The Impact of COVID-19 Pandemic on Capital Structure: Evidence from German Manufacturing Firms

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Final International University

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Girne, North Cyprus

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by

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<u>APPROVAL</u>

The Impact of COVID-19 Pandemic on the Capital Structure: Evidence from German Manufacturing Firms.

We certify that we approve this thesis submitted in partial fulfillment of requirements for the degree of Master of Business Administration

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To my mother and father for their love and support.

ETHICAL DECLARATION

I, Galvani Kemmogne Ngatchueng, hereby, declare that I am the sole author of this thesis and it is my Original work. I declare that I have followed ethical standards in collecting and analyzing the data and accurately reported the findings in this thesis. I have also properly credited and cited all the sources included in this work.

Galvani Kemmogne Ngatchueng

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ABSTRACT

Companies successfully and properly handle their activities when they get to the optimum and adequate means of finance. This is why in the literature to date, the issue of capital structure has been preoccupying a good number of authors. Many of them have been trying to examine the financial decisions of firms considering the contingencies and the economic changes. The financing decisions taken by decision makers do not necessarily follow one of the financial theories. In this study, we examine the potential effects of the COVID-19 pandemic on the financial leverage of firms belonging to the manufacturing sector in Germany by emphasizing on the determinants of capital structure of the firms in this sector. To this respect, we use panel estimation model, namely the random effects model, on 42 listed companies in the manufacturing sector over a period ranging from 2015 to 2020. The financial leverage is proxied by the short term debt, long term debt and total debt. Based on the previous literature, we use the most relevant firm specific determinants as our explanatory variables. Our findings reveal that tangibility, size, liquidity, profitability and non-debt tax shield are significant determinants of capital structure. However, growth opportunities and age are not significantly related to the financial leverage. The results also reveal that unlike expected, the COVID-19 pandemic does not have effect the financial decisions of the firms in this sector. The study also shows that firms in the manufacturing sector in Germany do not follow, in a strict way, one theory or the other.

Keywords: Capital Structure, COVID-19 pandemic, Pecking order theory, Trade-off theory, Manufacturing Sector.

ÖZ

Şirketler, optimum ve yeterli finansman araçlarına ulaştıklarında faaliyetlerini başarılı ve doğru bir şekilde yürütürler. Bu nedenle, bugüne kadar literatürde sermaye yapısı konusu çok sayıda yazarı meşgul etmiştir. Birçoğu, beklenmedik durumların ve ekonomik değişikliklerin, firmaların finansal kararlarını nasıl etkilediğini incelemiştir. Karar vericiler tarafından alınan finansal kararlar her zaman finansman ,teorileriyle aynı değildir. Bu çalışmanın amacı, firma düzeyindeki faktörlerin ve bunun yanında COVID-19 pandemisinin Almanya'daki imalat sektörüne ait firmaların sermaye yapısına etkilerini incelemektir. Bu doğrultuda, 2015-2020 yılları arasında imalat sektöründe faaliyet gösteren 42 firma, rastgele etkiler modeli kullanılarak, panel veri analizi ile incelenmiştir. Kaldıraç göstergeleri olarak, kısa vadeli borcun toplam aktiflere oranı, uzun vadeli borcun toplam aktiflere oranı ve toplam borcun toplan aktifleri oranı kullanılmıştır. Daha önce yapılan çalışmalara da dayanarak, bir firmanın kaldıraç faktörünü etkileyen belirleyicileri tespit ettik. Bu bağlamda yaptığımız analiz, sabit varlıkların büyüklüğü, toplam varlık büyüklüklüğü, likidite, karlılık ve borç dışı vergi kalkanının sermaye yapısının önemli belirleyicileri olduğunu ortaya koymuştur. Ancak, büyüme fırsatları ve yaş, kaldıraçla önemli ölçüde ilişkili değildir. Beklenenden farklı olarak, sonuçlar, COVID-19 pandemisinin bu sektöre ait firmaların alınan finansal kararları üzerinde etkili olmadığını ortaya koymuştur. Çalışma ayrıca Almanya'daki imalat sektöründeki firmaların herhangi bir teoriyi katı bir şekilde takip etmediğini göstermektedir.

Anahtar Kelimeler: Sermaye yapısı, COVID-19 pandemisi, Finansman hiyerarşisi (pecking order) teorisi, Dengeleme teorisi, imalat sektörü.

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AIDS	Acquired immune deficiency syndrome
CA	Current assets
CA	Current liabilities
DDA	Depletion depreciation and Amortization
D/E	Debt to equity ratio
E	Equity
FA	Fixed assets
FEM	Fixed effect model
HIV	Human immunodeficiency virus infection
Ke	Expected return on equity
LIQ	Liquidity
Ln	Natural logarithm
LTDa	Long-term Debt to assets
MBV	Market to Book Value
M & M	Modigliani and Miller
NDTS	Non-debt Tax Shield
OLS	Ordinary least squared
POT	Perking order theory
PROF	Profitability
R&D	Research and development
REM	Random effect model
SMEs	Small and medium-sized enterprises
STDa	Short-term Debt to assets

TANG	Tangibility
TDa	Total Debt to assets
TD	Total leverage
TL	Total liabilities
TOT	Trade off theory
W.A.A.C	weighted average cost of capital
Y	Leverage

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Companies always face difficulties when it comes to choosing the optimal combination of shareholder equity and debt to build their capital structure. These difficulties at times lead them to finance their investments or projects without caring whether they have to use debt or equity. Most of them stay focused on the form of financing that is good at a given point in time as regard of the financial market. This practice is explained by the market timing theory (Attar, 2014). In other words, managers analyze the market and they go for the form of financing that maximizes the value of the firm. A firm's capital structure means the combination of its leverage and its equity which make up its sources of finance. Since the seminal work performed by Myers (1958), many empirical studies emerged to analyze the capital structure decisions of companies. One remarkable thing is that, the findings of these studies remain inconclusive and mixed (Rajan & Zingales, 1995). There are many theories in regard to the study of capital structure among which the two prominent ones are the pecking order theory and the tradeoff theory as well as the agency theory by Jensen and Meckling (1976); the theory of Modigliani and Miller (1958) etc. The theories are at some points contradictory. For example, the tradeoff theory suggests the existence of an optimal capital structure (Myers, 2001). The pecking order theory posits that firms should assign a specific order in the way they use their source of finance. Those theories that attempt to find a universal theory for capital structure simply do not take into account some important factors that could indeed thoroughly modify or contradict consequent findings. Basically, these factors are country specific factors, firms' specific factors and industry specific factors. However, the results would have been otherwise if these factors were used as variables considering that they could significantly change the financial choice of firms (Frank & Goyal, 2003). To our knowledge, no study yet has considered all these factors at a time. Some of them are

considered as significant factors and some others not (Handoo & Sharma, 2014). Most of the studies, analyzing the impact of these factors on firm performance, issue different results. For example, the study of Yigit and Jermias (2019) shows that the firm size has a positive association with performance given the greater propensity for larger firms to incur higher debt. However, firms with bigger size might become inefficient resulting in poor performance (Klapper & Love, 2004). Some authors even do not find any consistency with the theories therefore explaining the inconclusiveness aforementioned. For example, Baker and Wurgler (2002) advocated that none of the trade-off theory and the pecking order theory is lining up with the negative effect that the long-past market-to-book ratios has on the leverage of firm. The asymmetry of information, explained by the pecking order theory, leads managers to choose internal financing rather than relying on equity financing. Myers and Majluf (1984) view it the same. On the other hand, the tradeoff theory posits an optimal capital structure which suggests that there should be a balance between the benefits of debt and its costs. Germany is a developed country with a strong manufacturing sector. In Germany manufacturing sector is much more important than in other European countries. The output of this sector constitutes nearly 19% of value added (% of GDP) in 2021 (World Bank, 2021). The existing literature review related to capital structure is short of studies on capital structure of the firms in the manufacturing sector, in Germany. The current study aims at filling this gap. The idea of filling this gap holds as the world today is being hit by the COVID-19 pandemic that actually troubles the functioning of countries and companies. Due to COVID-19 pandemic, governments were forced to take harsh actions Vis - a -Vis firms alongside lockdowns, restrictions in mobility, and so many other hindrances (Sharma, Leung, Kingshott, Davcik & Cardinali, 2020). As a results of the COVID-19 pandemic outbreak, companies found a lot of difficulties to get access to financial markets (This is particularly explained by the leverage). The impact of this crisis became particularly visible in 2020 as drastic measures were taken by governments and the businesses themselves therefore distressing the economy of firms. Besides, these businesses had their cash reserves, balance sheets, and revenues hit strongly. Companies therefore needed to look for ways out. As a result, many decisions

in relation with the capital structure were often taken by managements. It is important to mention that all the companies were not affected in the same way.

Firms with high financial flexibility were more protected than those with a relative flexibility (Liu, Qiu, & Wang, 2021). Some were affected but the impact was significantly nuanced by the rapid intervention of their respective governments. Many companies as a result found themselves in a state of insolvency (Mizar, Naqvi, Rahat, & Rizvi, 2020). For sure, this pandemic must have had a significant impact on German manufacturing companies. To date literature does not go deep into it: it mostly focuses on the impact of the COVID-19 pandemic in an encompassing way as it studies only the financial decisions as well as the performance and not the link with the determinants of capital structure.

1.2 Problem Statement

The novel COVID-19 that spread all over the world caused the disruption of lives and also of companies. A number of these companies especially the more resisting ones were forced to change their traditional functioning quite significantly. One of the significant changes is the capital structure and therefore the financial decisions. The rationale behind this is that companies that have been able to resist this pandemic must maintain some of their cash flow requirements. For instance, they should still meet salary payments, fixed costs and so on so forth hence entailing a change either in long term debt, short term debt or even in total debt. In the light of the literature review to date, there is no full list of the variables that determine the structure of the capital. The use of the variables considered in the literature vary from one study to another making it difficult to identify the most significant ones. Germany has reached a wonderful and sustained performance in the manufacturing sector which plays an important role in the overall economy given the vast and significant number of companies operating in this sector. To the best of our knowledge, no study has ever focused on the present topic: The impact of COVID-19 upon the companies operating in the manufacturing sector in Germany. That is why we find the need to investigate this.

1.3 Purpose of the Study

The aim of this study with respect to the problem stated above is:

- Among many firm specific factors, to find out the ones which are significant in determining the capital structure in the manufacturing sector in Germany.
- To explore how severe has been the impact of the pandemic (COVID-19) on the firms in the manufacturing sector in Germany.

1.4 Significance of the Study

This study will help the policy makers to check if there is any need to reconsider the financial decisions made during the most crucial time of the pandemic. On the other hand, the most significant determinants of capital structure in the manufacturing sector will be better identified especially for the case of the firms based in Germany. Companies will then be well prepared in case of resurgence of the pandemic or the potential appearance of a new crisis of the kind.

1.5 Research Questions and Hypotheses Development

1.5.1 Research Questions

This study arises two different research questions in relation to capital structure.

- What are the factors that significantly determine the capital structure of manufacturing companies in Germany?
- What is the influence of COVID-19 on the financial decision of the companies in the manufacturing sector in Germany?

1.5.2 Hypothesis Development

As we mentioned before, different factors can affect the capital structure of a company. So, the financial decision makers should be thoughtful when it comes to the mixture of debt and equity they choose for their company. The following are the hypotheses that we shall be testing to answer our research questions.

H1: COVID-19 has a positive and significant association with short-term debt to assets ratio.

H2: COVID-19 has a positive and significant association with Long-term debt to assets ratio.

H3: COVID-19 has a positive and significant association with total debt to assets ratio.

H4: Firm size has a positive and significant association with short, long and total debt ratios.

H5: Profitability has a negative and significant association with short, long and total debt ratios.

H6: Tangibility has a positive and significant association with short, long and total debt ratios

H7: Market to book ratio has a positive and significant association with short, long and total debt ratios

H8: Age has a negative and significant association with short, long and total debt ratios

H9: Liquidity has a positive and significant association with short, long and total debt ratios.

H10: Non-debt tax shield has a negative and significant association with short, long and total debt ratios.

1.6 Limitations

This study has some limitations. First, the results may not be applicable to the companies beyond the manufacturing sector. In addition to that, we cannot generalize the determinants of capital structure considering that they differ among countries (De Jong, Kabir & Nguyen, 2008). Due to the incompleteness of the data available in the data base that we used for the period considered, we have been able to focus on merely 42 firms in this sector.

Besides, the effects of the COVID-19 pandemic have been observed only throughout the year 2020 given that during the period of our research, the financial statements of the subsequent year, namely 2021, have not yet been released for most of the companies in our data.

1.7 Definition of Key Terminology

We find it necessary to define some key terms we are referring to in our study. The definitions are as follows:

Trading of security: it is referred to when the management plans to invest in equity or/ and in debt with the aim of making profit within the ongoing period.

Weighted average cost of capital is the average of the rate that companies expect to pay for financing their assets.

CHAPTER 2

LITERATURE REVIEW

Capital structure refers to the combination of debt and equity by a company with the aim of having an appropriate source of finance. The policies in term of debt (which is the preferred tool for managers) in many companies vary depending on many factors commonly known as determinants. These factors that affect the capital structure refer to those elements that determine the policy of a company. As a result of the seminal work of Modigliani and Miller (1958) regarding capital structure, a lot of theories emerged aiming at giving some standpoints on firms' capital structure. This review of literature is basically mentioning the findings of past studies that relate to capital structure and its determinants. Besides we cannot study this concept of capital structure without mentioning about the theories that underlie it.

2.1 Theories of Capital Structure

2.1.1 The Theory of Modigliani and Miller (M and M)

Before the seminal work of Modigliani and Miller (1958), there did not exist any research about capital structure. Pan (2012) considers this theory as the main one. Modigliani and Miller (1958) made the assumption that in a perfect capital market, there is no correlation between capital structure and market value. Now, the question is what are the conditions in which a market can be considered as perfect? The answer to this question resides in their propositions. Modigliani and Miller (1958) explain it as a market where there are no transactions costs, no bankruptcy costs, no taxes, availability of information for all parties, differently put, no information asymmetry. Breuer and Gürtler (2008) studied the propositions and shaped them as it follows:

2.1.1.1 First Proposition. The total market value of a firm does not depend on its capital structure. This is to say that the r equity/debt ratio cannot have any effect on the market value of a firm. The proposition is based on the assumption of the perfection

of a capital market featured by the aforementioned conditions in the first proposition, which mainly targets the trading of securities (Ahmeti & Prenaj, 2015, p. 916).

2.1.1.1.1 Proposition 1 without Taxes. Throughout their study, Modigliani and Miller (1958) considered two companies, one that uses debt in its capital structure and one with no debt. They tried to compare the financial decisions that were to be made in each of the companies. Definitely, they realized at the end of the day that there was no difference in terms of the decision made given the equality of cash flow at the disposal of the considered companies (Brigham & Ehrhardt, 2010).

Firstly, Modigliani and Miller (1958) make abstraction of the effect of taxes in the capital structure. The following assertion is then formulated: the value of a levered firm is the same as that of an unlevered firm (Pan, 2013). From which we draw the equation $V_U = V_L$. In this equation, V_U represents the value of the firm in the case of zero leverage in the capital structure, and V_L represents the value of the firm in the case of leverage in the capital structure. The equation shows that financial decisions do not have any influence on the firm's market value (Modigliani & Miller, 1958).

2.1.1.1.2 Proposition 1 with Taxes. Secondly, Pan (2013) still gives another formula taking into account the effect of taxes. According to him, the value of a levered firm is equal to that of an unlevered firm added to the tax ratio multiplied by the value of the debt. The formula is drawn from Modigliani and Miller theory by Julio Pan (2012) is the following: $V_L = V_U + T_C D$. In this equation, V_U represents the value of the firm in the case of zero leverage in the capital structure, and V_L represents the value of the firm in the case of leverage in the capital structure and then, $T_C D$ represents the tax ratio (T_C) multiplied by the value of the debt (D). Taking a step away from the perfection of the market, Modigliani and Miller (1963), considered the effects of taxes on financial decision. The financial decision is actually driven by the benefit of debt drawing from the payment of interest. This is referred as tax shield. In fact, the interest on a debt is an expense once it is paid. It has the effect of decreasing the firm's earnings hence the tax burden. There is an advantage due to the deductibility of the interest before the payment of taxes (Modigliani & Miller, 1963). The analysis of Alifani and

Nugroho (2013) was similar. They concluded that this practice can immediately have an impact on the firms' market value and in the long run find an opportunity for firms to be highly levered. In other words, it is convenient for a firm to use debt. Given the absence of a perfect market, there cannot be anything like an optimal capital structure. However, Baxter (1967) figures out an optimal capital structure on condition that the benefit of debt (tax shield) and cost of debt are equal. This author posited that there is an association between debt and the cost servicing it.

2.1.1.2 Second Proposition

Like the first proposition, the second proposition is examined with taxes and without taxes.

2.1.1.2.1 The second Proposition without Taxes. The rationale is that the leverage does not influence the average cost of capital (W.A.A.C) in the absence of the tax of the firm. Which in turn does not affect the value of the firm. There is a proportionality between the cost of equity and leverage. In fact, if there is an increase in borrowing, then the cost of the equity will definitely increase too. Modigliani and Miller (1958) emphasize on the rationality of investors and they argue that there is a direct proportionality between the expected return on equity (Ke) and the increase in gearing (D/E).

Figure 1

The value of firm and the cost of capital structure based on Modigliani and Miller
theory (excluding taxes)
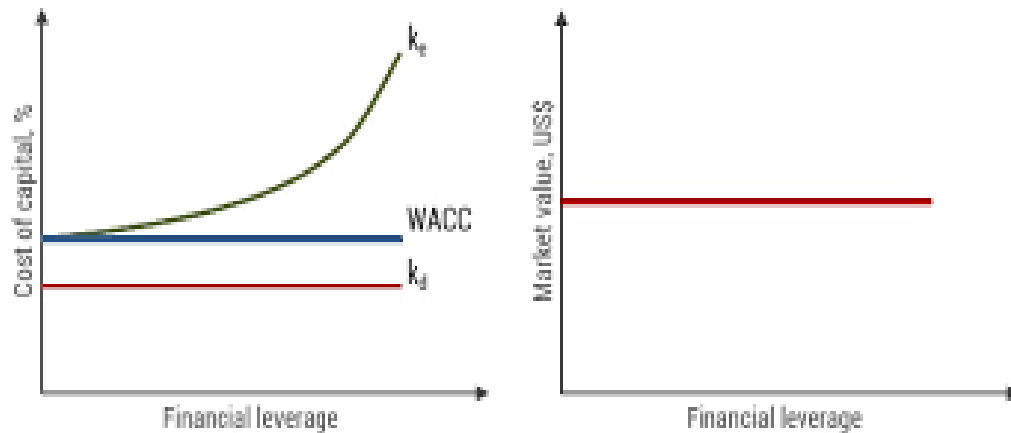
Source: *Kaplan Financial Knowledge Bank, (2012)*

So what we can retain from the above figure is that the capital structure does
not influence the weighted the average cost of capital which therefore means that the
value of the firm remains unchanged whatever the mixture of the capital structure.

2.1.1.2.2 The second Proposition with Taxes. In 1963, Modigliani and Miller
considered the effect of taxes into their work. Brigham and Ehrhardt (2010) examined
this second proposition and according to them, Modigliani and Miller (1963) argue
that if company increase the debt share in the capital structure, then the weighted
average cost of capital (WAAC) will decrease due to the tax shield effect.

Figure 2

The value of firm and the cost of capital structure based on Modigliani and Miller theory (including taxes)
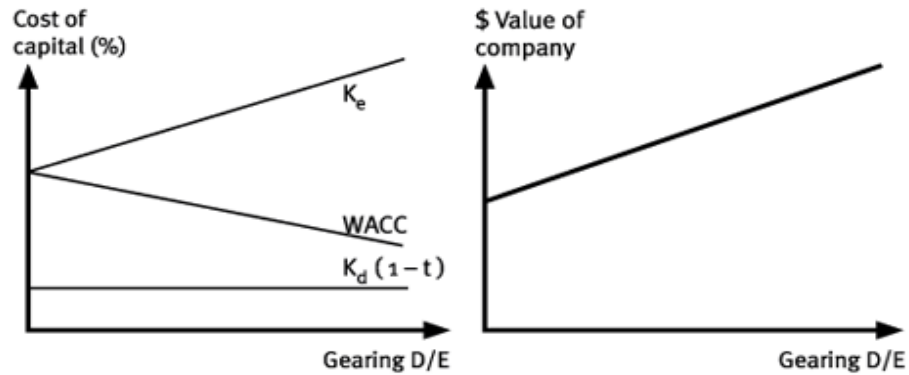
Source: *Kaplan Financial Knowledge Bank, (2012)*

2.1.1.3 Third Proposition. The third proposition of Modigliani and Miller (1961) is concerned with the irrelevance of the dividend policy. According to them, the market value remains the same regardless of the dividend policy. What matters in determining the value is the "earning power and the risk of its underlying assets'' (Ahmeti & Prenaj, 2015, p. 920).

2.1.2 Agency Cost Theory and Capital Structure

The theory of agency cost was proposed by Jensen and Meckling (1976). According to them, there is an agency relationship whenever there is a contract where one party assigns another one to act in his behalf. The former is called the principal and the later the agent. There is a separation in terms of management and ownership. Hence, a conflict is likely to occur. It is generally a conflict of interest for parties (Jensen & Meckling, 1976). This conflict occurs because of the discretion power at the disposal of managers on the one hand and on the other hand, the abundance of information they have ahead of the shareholders (Stulz, 1990).This difference in terms of information is known as information asymmetry (Jensen & Meckling, 1976). There is a divergence of interest between the two parties. In fact, managers use the available cash flow to finance project with low return (Jensen, 1986). According to Hoque (2018), managers

make use of the company to the detriment of the shareholders, they feed their own benefits: this second form of agency cost is called agency costs of equity (Hoque 2018). With this respect, the study of Hart and More (1995) proves the relevance in financing projects and investments using debt. A similar result is found by Jensen (1986). Besides, a study carried out by Kontuš (2021) was consistent with this theory. Furthermore, they agree with Williams (1987) that, incurring more debt decreases the agency costs. In the same vein, Jensen (1986) gives the evidence that this financing method can also help mitigate the agency costs problem. As a matter of fact, he explains that financing through debt put the managers under a kind of pressure to do well, because in the event of failure to repay, the contract can lead them to lose their decision rights or even their jobs. However, there is a little inconsistency; as the level of debt increases, agency cost of debt increases (Kontuš, 2021).

2.1.3 The Trade-off Theory of Capital Structure

The trade-off theory of capital was initiated by Kraus and Litzenberger (1973). It is based on Modigliani and Miller (1963) theory but here, taxes and bankruptcy effects are taken into account. The theory emphasizes an optimal capital structure which can be obtained as a result of a firm balancing between costs of debt and benefits of debt whenever debt is used as a source of financing (Brigham & Houston, 2004). Modigliani and Miller (1963) suggest that an optimal capital structure leads to the maximization of the firm's value. Baxter (1967) also found the significance of optimal capital structure when there is an equality between benefit and cost of debt servicing it. Besides, a firm can use the optimality of its capital structure to ameliorate its performance (Ross, 1977; Myers, 1977). The use of debt also has a dark side considering the propensity to bankruptcy that it may lead to (Brealey & Myers, 2012). In fact, bankruptcy is imminent especially when the taxes are high. The shareholder will be in need of more return on their investment (return on equity) inducing higher debt to incur and that is not without risk. The advantage of using debt is because of the tax shield provided, considering the interest on debt being tax deductible (Modigliani & Miller, 1963).

Figure 3

The Tradeoff theory illustration

The tax shield enables tax deduction of interest payments of debt. This can enhance the performance

The firm is risking bankruptcy considering that it pays interests causing liquidity issues
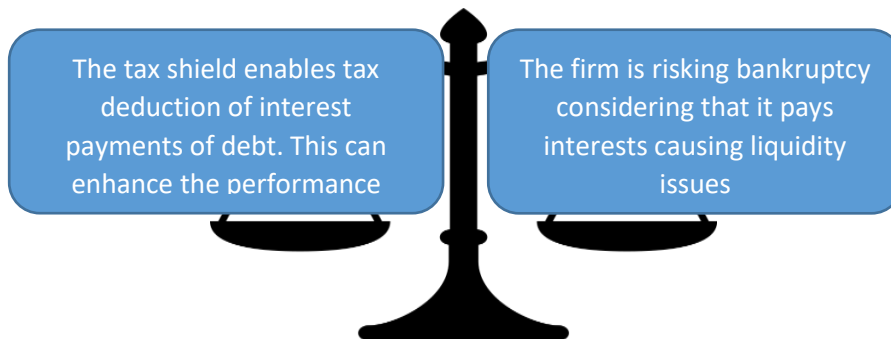
Source: The determinants of capital structure (Huang, 2006)

2.1.4 The Pecking Order Theory

Right after the seminal work of Modigliani and Miller (1958), another theory emerged; the pecking order theory proposed by Myers and Majluf (1984). This theory is influential in corporate leverage. According to Myers and Majluf, there should be a hierarchy in financing firms' investments or projects. The first financing source should be from within the firm not from outside the firm. In other words, the internal financing should be used in the first place. This kind of financing includes mainly the retained earnings by the company. Then, comes financing through debt, and financing through equity has to take place in the last order when the debt capacity is depleted (Myers & Majluf, 1984). The theoretical approach is based on adverse selection costs: debt issuance is associated with lower information costs (Shyam-sunder &Myers, 1999). As a matter of fact, on a continuum of adverse selection, there is a ranking that firmly holds: retained earning does not have adverse selection issues, followed by debt that has a minor one and eventually followed by equity that is full of adverse selection issues. Frank and Goyal (2003) carry out a study and they end up finding some limits about the theory of Myer and Majluf. They state that, the theory does not explain broadly the different patterns of corporate finance, given the adverse selection that it relies on, it does not study thoroughly firms facing severe information asymmetries. To highlight this fact, the reluctant authors examine small high-growth companies. They also added the time span that could indeed favor the confirmation of that theory:

In fact, the pecking order works best in samples of large firms that continuously existed during the 1970s and the 1980s (Frank & Goyal, 2003, p. 219). Trying to state what should drive the financing behavior of firms, Myers (1984) suggested the following hypothesis:

 - Internal financing should prevail so as to avoid taking risk.

 - The financing order should be the following: Retained earning- Debt - Equity.

 - Dividend target ratio will be enhanced in the event of investment opportunities.

 - Dividend should be reinvested rather than being paid out. This theory has led to another theory that emerged in the course of time.

Figure 4

The pecking order theory illustration
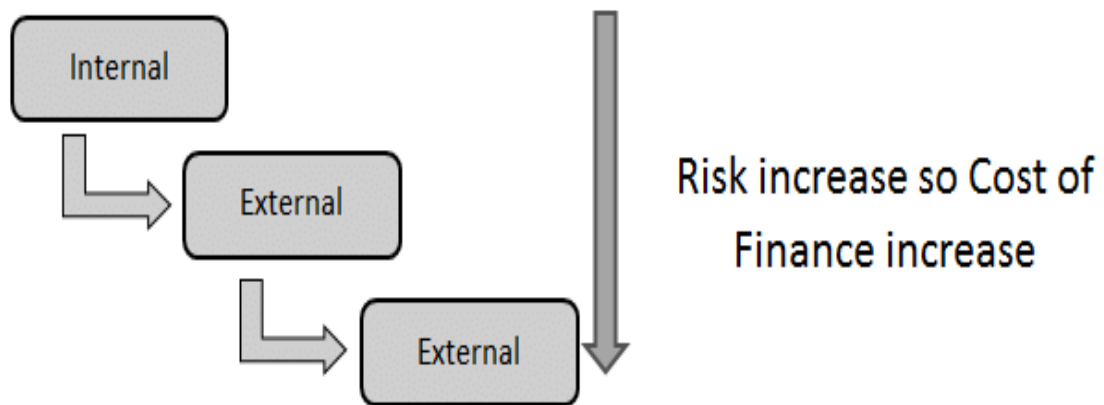
Source: The determinants of capital structure Huang (2006).

2.1.5 Information Asymmetry and Signaling Theory

The information asymmetry arises when managers possess more information about the firm compared to investors. The agent is supposed to act diligently on behalf of the principal which is never the case given that both of the parties are trying to maximize their utility vis-a-vis the firm (Jensen & Meckling, 1976). The utilities are associated with costs called agency cost. For example, a manager can overuse the

firm's free cash flow for their own excessive wages or prerequisites. Jensen and Meckling (1976) point out the ways to mitigate agency costs when it comes to the capital financing behavior. They suggest that using debt in a regular way might act as a discipliner for managers in the sense that, free cash flows will not exist consequently. Hence it will discourage the value destruction that managers are involved with, thus their sense of effort will be enhanced. In the same vein, Myers (1977) suggests that short term debt can be helpful in sorting out underinvestment problems on the one hand and on the other hand, that of the assets substitution. Information asymmetry draws two types of agency problems. In the first place, moral hazards based on the impossibility of monitoring managers' actions by the shareholders given that there are always hidden costs. Secondly, we have adverse selection. This time around, some of the managers' actions could be observed but it is not sure that it is the right way. With this respect, the findings of many research have been in the same line. For instance, some authors believe that if shareholders are better granted information, the firm's value will be enhanced. Besides, Xiao (2009) found the inverse relationship between the firm's value and agency costs due to information asymmetry. In firms, managers (the insiders) may send financial decisions to the investors with the aim of compensating the information asymmetry. In a competitive environment, signal theory tries to sort out this information asymmetry problem (Taj, 2016). According to Conelly (2011) and Taj (2016) There are four elements that make up the signaling theory the signaler (The managers, directors); the signals (for example dividend stock price) the receiver (the outsiders) and the feedback which defines the interaction between the receivers and the signalers.

2.2 The Determinants of Capital Structure

Capital structure refers to a particular way equity or/and debt could be used as a source of finance for investments or projects in a company. It is not trivial for a firm to take actions when it comes to financial decisions, differently put, the portion of debt or equity that builds the capital structure must be considered in depth together with many factors affecting capital structure. For example, small and medium-sized enterprises (SMEs) that are always having difficulties getting access to external capital

(Beck & Maksimovic, 2008) cannot necessarily use the same way to finance their projects or investments like large companies. Because of the risks they incur, or the sufficiency of collaterals are different (Brav, 2009). Some theories like the trade-off theory seeks to find an optimal capital structure (Modigliani & Miller, 1963). As per the previous studies, financial decisions in a firm is directed by economical or institutional factors. Throughout his study, about capital structure, Hall (2000, 2004) found that the determinants of capital structure could be divided into three groups: country related determinants, industry specific factors, and firm specific factors. For firm specific factors, we have size, age, profitability, growth and tangibility (Michalelas & Poutziouris, 1999). However, business risk (the higher the business risk in an industry the lower the propensity to indebtedness), non-debt tax shield, the amount of fixed assets, the level of agency costs, the level of competition in the industry can also be listed as industry-specific factors (Mac an Bhaird & Lucey, 2010). There are also country specific factors which affect capital structure. For instance, Kenourgios and Papageorgiou (2020) proved taxation to be a significant country specific-factor regardless of the firm size and country. In other studies, different variables are used. For example, uniqueness, the industry and the earning volatility (Timan & wessels, 1988). On his part, Harris and Raviv (1991) added bankruptcy and advertising, R&D expenditure, and free cash flow. Some researchers used cultural dimension, conservatism mystery and agency (Chui, Lloyd, & Kwok, 2002). Fanck and Goyal (2003) used dividend, and some macroeconomic factors as determinants of capital structure. Some authors used the share price performance (Deesomsak, Paudyal & Pescetto, 2004) others used life insurance penetration (Fan, Titman & Twite, 2012). The theoretical framework about the determinants of capital structure is not consistent in the literature therefore making it difficult to have the full list of the variables. This study is centered on the most predominant variables, the firm specific variables that were used in the literature together with the covid-19 pandemic.

2.2.1 Profitability

When we refer to the literature to date, the profitability of a given company has been studied, using different indicators. For instance, Raheman and Bodla (2010) used

the net operating income, meanwhile Deloof (2003) used the return on total assets. In line with Huang and Song (2006), profitability can be found based on the following formula:

Figure 5

Profitability proxy

$$profitability = \frac{\text{Earning before interest,tax ,depreciation}}{\text{Total assets}}$$

Source: The determinants of capital structure (Huang, 2006)

2.2.1.1 Relationship between Profitability and Capital Structure. The pecking order theory proposes a negative association between leverage of a firm and the profitability. In other words, the more the profitable the company the less debt is used. This affirmation was proved by many authors like Sen and Orus (2008); Tongkong (2012). The pecking order theory gives a priority to internal financing ahead of the external one. However, there are studies which found a positive association between profitability and the capital structure for example (Adair & Adaskou, 2015; Ouida, 2018). Besides, Bae and Oh (2017) rather found a non-correlation between the leverage and the profitability of the firm. A similar result is observed by Pattitoni and Spisni (2014). So, these divergent results lead to utter a non-conclusive direction of profitability Vis-a-Vis capital structure.

2.2.2 Size

This explanatory variable is one of the most important variables which changes firms' the capital structure decisions.

2.2.2.1 Relationship between Capital Structure and the Size of the Firm. The existing findings about this relationship are quite different. Trade off theory explains this relationship to be positive. There are findings for example (Bunkanwanicha & Rokhim, 2008; Handoo & Sharma, 2014) which show the consistency with the earlier mentioned theory. Firms larger in size are more diversified which reduces the risk of bankruptcy (Rajan & Zingales, 1995). Large companies are prone to the diversification

of the "Investment projects on the broader basis therefore reducing their exposure to cyclical fluctuation in one particular line of production'' (Moosa & Li, 2014, p. 4). At the other extreme, the pecking order theory rather posits a negative relationship between two variables. For example, Pratheepan and Yatiwella (2016). The rationale behind pecking order theory is that, the smaller the firm, the less important the effects of information asymmetry are, so they use more debt.

2.2.3 Non-debt Tax Shield

A study conducted across small and medium-sized enterprises firms in Portugal found the provision that debt has over tax shield (Proença & Laureano, 2014). In fact, the use of debt entails the increase of the firm debt shield. Elsewhere in Germany, many companies employ debt so as to increase the tax shield (Abdullah & Tursoy, 2021). Also, a study carried out by Moore (1986) found a positive association between non-debt tax shield and leverage for German companies. This suggests that the non-debt tax shield plays an opposite effect.

2.2.3.1 Relationship between Non-Debt Tax Shield and Capital Structure. The relationship is proved to be negative according to the tradeoff theory. Hossain & Hossain (2015) support this argument. However, as per the pecking order theory, this relationship is positive. The work of Moore (1986) confirms this idea. Now if we want to explain the negative relationship posited by the pecking order theory, the reason is that the financing order assigned by the theory, debt is among the last option. So, the firm should better avoid incurring debt (Moore 1986). Debt is secured due to the tangibility of assets therefore prone to explain the positive relationship between the variables.

2.2.4 Age

The age of the firm also plays a role in the capital structure of a firm. The pecking order theory states a negative relationship between the capital structure and the age of the firm. The reason is that the older the firm, the more likely the availability of funds generated internally as a result of several retained earnings over the years.

Ziane (2004) and Adair and Adaskou (2015) find results supporting this view. Meanwhile, the tradeoff theory's argument is a positive relationship. The reasoning is that as the firms become more mature they are more reputed and more experienced lowering the agency costs.

2.2.5 Tangibility of Assets

Tangibility also determines the level of a firm's leverage. A firm with a good level of tangible assets also have considerable borrowing capacity: creditors may rely on assets to lend more funds. According to Shleifer and Vishny (1992), the ease of reselling assets offers the firm an opened door for more debt. Campello and Giambona (2011) view it the in same way. Tangibility is obtained by dividing the fixed assets by the total assets (Myers & Majluf, 1984). This suggests a positive relationship between the studied variables which is consistent with the Tradeoff theory. The study carried out by Campello and Giambona (2011) shows that the only portion of assets that are sellable can have an explanatory power in relation with the firm's leverage. It therefore means that all assets are not susceptible to protect the firm leverage in the event of bankruptcy. This suggests a negative correlation between the firm's leverage and the tangibility of assets. It is in the same vein that the pecking order theory made its postulates.

2.2.6 Liquidity

Liquidity is calculated by the ratio of current assets to current liabilities. Naughton and Moosa Li (2011) shows in their study, among other factors, that liquidity is a robust variable of capital structure. Liquidity serves to measure the capacity of a firm to meet its financial leverage commitments. For a firm to use more debt, liquidity is an important factor. In consequence, the expected relationship between the leverage of a firm and liquidity is a positive one. This direction is emphasized by tradeoff theory. A positive relationship between liquidity and long term debt is also shown by the study of Hossain and Hossain (2015). Dakua (2019) finds a positive relation among Total debt ratio and liquidity. The pecking order theory advocates an opposite relationship;

this when a firm has enough liquidity in its asset, there is no need to borrow in order to finance new investments or projects.

2.2.7 Market–to-Book Value

In so many research, the proxy used to study the growth opportunities is the market to book value. It is one of the main determinants of capital structure that captures firm's growth opportunities. There is a positive relationship between market to book value and the leverage based on the prediction the pecking order theory. On its part, the trade-off theory rather predicts a negative relationship between leverage and the market-to-book value considering that growth opportunities cannot be collateralized. In fact, in case of growth opportunities the internal funds should be used before relying to the external fund in case of insufficiency. Firms that hold future growth opportunities tend to borrow less Jensen (1986). On the other hand, the negative relationship is emphasized because when a company has a high market-to-book value ratio, it tends to increase financial distress costs. Other theories like market timing theory also predicts a negative relationship between leverage and growth opportunities (Baker & Wurgler, 2002). In the same vein, Rajan and Zingales (1995); Gaud, Hoesli, & Bender (2005) find the same relationship in their studies. In summary, based on the empirical research, we have the following table.

Table 1 depicts the expected associations between the study variables.

Table 1

summary of the expected and empirical relationship between the leverage and the determinants

variables	Expected theoretical association
profitability	Negative(POT) Positive (TOT)
Size	Positive(TOT) Negative (POT)
Liquidity	Negative(POT) Positive (TOT)
Age	Positiv(TOT) Negative (POT)
Tangibility	Positive(TOT) Negative (POT)
Non-debt tax shield	Positive(TOT) Negative (POT)
MBV	Positive(POT) Negative (TOT)

2.3 Covid-19 Impact

Numerous studies to date literature analyzed the impact of Covid-19 on businesses (Bacq, Geoghegan, Josef, Stevenson, & Williams, 2020). Since its beginning at the end of year 2019, the pandemic has seriously damaged the world, with many consequences which are visible most importantly in the business' environment. The severe measures taken by governments seriously constituted obstacles within the supply chain (Sharma, Leung, Kingshott, Davcik, & Cardinali, 2020). No matter their size, all companies were more or less affected. Firms' revenue was shocked, same as the operating profit (Rababah, Al-Haddad, Sial, Chunmei & Cherian, 2020). For example, in the food industry; in the agricultural sector (Lin & Zhang, 2020) or in the airline industry (Agrawal, 2021) just to name a few. The impact of Covid-19 has been

seen differently in various companies. When we refer to the study conducted by some scholars (Mirza, Naqvi, Rahat & Rizvi, 2020), it is shown that the main issue facing non-financial listed companies is insolvency caused by the drop in market capitalization. According to them, the earlier governments react, the less the consequences on firms. A number of articles that studied the pandemics alongside the COVID-19 pandemic put emphasis on the costs. Another set of papers signaled the importance of economic costs that can arise as a result of problems like the COVID-19 pandemic (Bloom, Cadarette, & Sevilla, 2018). COVID-19 pandemic influenced the financial decisions of corporates. Emphasis were put on raising capital using bond and equity (Pettenuzzo, Sabbatucci & Timmermann, 2021). Other companies in the same period (first quarter of 2020) relied on external markets rather (Acharya & Steffen, 2020). The external risk underlain by the COVID-19 pandemic forced firms to reshape their capital structures (Foss, 2020). Firms with high flexibility have been more resistant during the most severe period. A firm is said to be more flexible when it has more cash holdings than it has debts, hence offering it a good debt capacity. The financial capacity mitigates the impact of the pandemic on highly financial and flexible firms (Liu, Qiu & Wang, 2021). This does not go along the line with the pecking order theory. Having debt capacity for a firm means that the firm is in the position of incurring more debt. Huang and Ye (2021) show in their study that firms using more debt during the pandemic are contributing in increasing their risks.

CHAPTER 3

METHODS

3.1 Research Design

A research design should ensure that the data collected is significantly linked to the research question. The results should be free of ambiguity (Patel & Davidson, 1994). The study is designed in such a way that it will enable us to provide answers to the research questions. In this study, we determine the significant determinants of capital structure and analyze the extent to which the COVID-19 pandemic has impacted the financial structure of companies in the manufacturing sector in Germany. The study is conducted over the time interval ranging from 2015 to 2020. The cross-sectional and time series data enables us to create a panel data. A panel data gives information both in time dimension and in individual dimension. In this study, we capture the effect of COVID-19 pandemic on capital structure by adding year 2020 data in our sample

Figure 6

Preliminary framework
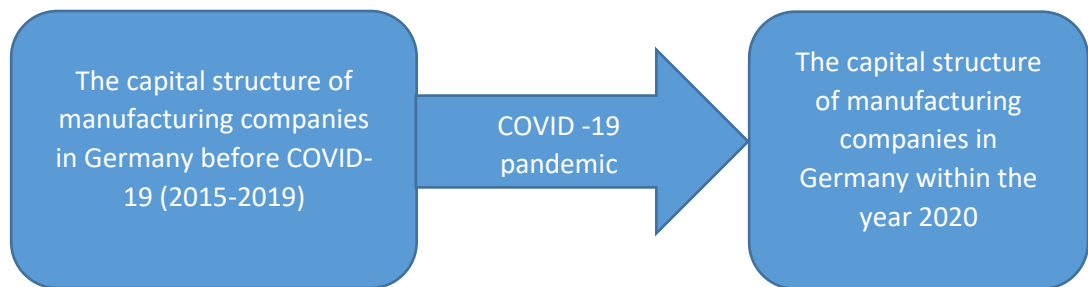
3.2 Population and Sampling

This study includes the financial information of publicly listed companies in Germany. Our data are collected from Orbis database. The list that consist of 42

companies represents different subsectors; industrial electric and electronic machinery, food and the tobacco manufacturing sector, chemicals petroleum rubber and plastics manufacturing sector, computer and hardware manufacturing sector, wood furniture and paper manufacturing, communication sector and transport manufacturing sector. We provide number of firms in each subsector in Appendix B. We use end of year financial data of 6 years that is from December 2015 to December 2020. The Orbis database we earlier mentioned has a plethora of companies that's about 244 listed. However, our selection was based on the availability of the whole data with respect of considered variables.

3.3 Variables

This study considers on the one hand the variables that are empirically used to measure the financial leverage and accordingly analyzing the capital structure. On the other hand, it considers the exogenous variables also called controlled variables. In this section, we are going to recall these variables given that they are amply discussed in the literature review part.

3.3.1 Dependent Variables

In the existing literature, many authors following Rajan and Zingales (1995) use total debt, long-term debt, and short-term debt as dependent variables when studying the capital structure of companies.

- Long-term debt (LTDa) is obtained by dividing the long term debt by the total assets.
- Short-term debt (STDa) is obtained by dividing the short term debt by the total assets.
- Total debt (TDa) is obtained by dividing the total by the total assets.

3.3.2 Independent Variables

There are firm specific variables, independent variables, which affect the capital structure of firms. We use: size, tangibility, non-debt tax shield, market to book value, liquidity, profitability and age as independent variables. Size (SIZE) is obtained through the natural logarithm of total assets (Anderson, 2003). Tangibility (TANG) is a factor commonly used as a capital structure determinant it is obtained after dividing

the fixed assets by the total assets (Cortez & Susanto, 2012). The same formula was used by Baker and Martin (2011) Non-debt tax shield (NDTS) is obtained by dividing the total annual depreciation, depletion and amortization by total assets (Titman & Wessels, 1988). In their study, Ali, Muhammad, and Abd, (2011) simply use depreciation expenses which they scale by the total assets. Market to book value (MBV) is measured as a ratio of market capitalization to total shareholder equity (Rajan & Zingales, 1995). Simamora (2021) uses this approach in his study when he examines the managerial ability as playing a moderating role in the capital structure and performance of firms. Liquidity (LIQ) is measured by dividing the current assets by the current liability (Hossain & Hossain, 2015). Profitability (PROF) it is obtained by dividing the earnings before interest taxes, depreciation, and amortization by the total assets. This later formula was used in the study of Sofat and Singh (2017). A firm with a negative leverage shows that the firm uses less debt in their capital structure (Rajan & Zingales, 1995). There are two other ways of measuring the profitability of a firm: It can be assessed based on the return on assets or based on the profitability margins on sales (Sen & Oruc, 2008). Age (AGE) is measured by the natural logarithm of the difference between the incorporation year and the current year (Petersen & Rajan, 1994).

To explain the impact of COVID-19 on the firms' capital structure we use a dummy variable, it takes the value "0" in the years 2015-2019 and the value "1" during the year 2020.

3.4 Econometric Model

In the section above, we introduced the dependent and independent in this study, we have eight independent variables also called regressors including Profitability (PROF), Non-debt tax shield (NDTS), Market-to-book value (MBV), Age, Tangibility (TANG), Liquidity (LIQ), COVID-19, and Size. Therefore, a multiple regression analysis is required to study the relation with the dependent variable respectively the short term debt to assets (STDa) the long term debt to assets (LTDa) and the total debt to assets (TDa) (Huang, 2006). In this study, we are dealing with panel data. The model is taking the following form:

Y (Leverage)$_{i,t}$ = α + β$_1$ PROF+ β$_2$ NDTS+ β$_3$ MBV+ β$_4$ AGE + β$_5$ TANG+ β$_6$LIQ + β$_7$ SIZE + μ$_0$COV ID−19t + ε$_{i,t}$ (3.1)

   In this equation, (Leverage)$_{i,t}$ is a dependent variable. It is the proxy considered to measure the capital structure of the firm i during the year t. We also have an array of firm capital structure determinants that constitute the control variables. Those are size, profitability, liquidity, market to book value, non-debt tax shield, age, and tangibility. COVID-19, a dummy variable, shows how leverage of the firms are affected by COVID-19 pandemic. As a reminder, our database ranges from 2015 to 2020. The coefficient of interest is μ$_0$. It serves to capture the behavior of leverage of firms during the COVID-19 specifically in 2020. We also have ε$_{i,t}$ the error term.

   To conclude this part, the regression models to test the null hypothesis retained in this study considering the different proxies are:

STDa$_{i,t}$ = α + β$_1$ PROF+ β$_2$ NDTS+ β$_3$ MBV+ β$_4$ AGE + β$_5$ TANG+ β$_6$LIQ + β$_7$ SIZE + μ$_0$COVID−19t + ε$_{i,t}$ (3.2)

LTDa$_{i,t}$ = α + β$_1$ PROF+ β$_2$ NDTS+ β$_3$ MBV+ β$_4$ AGE + β$_5$ TANG+ β$_6$LIQ + β$_7$ SIZE + μ$_0$COVID−19t + ε$_{i,t}$ (3.3)

TDa$_{i,t}$ = α + β$_1$ PROF+ β$_2$ NDTS+ β$_3$ MBV+ β$_4$ AGE + β$_5$ TANG+ β$_6$LIQ + β$_7$ SIZE + μ$_0$COVID−19t + ε$_{i,t}$ (3.4)

3.5 Data Analysis Procedure

3.5.1 Panel Regression

   A panel regression enables us to check the dependency between two or more variables. In this study, we use panel data to figure out the impact of COVID-19 pandemic on the financial decision, the capital structure decision of manufacturing companies in Germany. For Panel data we can use the pooled ordinary least square regression, the fixed effects model, and the random effects model.

   3.5.1.1 The Pooled Ordinary Least Square. The main problem using this method is that it does not take into account the individuality or the heterogeneity of

population in the sample. In effect, if the sample consists of various firms, this model will not distinguish between them (Stock & Watson, 2011).

3.5.1.2 The Fixed Effect Model. In this method, the parameters are fixed. The slope coefficients and the intercept is constant. Besides, there is heterogeneity among the individual characteristics. This method is used to analyze the effect of the variables over time. According to Wooldridge (2010), fixed effect model enables the evaluation of the net effect of the predictors considering that these latter might be affected by some factors within the individuals.

3.5.1.3 The Random Effect Model. This model assumes that there is a random distribution in the individual characteristic effects. Here, intercept is considered as an error term. Besides, the use of this method includes time invariant variables (Baltagi, 2008).

3.5.2 The Hausman Test

In order to be able to choose between the random effects model (REM) and the fixed effects model (FEM), the Hausman test can be performed Wooldridge (2010). As a matter of fact, the choice of one method ahead of the other relies on the p-value. As a result of running the model, if we find a p-value less than the threshold of 5%, (which represents the significant level) then the model to be retained is the fixed effects model (FEM). Otherwise, i.e. if the p-value is not significant, then the random effect model (REM) should be the fitting method. As a reminder, the null hypothesis is that the random effect model is appropriate. In this study, The Hausman test results show that REM is preferred to FEM for all the regression models we carried out. See Table 2.

Table 2

Hausman test results

Test Summary	Chi-Sq. Statistic	Chi-Sq. d.f.	Prob.
specification : Model 1 (STDa)	0	8	1
specification : Model 2 (LTDa)	0	8	1
specification : Model 3 (TDa)	24.963	8	0.101

27

3.5.3 Autocorrelation

Before carrying out an ordinary least square (OLS) regression, we have to make sure there is no autocorrelation problem to the risk of failing our results (Gujarati & Porter, 2009). Autocorrelation is also referred to as serial correlation, and the reason of getting rid of serial correlation problem is because if the data are correlated with their past or future values in the time series, then the identification of the significant correlation will be negatively affected. In other to check whether there is such problem, the Durbin-Watson test is commonly used (Wooldridge, 2012). According to Wooldridge (2012), if we have a test value closer to 0 or 4 autocorrelation exists. In this test, 0 illustrates positive and 4 negative one and if the value is around 2 it means there is no autocorrelation problem (Wooldridge, 2012). The Table 3 below shows the results of the Durbin-Watson test conducted. The test results show the absence of serial correlation problem in our data.

Table 3

Durbin-Watson test

Durbin-Watson stat (STDa)	1.596
Durbin-Watson stat (LTDa)	1.528
Durbin-Watson stat (TDa)	1.994

3.5.4 Test of Heteroscedasticity in the Regression Model

As for the autocorrelation, before running a regression model we need to make sure there is no problem of heterescedacity. According to Studentmund and Cassidy (1997: 336, as cited in Samour and Hassan, 2016), OLS assumes that it is only through a distribution with a constant variance that we can observe the error term. Therefore, the problem of heteroscedacity occurs when the errors terms are not varying constantly. They added that it is necessary to adjust and to control for heteroscedacity. We run the ordinary least square (OLS) using the variables of interest. Then, the *Breusch-Pagan-Godfrey* test is performed to check the homoscedacity in the regression model. For this test, the null hypothesis is that there is no heteroscedacity in the model. For each

regression model the following table is depicting the results of the *Breusch-Pagan-Godfrey* test.

From the Table 4 and based on the probability values we obtained (greater than 5 % in every case), we can note that the absence of heteroscedasticity problem.

Table 4

Results of the Heteroscedasticity Test: Breusch-Pagan-Godfrey

STDa	**F-statistic**	1.196	**Prob. F(8,243)**	0.301
	Obs*R-squared	9.551	**Prob. Chi-Square(8)**	0.297
LTDa	**F-statistic**	5.637	**Prob. F(8,243)**	0.069
	Obs*R-squared	39.446	**Prob. Chi-Square(8)**	0.068
TDa	**F-statistic**	1.789	**Prob. F(8,243)**	0.079
	Obs*R-squared	14.023	**Prob. Chi-Square(8)**	0.081

CHAPTER 4
DATA ANALYSIS RESULTS

In this section, we discuss the results of the regression analysis we conduct based on the random effect model that is proven to be the appropriate estimator. The regression is based upon the sample covering the whole period of study. The aim of conducting a regression is to explain to what extend the different proxies of leverage are affected by the firm determinants that have been discussed in previous section. The results are reported in the Tables below. The results depicted by the regression in the various tables will enable us to confirm or to reject the hypothesis aforementioned. The first part presents the results for the descriptive statistics for both regression model 1 and 2 and the second part examines the relationship between the dependent and independent variables considered.

4.1 Descriptive Statistics

This section depicts the results of the descriptive statistics. Table 5 represents the descriptive statistics for the whole study period i.e. from 2015 to 2020 for all firms considered in our study. In Table 6 below, we can see the descriptive statistics of the dependent and independent variables for the period before the COVID-19 pandemic, 2015-2019. Table 7 presents the descriptive statistics for 2020. While Table 8 compares the mean values of variables for period the before COVID-19 and the COVID-19 period. As a reminder, this study examines the effects of COVID-19 on the financial leverage (capital structure) of listed firms in Germany especially in the manufacturing sector. For each time period considered, standard deviation as well as mean and median are used to better picture the overall situation. The mean gives an idea about the average values of the variables in the sample meanwhile the standard deviation gives an idea about how dispersed are the values of the variables around the mean. Median shows the center value of the data for each variable the descriptive statistics show that the variables are different as per firm therefore indicating that the firms are somehow affected by the pandemic.

Table 5 shows that the mean total debt is 0.51. This means 51% of assets are financed by leverage. The median for this variable is also around 0.51.the maximum and minimum total debt for this period are 1.77 and 0.04. On average 27% of assets are financed by short term debt and 24% by long term debt. The median for long term debt is 0.19 and 0.26 for short term debt. On average the profitability of firms in the whole period is 0.09, non-debt tax shield is 0.03, market to book ratio is 2.7, and tangibility is 0.46, while the mean values for liquidity and age are 2.60 and 3.99 respectively. The median values are 2.00 and 3.77.

Table 6 shows that the mean total debt is approximately 0.508. This means about 51% of assets are financed by leverage. The median for this variable is around 0.51. The maximum and minimum total debt for this period are 1.772 and 0.042. On average 28% of assets are financed by short term debt and 23% by long term debt. The median for long term debt is 0.190 and 0.257 for short term debt. On average the profitability of firms in the whole period is 0.089, non-debt tax shield is 0.028, market to book ratio is 2.606, and tangibility is 0.457, while the mean values for liquidity and age are 2.603 and 3.984 respectively. The median values are 2.009 and 3.761.

Table 7 displays the descriptive analysis for the year 2020. Here we aim at investigating the effect of the COVID-19 pandemic on the capital structure of the companies in more detail by comparing the evolution of the respective values of the variables. As depicted in the Table 8, the total leverage (TD) has increased by 2.74 %. We also have an increase of the long term debt by 10.55%. These increase might be explained by the major policy actions taken by the German government so as to facilitate access to the liquidity to firms and to enhance their ability to raise funds in the capital market. For the specific case of Germany, in March 2020, the government offered financial support to firms and one of the greatest measures taken was the guarantee of bank loans or loans from other financial institutions which made it easier for the companies to obtain long term loans. In contrast the short term debt has decreased by 3.8% showing that the companies in this sector preferred to use mainly long term debt as a source of finance for their assets and investments. If we compare the COVID-19 crisis with the global financial crisis, then we conclude, in line with

Fosberg (2012) that the pandemic forces companies to incur more debt. The Table 8 shows a drop in mean profitability by about 15%. Another important point to underline is that during the two sets of period, the liquidity remained virtually the same.

The following table displays the Descriptive statistic for the period ranging from 2015-2020

Table 5

Descriptive statistics for the period ranging from 2015-2020

Variables	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
TDA	0.511	0.506	1.772	0.042	0.211	252
LTDA	0.236	0.194	1.182	0.001	0.171	252
STDA	0.275	0.257	0.985	0.022	0.164	252
SIZE	12.821	12.118	19.245	8.098	2.679	252
PROF	0.086	0.107	0.391	-0.972	0.129	252
NDTS	0.029	0.024	0.121	0.000	0.019	252
MBV	2.706	1.690	46.930	-9.660	3.962	252
TANG	0.462	0.460	0.993	0.049	0.207	252
LIQ	2.604	2.009	12.944	0.086	2.079	252
AGE	3.997	3.773	6.568	1.792	1.001	252
COVID-19	0.167	0.000	1.000	0.000	0.373	252

The following table displays the Descriptive statistic for the period ranging from 2015-2019

Table 6

Descriptive statistics for the period 2015-2019

variables	Mean	Median	Maximum	Minimum	Std. Dev.	Observations
TDA	0.508	0.509	1.772	0.042	0.216	210
LTDA	0.232	0.190	1.182	0.001	0.172	210
STDA	0.276	0.257	0.985	0.023	0.167	210
SIZE	12.796	12.086	19.245	8.098	2.680	210
PROF	0.089	0.109	0.391	-0.972	0.135	210
NDTS	0.028	0.024	0.095	0.000	0.018	210
MBV	2.606	1.645	46.930	-9.660	3.963	210
TANG	0.457	0.454	0.993	0.049	0.207	210
LIQ	2.603	2.009	12.944	0.086	2.050	210
AGE	3.984	3.761	6.567	1.792	1.011	210

The following table displays the Descriptive statistic for the period of 2020

Table 7

Descriptive statistic for the year 2020

variables	Mean	Median	Maximum	Std. Dev.	Observations
TDA	0.522	0.491	0.892	0.181	42
LTDA	0.256	0.218	0.803	0.169	42
STDA	0.266	0.257	0.763	0.154	42
SIZE	12.947	12.171	19.194	2.704	42
PROF	0.075	0.090	0.189	0.089	42
NDTS	0.036	0.029	0.121	0.024	42
MBV	3.206	1.765	19.100	3.969	42
TANG	0.489	0.502	0.992	0.209	42
LIQ	2.612	1.979	12.669	2.249	42
AGE	4.066	3.828	6.568	0.953	42

The following table displays the *evolution of the variables within the period of 2015-2019 and 2020*

Table 8

Evolution of the variables within the period of 2015-2019 and 2020

Variables	Mean 2015-2019	Mean 2020	Change (%)
TDA	0.508	0.522	2.745
LTDA	0.232	0.256	10.554
STDA	0.276	0.266	-3.804
SIZE	12.796	12.947	1.178
PROF	0.089	0.075	-15.321
NDTS	0.028	0.036	28.559
MBV	2.606	3.206	23.040
TANG	0.457	0.489	7.106
LIQ	2.603	2.612	0.367
AGE	3.984	4.066	2.073

4.2 Correlation Analysis

In correlation analysis we examine the relationship between the dependent and independent variables considered. Correlation analysis displays the direction of the relation as well as the strength. Besides, it allows us to detect multicollinearity problems. To be reliable, there should not be any problem of multicollinearity within the variables. It becomes problematic when the correlation coefficient between two or more variables has a value greater than the threshold of 0.8 (Gujarati, 2003). After running the correlation test, it is found that none of the independent variables has a correlation higher than 0.8. This then confirms that the data are free from multicollinearity problem.

Below are the results of the univariate Pearson correlations.

Table 9
Correlations matrix of the period ranging from 2015 to 2020

variables	1	2	3	4	5	6	7	8	9	10	11
Tda (1)	1										
LTDa (2)	.647**	1									
STDa (3)	.606**	-.214**	1								
SIZE (4)	.244**	.161*	.145*	1							
PROF (5)	-.134*	-.340**	.183**	.259**	1						
NDTS (6)	.199**	.109	.141*	.087	.127*	1					
MBV (7)	.061	.158*	-.087	-.064	-.235**	-.120	1				
TANG (8)	-.050	.266**	-.342**	.167**	-.050	.269**	.070	1			
LIQ (9)	-.570**	-.179**	-.543**	-.402**	-.218**	-.358**	-.024	.187*	1		
AGE (10)	.194**	.078	.167**	.202**	.027	-.057	-.014	.128*	-.277**	1	
COVID-19 (11)	.025	.053	-.024	.021	-.039	.158*	.057	.058	.002	.031	1

Note ** $P < 0.01$ level (2-tailed) ; * $p < 0.05$ level (2-tailed). N= 252

Based on the Table 9, we can see that total debt is negatively correlated with profitability, liquidity and tangibility but positively correlated with market to book value, covid-19, size, age, and non-debt tax shield. On the other hand, Long term debt is positively correlated with tangibility, market to book value, COVID-19, size, age, and non-debt tax shield. Finally, short-term debt is negatively correlated with tangibility liquidity market to book value COVID-19. But it's positively correlated with profitability and size. Some variables are found to be insignificant as shown in the table. Market-to-book and COVID-19 are positively correlated to total debt but insignificantly; meanwhile tangibility is negatively correlated to total debt. Besides, non-debt tax shield, age and COVID-19 are all positively but insignificantly correlated to long term debt. Finally, COVID-19 is negatively and insignificantly associated to short term debt.

4.3 Regression Results and Discussions

In this section we present the results of random effects regressions we got from the three models we previously described. Table 10, Table 11, and Table 12 represent the regression analysis results for short term debt long term debt and total debt financing respectively.

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Table 10

Panel Analysis (COVID-19 and Short Term Financing)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.424	0.099	4.263	0.000
COVID-19	-0.005	0.009	-0.599	0.549
AGE	0.012	0.017	0.742	0.458
LIQ	-0.031***	0.003	-9.261	0.000
MBV	-0.001	0.001	-1.108	0.268
NDTS	0.379	0.431	0.879	0.380
PROF	-0.038	0.046	-0.827	0.408
SIZE	0.000	0.006	-0.104	0.916
TANG	-0.244***	0.050	-4.800	0.000

	Effects Specification			
R-squared	0.294			
Adjusted R-squared	0.271			
F-statistic	12.664	**Durbin-Watson stat**		1.596
Prob(F-statistic)	0.000			

Note: *, **, *** indicates that coefficients are statistically
significant at α= 10%, 5% and 1% respectively

Table 11

Panel Analysis (COVID-19 and long Term Financing)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.001	0.127	0.014	0.988
COVID_19	-0.001	0.015	-0.071	0.942
AGE	-0.009	0.021	-0.437	0.662
LIQ	-0.003	0.005	-0.704	0.481
MBV	-0.000	0.001	-0.152	0.879
NDTS	1.416**	0.655	2.161	0.031
PROF	-0.422***	0.072	-5.801	0.000
				0.098
SIZE	0.013*	0.007	1.660	
TANG	0.230***	0.073	3.137	0.001

Table 11 (continued)

Panel Analysis (COVID-19 and long Term Financing)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
	Effects Specification			
R-squared	0.191			
Adjusted R-squared	0.164			
F-statistic	7.175	**Durbin-Watson stat**	1.523	
Prob(F-statistic)	0			

Note: *, **, *** indicates that coefficients are statistically significant at α= 10%, 5% and 1% respectively

Table 12

Panel Analysis (COVID-19 and total debt Financing)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.437	0.131	3.336	0.001
COVID_19	-0.005	0.017	-0.340	0.733
AGE	0.007	0.021	0.336	0.737
LIQ	-0.038***	0.005	-6.650	0.000
MBV	-0.001	0.002	-0.785	0.432
NDTS	1.820***	0.706	2.578	0.010
PROF	-0.450***	0.079	-5.695	0.000
SIZE	0.012	0.008	1.567	0.118
TANG	-0.062	0.077	-0.808	0.419
	Effects Specification			
R-squared	0.284			
Adjusted R-squared	0.260			
F-statistic	12.051	**Durbin-Watson stat**	1.994	
Prob(F-statistic)	0			

Note: *, **, *** indicates that coefficients are statistically significant at α= 10%, 5% and 1% respectively

4.3.1 Study of the Various Variables

4.3.1.1 COVID-19. COVID -19 is negatively and insignificantly associated with short term debt, long term debt and total debt. In fact, we have a p-value of 0.5491; 0.9428; and 0.73 respectively for the short term debt, the long term debt and the total debt. And the coefficients of this variable are -0.005, -0.001, and -0.005 respectively.

4.3.1.2 Age

4.3.1.2.1 Short Term Debt Financing. The coefficient of Age is 0.012 and the p-value is 0.458 it is not significant. This result shows a positive association between the age, the amount of time since its incorporation and the short term debt. For this sector during the study period, the age is not a significant determinant in explaining the short term financing of firm. See Table 10.

4.3.1.2.2 Long Term Debt Financing. The coefficient of Age is -0.009 and the p-value is 0.662, it is not significant. This result shows a negative association between the age, the amount of time since its incorporation and the short term debt. For this sector during the study period, the age is not a significant determinant in explaining the long term financing of firm. See Table 11.

4.3.1.2.3 Total Debt Financing. The coefficient of Age is 0.007 and the p-value is 0.737, it is not significant. This shows a positive association between the age, the amount of time since its incorporation and the short term debt. For this sector during the study period, the age is not a significant determinant in explaining the short term financing of firm. See Table 12.

Even though age is insignificant in this study, there are previous research finding positive significant relation between age and leverage (Hall et al., 2000, 2004; Ibrahim, 2017). A positive relationship means higher possibility of investments or projects and the easiness of obtaining debt due to reputation. Meanwhile a negative relationship reveals that the more the age of the company, the less debt is issued This finding is in line with the POT (Michaelas, Chittenden & Poutziouris, 1999) and Hall et al. (2004). On the other hand, we can align with the study of Kumar et al. (2017) upon the capital structure of European and American countries that aged companies do not often rely on external source of financing1

4.3.1.3 Liquidity

4.3.1.3.1 Short Term Debt Financing. Liquidity has a negative relationship with short term debt financing. The relevant coefficient is -0.03. 1 Based on Table 10, liquidity is a significant determinant of capital structure given that it coefficient is significant at 1% level.

4.3.1.3.2 Long Term Debt Financing. Liquidity has a negative relationship with short term debt financing. The relevant coefficient is -0.003 Based on Table 11, liquidity seems not to be a significant determinant of capital given a p-value greater than 5%.

4.3.1.3.3 Total Debt Financing. Same like the total debt financing, liquidity has a negative relationship with short term debt financing. The relevant coefficient is -0.038. The relationship is significant at 1% level. See Table 12.

A negative relationship as found in this study is consistent with the POT. Chaklader and Chawkla (2016) find the similar result. This finding is also the same as that of Panno (2003), Voulgaris et al. (2004) and Handoo and Sharma (2014). High liquid companies have a working capital that can enable them to run their activities. The results contrast with the TOT considering that this theory forecasts a positive correlation between liquidity and leverage. According to the TOT, liquid firms have lower bankruptcy costs, and risks which increase the capacity of obtaining debt.

4.3.1.4 Profitability. This variable is one of the important factors in capital structure studies. It is calculated, as we mentioned earlier, by dividing the earnings before interest and tax by total assets.

4.3.1.4.1 Short Term Debt Financing. In this study, profitability has a negative association with short term debt. It is not significant considering that we have a p-value greater than 5%. The coefficient associated to profitability here is -0.038. See Table 10.

4.3.1.4.2 Long Term Debt Financing. Like for the short term debt, profitability is negatively associated to long term debt. Profitability seems to be a significant

determinant given a p value of 0. The coefficient associated to profitability here in this case is -0.422. See Table 11.

4.3.1.4.3 Total Debt Financing. Like for the long term debt, profitability is negatively associated to total short term debt. Profitability seems to be a significant determinant given a p value of 0. The coefficient associated to profitability here in this case is -0.450. See Table 12.

A negative relationship, as shown by the results, are in line with the POT. POT states that firms that have a good profitability ratio do not need to take loan or, the level of the loan should be pretty limited. This was demonstrated by the study of Granguli (2013). The same results were found by Rajan and Zingales (1995).

4.3.1.5 Size.

4.3.1.5.1 Short Term Debt Financing. Size is negatively associated with the leverage but it is not significant given a p-value of 0.91. See Table 10.

4.3.1.5.2 Long Term Debt Financing. Size is positively associated with the long term leverage. We have a positive coefficient of 0.013, but it is not significant given a p-value of 0.0981. See Table 11.

4.3.1.5.3 Total Debt Financing. Size is positively associated with the leverage. We have a positive coefficient of 0.012, but it is not significant given a p-value of 0.118. See Table 12.

Our results show that size is not a factor affecting the amount of leverage for manufacturing companies in Germany. But there are different findings in literature. For size, a negative relationship corroborates the theory according to which larger firms keep higher leverage. The negative association is supported by the POT. Bhayani (2005) concludes his study on capital structure by the same results. Also, Frank and Goyal (2009) find that larger firms use the available funds rather than the outside one. In contrast, Pandey et.al (2019) find a positive relationship confirming the TOT. TOT, in turn emphasizes that larger companies are likely to diversify their activity and so mitigate the risk exposure. This allows them to have higher levels of debt.

4.3.1.6 Tangibility.

4.3.1.6.1 Short Term Debt Financing. Tangibility is negatively and significantly associated with the short term leverage (STDa). In fact, the relevant coefficient is -0.24 and significant at 1% level. The results reveals that when tangibility increases by 1 unit the short term debt decreases by 0.24 units on average. See Table 10

4.3.1.6.2 Long Term Debt Financing. The coefficient of tangibility is 0.230 and the p-value is 0.001, significant at 1% level. This result shows a positive association between tangibility and long term debt financing. See Table 11.

4.3.1.6.3 Total Debt Financing. Just like for short term debt financing, Tangibility is negatively and insignificantly associated with the total debt (TDa). In fact, the relevant coefficient is -0.0628. The probability value, 0.419 is greater than the threshold level of 10%. See Table 12.

There is a positive relationship between tangibility and LTD as expected. This is what the TOT posits. This theory emphasizes on the fact that the more firms have fixed assets the more security they have to be granted loans by financial institutions. These results are also accepted by Myers and Majluf (1984). They argue that companies issue more debt when they have tangible assets and they give priority to this type of financing because their assets have value. For example, equipment, plant etc. Meanwhile there is a negative relationship between STD and tangibility. Sahudin (2019) also found the same results for shariah-compliant firms. In the same vein, Czerwonka and Jaworski (2021) find a negative relationship between tangibility and total debt.

4.3.1.7 Non-debt Tax Shields.

4.3.1.7.1 Short Term Debt Financing. NDTS has a positive relation with leverage (proxied by the STDa) the relevant coefficient is 0.38 but, it is not a significant. See Table 10.

4.3.1.7.2 Long Term Debt Financing. Just like for the short term debt, NDTS has a positive relation with leverage (proxied by the LTDa) the relevant coefficient is 1.41 and, it is significant at 5% level (p-value of 0.03). See Table 11.

4.3.1.7.3 Total Debt Financing. Like for the long term debt, NDTS has a positive relation with leverage (proxied by the TDa) the relevant coefficient is 1.82 and, it is significant at 5% level (p-value of 0.01). See Table 12.

Based on the results, a positive relationship is consistent with the study of Moore (1986), Li and Hovakimian (2011), and Harris and Raviv (1991). This direction of relationship is opposed to the TOT. Trade-off theory states that the high amount of non-debt tax shield in a firm entails the decline of the need of debt in the capital structure.

4.3.1.8 Market to Book Value

4.3.1.8.1 Short Term Debt Financing. Market to book value is negatively associated with STDa. When the MBV increases by 1%, STDa decreases by 0.13%. The related coefficient is negative (-0.001331) the p-value is 0.26 (>5%). It is therefore not significant. See Table 10.

4.3.1.8.2 Long Term Debt Financing. The same direction of the relationship works for the MBV in fact, MBV is negatively associated with LTDa. The related coefficient is negative (-0.000288) the p-value is 0.8792 (>5%). It is therefore not significant. See Table 11.

4.3.1.8.3 Total Debt Financing. Market to book value is negatively associated with TDa. The related coefficient is negative (-0.00163) When the MBV increases by one, TDa decreases by 0.16%. The p-value is 0.4329 it is therefore not significant. See Table 12.

The negative relationship is consistent with the study of Franck and Goyal (2009). It is also consistent with the TOT. According to the TOT, the greater the opportunities for a firm the more likely it is for it to lose it value in financial distress.

Based on the regression results, about 29.4% of the determinants of capital structure, considered in this study, can explain the variability in the short-term debt financing, meanwhile 19.1% can explain that of the long-term debt and then 28.4% can explain the variability in the total debt financing.

CHAPTER 5
CONCLUSIONS AND IMPLICATIONS

5.1 Conclusions and Discussions

The most important thing about studying the capital structure of a company is to find out the optimal capital structure for the company. That is, the one that can enhance or maintain the value of the company. For this to be made possible, there need to be a tradeoff between two major processes. In the first place, the advantage of taxes from the borrowed funds and in the second place the cost of the possible financial distress that may arise. The optimal capital structure or a theory explaining the capital structure of the companies has not yet been found by the existing literature even though some authors made this attempt. In this study, we went over two of the major theories of capital structure with the aim of confirming or rejecting the hypotheses aforementioned. These theories are: the pecking order theory and the tradeoff theory. In this study, the goal is to determine the most important determinants of the capital structure of the companies in the manufacturing sector in Germany and to investigate what could have been the impact of COVID-19 on the capital structure of these companies. The determinants analyzed include market-to-book value, size, tangibility, non-debt tax shield, profitability, age and liquidity as well as COVID-19. The results of our study show that the determinants of capital structure we considered do not have the same impact on different proxies of leverage. For example, liquidity and tangibility significantly impact the short-term debt, while non-debt tax shield, profitability, size and tangibility significantly impact the long term debt. For the total debt, liquidity, non-debt tax shields and profitability are significant. The results of the regressions do not align with one theory. Some align with the predictions of the pecking order theory and some with the tradeoff theory. COVID-19 pandemic is found not to have a significant impact on the financial decisions of the companies, unlike what we expected. This absence of impact especially in the manufacturing sector in Germany could be explained somewhat by the different measures taken by the government. For example, the restrictions put in place during COVID-19 was to enable firms to adapt their

processes of production accordingly while respecting the distancing and not to prevent them from producing. In many studies it has been proven that COVID-19 seriously impacted business performance, managerial decisions obviously leading to financial decisions. During the two first quarters of 2020, although at risk, small firms were managing to follow the trend by raising fund in the market of equity ignoring that constrained firm should not raise capital or should raise less capital than the other firms (Hotchkiss, Nini & Smith, 2020).

5.2 Implications and Recommendations

Our study is helpful for the policymakers and for the managers especially in the manufacturing sector. In the scope of this study, policy makers will have an understanding of specific factors of firm they consider so as to get better results for their policies affecting the financial decisions. On the other hand, managers have to know the right proportion of debt and equity to shape the capital structure no matter there is a problem like the pandemic or any crisis of that sort. Doing so, firms will not face financial distress due to over debt or untimely debt. This study also corroborates the irrelevance of an optimal capital structure. It is necessary that we mention the constraints of the study. The COVID-19 effects were studied just within the year 2020 due to the absence of complete data of the subsequent year in the data base while we were conducting this study. We therefore recommend the future study to extend their potential study on more years to better picture the effect of the pandemic on the capital structure. Due to missing data, most of the firms in the data are in the industrial electronic and electric machinery sector. 42 companies were used to conduct the study, even though statistically reliable, are not quite representative and appropriate for our various conclusions. That is why future research are recommended to enlarge the sample size for better results. In addition, a survey-based research can help better understanding of the determinants of capital structure. For example, facts like asymmetry information and agency problem will be better assessed considering that they significantly come into play when it comes to taking financial decisions.

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APPENDICES

APPENDIX A : THE VARIABLES AND THEIR RESPECTIVE MEASURE

Variables	Measurement
STDa	STD /TA
LTDa	LTD /TA
Tda	TD /TA
PROF	EBITDA /TA
LIQ	CA /CL
AGE	$T_f - T_i$
NDTS	DDA /TA
MBV	(TL+MVE)/(TL+E)
TANG	FA /TA
SIZE	Ln (TA)

APPENDIX B: SECTORS OF ACTIVITY OF THE CONSIDERED FIRMS

Activity sector of the firms	Number
Industrial, Electric & Electronic Machinery	19
Communication	3
Chemicals, Petroleum, Rubber & Plastic	9
Transport Manufacturing	1
Textiles & Clothing Manufacturing	2
Computer Hardware	1
Food & Tobacco Manufacturing	5
Miscellaneous Manufacturing	1
Wood, Furniture & Paper Manufacturing	1