hypothesis of a negative effect on leverage is neither be accepted or rejected. Regression (2) tests whether the effect of the firm-specific factors on the leverage of Dutch firms was different in the year 2020 due to the Covid-19 pandemic. The only interaction that shows a significant effect is the one with 2020 and tangibility. It shows a negative effect on leverage, just like expected by the Pecking Order theory. But since it is a stronger negative effect, it does not provide any evidence for the change in choosing leverage because of the Covid-19 pandemic in 2020. The significant results of the regressions for the Netherlands provide evidence that both the ideas of the Trade-off theory and the Pecking Order theory explain the effects of firm-specific determinants on the leverage of a firm.

Table 3.4: Fixed Effects regression results for the Netherlands

	Leverage (1)	Leverage (2)
Profitability $t-1$	-0.063 (0.078)	-0.062 (0.093)
Size $t-1$	0.014** (0.007)	0.013** (0.006)
Tangibility $t-1$	-0.133** (0.054)	-0.121** (0.055)
Liquidity $t-1$	-0.146*** (0.014)	-0.148*** (0.015)
Growth $t-1$	-0.007 (0.005)	-0.006 (0.006)
Profitability $t-1$ * Year <sub>2020</sub>		-0.002 (0.105)
Size $t-1$ * Year <sub>2020</sub>		0.003 (0.007)
Tangibility $t-1$ * Year <sub>2020</sub>		-0.074** (0.029)
Liquidity $t-1$ * Year <sub>2020</sub>		0.007 (0.011)
Growth $t-1$ * Year <sub>2020</sub>		-0.014 (0.013)
Industry	Yes	Yes
Year	Yes	Yes
Constant	0.335** (0.140)	0.340*** (0.132)
R <sup>2</sup>	0.539	0.541
Observations	459	459

Note: in this table the results of the Fixed Effects regression for the Netherlands. The dependent variable is Leverage. The independent variables are Profitability, Size, Tangibility, Liquidity, Growth, Sector and Year for regression (1) with in addition the interaction terms of the accounting variables with the year 2020 for regression (2). Each column gives the coefficients of the variables, where \*, \*\* and \*\*\* correspond to the significance level of 10%, 5% and 1%, respectively. The standard errors are shown in brackets below the coefficients.

To summarise, the results indicate that both the Trade-off theory and the Pecking Order theory are required to be able to accurately describe the effects on the decisions on leverage. The expected effects (positive or negative) of the firm-specific determinants on the leverage of a firm, tend to be the same for France, Germany, Italy, and the Netherlands. For France and Germany all five main variables, Profitability, Size, Liquidity, Tangibility and Growth, are significant and thus important factors to explain the capital structure decisions of a firm. For Italy this is the same, with the exception of Growth. For the Netherlands this is with the exception of both Profitability and Growth. The fact that Growth and Profitability are not as reliable as expected, is in contrast to prior research on this topic (Deesomsak et al, 2004;

Gonzalèz & Gonzalèz, 2012; Frank & Goyal, 2009; Harris & Raviv, 1991; Duran & Stephen, 2020; Titman & Wessels, 1988; Fama & French, 2002). The results of the second regression have indicated that there was no significant change in the effects of the firm-specific determinants on leverage in the year of the Covid-19 pandemic 2020. It was important to control for this, because this could have created biased results.

## 6. Discussion and future research

### 6.1 Discussion

Contrary to the expectations, this research did not find a significant positive relation between tangibility and leverage, as stated in Hypothesis 3. This is expected by the Pecking Order theory. Under this theory, it would be expected that firms with few tangible assets would have greater problems with asymmetric information. This would lead to the preference of debt over equity. Most research reported a positive effect of tangibility, which makes this result an outlier. However, this can still be explained by the Pecking Order theory. Another point of discussion are the results of regression (1) that did not show any significant effects. It could be argued that this is actually evidence for both theories, since it does not reject any of them. This again points at the need of a more complete theory that combines both the Pecking Order theory and the Trade-off theory. Lastly, an implication of the findings of this paper is the measurement of the dependent and independent variables. Harris and Raviv (1991) argued in their paper that the interpretation of results must be tempered by an awareness of the difficulties involved in measuring both leverage and the explanatory variables of interest. Even though the calculation of the variables was based on prior research, this does not mean that a different calculation would not result in a different outcome.

### 6.2 Future research

For future research, an idea would be to validate the results from this paper, using different formulas to calculate the dependent and independent variables. For example, Deesomsak et al (2014) measure leverage as the debt to capital ratio, calculated as  $\text{total debt} / (\text{total debt} + \text{market value of equity} + \text{book value of preference shares})$ . Rajan & Zingales (1994) on the other hand, use the ratio of total debt to net assets as the measurement of leverage. This may affect the outcome of the effects on leverage.

In addition, it would be interesting to extend the study to different countries using the same time period. There could be specifically investigated if the role of the firm-specific determinants changed over time, which could be affected by the Covid-19 pandemic. This could drastically differ per country.

## 7. Conclusion

This research investigated the effects of Profitability, Size, Liquidity, Tangibility and, Growth on the leverage of listed firms in France, Germany, Italy and the Netherlands for the most recent timeframe 2015-2021. The two main theories on capital structure decision, Trade-off theory and Pecking Order theory, were used to explain the effects of the determinants and tested on relevance. An important finding to emerge from this study is that for this recent timeframe, both the Trade-off theory and the Pecking Order theory are required to be able to accurately describe the effects on the decisions on leverage for these four European countries.

Using a Fixed Effects model, two different regressions were performed. The first hypothesis of a negative effect of Profitability according to the Pecking Order theory is accepted for France, Germany and Italy. The effect of profitability was not significant for the Netherlands, so the hypothesis could neither be accepted or rejected. The second hypothesis of a positive effect of Size according to the Trade-off theory is accepted for all four countries. The third hypothesis of a positive effect of tangibility according to the Trade-off theory is rejected for all four countries. It showed a significant negative effect on leverage, which can be explained by the Pecking Order theory. According to the Pecking Order theory, the fourth hypothesis of a negative effect of liquidity on leverage is accepted for all four countries. Lastly, the fifth hypothesis of the negative effect of growth on leverage is accepted for France and Germany. The effect was not significant for Italy and the Netherlands. The second regression was used to see whether there was a significant change in the effects of the different determinants in the year 2020 due to the Covid-19 crisis, using interaction terms. This regression was performed to check for biased results. There is no significant evidence that the effects of the determinants changed due to the pandemic.

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# Appendix

## 4. Tables with results for the White test

Table 4.1: White's test for heteroscedasticity for France.

### White's test

---

H0: Homoscedasticity

Ha: Unrestricted heteroscedasticity

---

Chi2(35)= 605.19

Prob > chi2 = 0.0000

Table 4.2: White's test for heteroscedasticity for Germany.

### White's test

---

H0: Homoscedasticity

Ha: Unrestricted heteroscedasticity

---

Chi2(35)= 502.17

Prob > chi2 = 0.0000

Table 4.3: White's test for heteroscedasticity for Italy.

### White's test

---

H0: Homoscedasticity

Ha: Unrestricted heteroscedasticity

---

Chi2(35)= 355.46

Prob > chi2 = 0.0000

Table 4.4: White's test for heteroscedasticity for the Netherlands.

### White's test

---

H0: Homoscedasticity

Ha: Unrestricted heteroscedasticity

---

Chi2(35)= 66.31

Prob > chi2 = 0.0011

## 5. Tables with results for the Wooldridge test

Table 5.1: Wooldridge test for autocorrelation for France

### Wooldridge test for autocorrelation in panel data

---

H0: no autocorrelation

Ha: autocorrelation

---

$$F(1, 642) = 65.647$$

$$\text{Prob} > F = 0.0000$$

Table 5.2: Wooldridge test for autocorrelation for Germany

### Wooldridge test for autocorrelation in panel data

---

H0: no autocorrelation

Ha: autocorrelation

---

$$F(1, 642) = 66.925$$

$$\text{Prob} > F = 0.0000$$

Table 5.3: Wooldridge test for autocorrelation for Italy

### Wooldridge test for autocorrelation in panel data

---

H0: no autocorrelation

Ha: autocorrelation

---

$$F(1, 642) = 25.852$$

$$\text{Prob} > F = 0.0000$$

Table 5.4: Wooldridge test for autocorrelation for the Netherlands

### Wooldridge test for autocorrelation in panel data

---

H0: no autocorrelation

Ha: autocorrelation

---

$$F(1, 642) = 15.706$$

$$\text{Prob} > F = 0.0002$$

## 6. Histograms to check for normality in the residuals

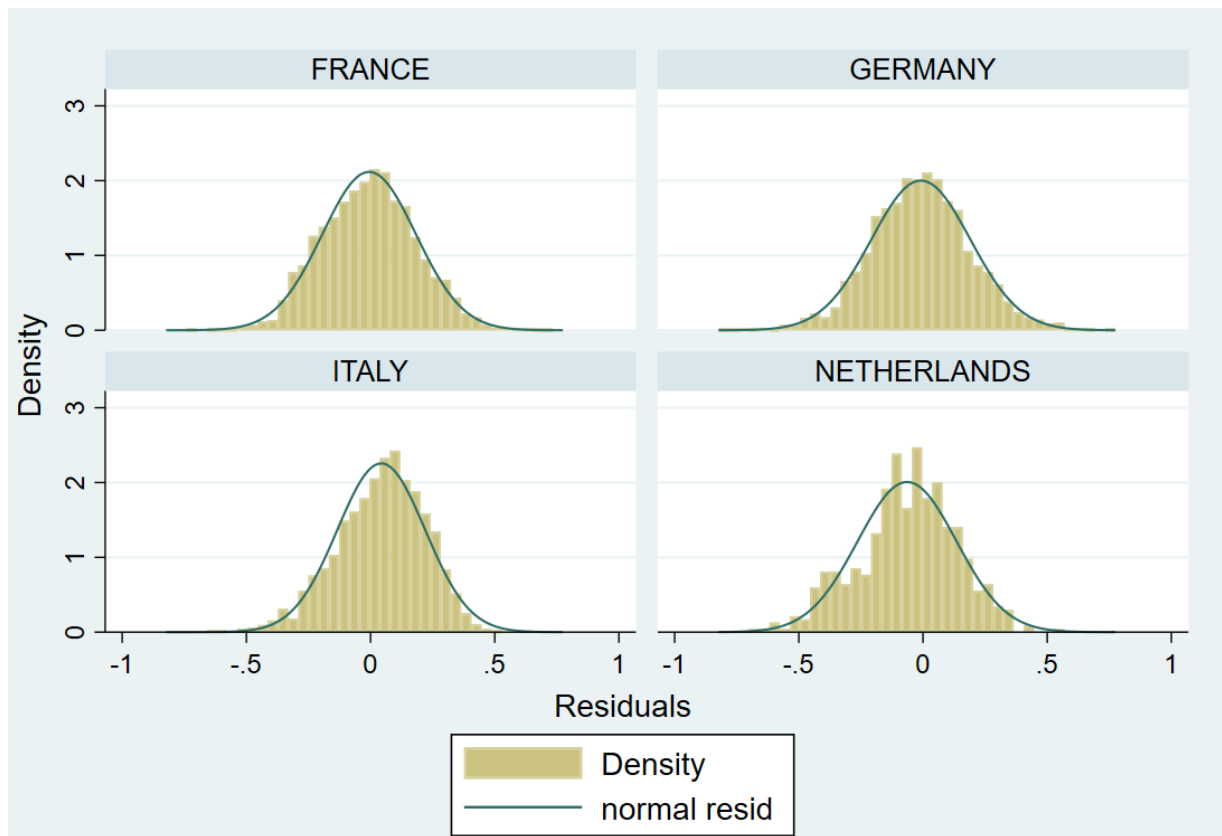


Figure 6.1: distributions of the residuals per country.

## 7. Table with Hausman Test to choose appropriate model

Table 7.1: Hausman test

### Hausman test

---

H<sub>0</sub>: difference in coefficients not systematic

H<sub>a</sub>: difference in coefficients systematic

---

$$\text{Chi2}(5) = 613.2$$

$$\text{Prob} > F = 0.0000$$

## 8. Variance Inflation Factor Test to test for multicollinearity

Table 8.1: Variance Inflation Factor Test for the four countries

<b>France</b>	<b>VIF</b>	<b>Germany</b>	<b>VIF</b>
PROF	1.09	PROF	1.08
SIZE	1.33	SIZE	1.22
TANG	1.46	TANG	1.24
LIQ	1.17	LIQ	1.25
GROWTH	1.06	GROWTH	1.03
SECTOR	1.05	SECTOR	1.10
YEAR	1.02	YEAR	1.01
Mean	1.17	Mean	1.13

<b>Italy</b>	<b>VIF</b>	<b>Netherlands</b>	<b>VIF</b>
PROF	1.11	PROF	1.16
SIZE	1.26	SIZE	1.18
TANG	1.55	TANG	1.40
LIQ	1.17	LIQ	1.41
GROWTH	1.04	GROWTH	1.01
SECTOR	1.16	SECTOR	1.06
YEAR	1.01	YEAR	1.01
Mean	1.19	Mean	1.18