Capital Structure of German publicly listed Firms: Evidence from the Financial Crisis

Author: Sebastian Beyer
University of Twente
P.O. Box 217, 7500AE Enschede
The Netherlands

ABSTRACT,
This paper examines the impact of the capital structure on firm performance of German listed firms using fixed-effect models. The main focus lies on the impact of the financial crisis (2008-2010) on the relationship between leverage and firm financial performance. Firm performance is measured by ROA and ROE. Capital structure is measured using book values of short-term, long-term and total debt. Moreover, the explanatory variables are lagged by one year. Based on the trade-off theory and the agency cost theory, multiple hypotheses have been created. The dataset contains 3372 data units across a time period of 9 years. The findings of this paper show that the financial crisis does not negatively affect the performance with regards to the capital structure of firms. Leverage has a positive relationship with both ROA and ROE for the financial crisis-period and post-crisis period. Also, there is no evidence which suggests that leverage has an inverted u-shaped relationship with performance measured by ROA and ROE as proposed by the literature.

Graduation Committee members:
Dr. H.C. van Beusichem (Henry),
Dr. X. Huang (Xiaohong),
Prof. Dr. M.R. Kabir (Rezaul),
Dr. S. Zubair (Siraz)

Keywords
Capital structure, Firm performance, Financial Crisis, Germany, Leverage

11th IBA Bachelor Thesis Conference, July 10th, 2018, Enschede, The Netherlands.

1. INTRODUCTION

The financing decisions made by managers of firms can have long-lasting consequences for a company. Deciding about capital structures involves large amounts of money and does affect the value of the firm. As a firm is striving towards the point of value maximization, minimizing the cost of capital is of great importance. Firms have three different financing options. They can make use of their retained earnings, take on debt or issue equity in the form of stocks. Retained earnings are the cheapest source of financing because of the absence of associated costs. Debt financing brings along certain risks due to interest payments and default risks and issuing equity reduces the control of ownership.

Many theories have been developed that try to explain how the capital structure of a firm impacts the value of a company. However, three theories have proven to be of great relevance when it comes to the decision of how the capital structure of a firm should be like. According to the trade-off theory, firms strive towards an optimal debt level where the benefits of the tax shield balance the associated costs of financial distress (Myers, 1984). The pecking-order theory introduces a financing hierarchy preferred by firms. According to Myers and Majluf (1984) firms will first rely on internal financing, followed by issuing debt. Lastly, firms will issue equity to acquire financial resources. According to the agency-cost theory, inefficiencies resulting from information asymmetry between different actors within the firm exist. These can be reduced by increasing or decreasing the debt levels of the capital structure (Jensen & Mekling, 1976). This paper only focuses on the trade-off theory together with the agency-cost theory since the pecking-order theory is best suited to investigate changes in the capital structure over time.

A vast body of research exists on the topic of capital structure. Previous research focused on the identification of determinants of capital structure as well as on the influence of capital structure on firm performance (see Titman & Wessels, 1988; Rajan & Zingales, 1995; Margaritis & Psilakki, 2010; Vatavu, 2015) Especially, investigating the impact of capital structure on firm performance has been of great interest in the field of finance, however with mixed results. One the one hand, studies showed that leverage is positively associated with firm performance (Ahmad, Abdullah & Roslan, 2012; Berger & Bonaccorsi di Patti, 2006; Margaritis & Psilakki, 2010; Abor, 2005). On the other hand, results from different studies indicate that leverage has a negative impact on firm performance (Majumdar & Chhibbert, 1997; Vatavu, 2015; Gleason et al., 2000).

As shown, so far the existing body of research is not able to find a consensus on this topic. More research on this topic is needed to provide clear agreement on the direction of the relationship between leverage and performance.

Furthermore, all studies have been conducted in periods of economic stability. Crises can have dramatic effects on the firm's business operations and financing options. One reason for that is the loan supply shock of banks to corporations and private firms (Duchin, Ozbas & Sensoy, 2010). During the financial crisis, debt becomes expensive due to increasing interest rates. This impedes the use of debt as a financing source and effects the capital structure of firms. According to Campello, Graham, and Harvey (2010), the financial crisis of 2008 led to 86% of firms in their sample to pass on attractive investment projects due to financial constraints. Moreover, constrained firms burned through more cash and took on some heavy credit lines due to an anticipated risk that banks would restrict access to credit in the future. All these factors that come along with a crisis raise the need to investigate how the capital structure influences firms' performance in periods of economic instability or crisis. Even though, Germany is a leading country in terms of economic power and financial strength within the European Union as well as the world, the body of research investigating Germany's firms is small. The outcome of that is an additional research gap on the financial performance of German firms, primarily the effect of leverage on firm performance in Germany.

In this context, this study is investigating the following research question:" *To what extent does the capital structure of listed firms in Germany influence the performance during the financial crisis starting in 2008?"*

The goal of the study is to investigate firms' performance with regards to their capital structure in a stable and an unstable economic period. By identifying better-performing companies, implications can be made to adjust the capital structure of lower performing firms to improve performance in unstable periods.

This study is of academic relevance due to multiple reasons. Firstly, it fills the research gap as to what extent the dynamics of a financial crisis impact the performance of a firm with regard to its capital structure. Secondly, it sheds light on the German industries and investigates their performance during and after the financial crisis. Moreover, the results of this study are also of business relevance. Periods of economic instability and crisis come along with great uncertainties for firms. Therefore, this study helps to reduce these uncertainties in terms of capital structure decisions when operating during economic downturns.

In order to come up with results, a fixed effect model is employed, whereby every independent variable is run separately due to problems of multicollinearity. The dataset lists 3372 data units over a time period of 9 years. The results show that the financial crisis does not negatively affect the performance of firms with regards to their capital structure. Based on the findings, leverages and performance have a positive significant relationship during and after the financial crisis. Thus, having larger debt amounts within the capital structure during times of economic instability does not seem to be a disadvantage when it comes to the financial performance of firms.

Section two of this papers provide insights into the different capital structure theories, as well as performance measures and identifies characteristics of publicly listed firms. In section three, based on the literature and previous findings, hypotheses are created regarding possible relationships of leverage on performance during and after the financial crisis. Section four elaborates on the data selection process, followed by section 5, which discusses the methods along with the models which are used. In section 6, the results of the descriptive, as well as results of the regression analysis, are presented and elaborated, followed by a robustness check of my findings. The conclusion is given in section 8.

2. LITERATURE REVIEW

2.1 Capital structure theory

The theories of capital structure try to explain how companies can employ capital and leverage to their best use. Therefore, striving towards the point where the value of the firm is maximized.

A milestone and starting point for discussion of capital structure developed 1958 with the work by Modigliani and Miller who introduced the theory of "capital structure irrelevance". Their argumentation is based upon the assumption that capital markets are perfect and therefore the capital structure doesn't affect the value of a firm (Modigliani and Miller, 1958). Many other theories used their work as a framework to challenge this assumption. Once certain relevant factors are included in the discussion of capital structure, such as information asymmetry, agency costs, corporate tax, flotation and transaction costs the capital structure becomes an important element to the value of the firm.

2.1.1 Trade-off Theory

One of the theories that assume that capital structure is not irrelevant is the trade-off theory.

The trade-off theory predicts that an optimal debt level exists within a company. Thus, appropriate debt levels are justified by the trade-off theory (Myers, 2001). Firms strive towards an optimal debt level which balances the benefits of debt and the costs of financial distress (DeAngelo and Masulis 1980; Myers 2001)**.** The tax benefits resulting from the tax deductibility of interest payments. Therefore, using more debt in the capital structure increases the value of the firm. However, larger tax shields also increase the costs of financial distress as the probability of default rises. This implies that once the optimal firm-specific debt level is reached, trespassing this point has a negative effect on the firm value. Financial distress includes costs of bankruptcy for legal and administrative services or reorganization of the firm (Myers 2001).

2.1.2 Agency-cost theory

The agency theory discusses possible agency conflicts between owners, managers and debt holders due to asymmetric information (Jensen and Meckling, 1976). One issue results from the fact that the interests of managers and owners are not perfectly aligned. Therefore, agents tend to maximize their own utility instead of maximizing the firm value. According to Jensen (1986)**,** this results in managers to overinvest free cash flow into negative net present value projects (NPV), rather than paying dividends to shareholders. This behavior can be reduced by increasing leverage, as this reduces the free cash flow available for managers to spend due to interest payments. Moreover, agency conflicts can also arise between equity and debt investors which results in underinvestment. Myers (1977) describes that highly leveraged firms will pass on positive net value projects as possible future earnings might be shared with debtholders. Another agency conflict can arise between these two parties called risk-shifting problem. This occurs if an investment yields greater returns than the cost of debt. As a result, debtholders are exposed to possible losses due to limited liability of the owners **(**Jensen and Meckling 1976)**.**

3. HYPOTHESES

The trade-off theory assumes that an optimal debt level exists within a company.

The level of debt creates a tax shield that should balance the costs of financial distress associated with debt (Myers 1984). Therefore, using debt as part of the financing should increase the value of the firm.

The agency-cost theory is built upon the assumption that the interests of the managers and owners of the firm are not perfectly aligned. Jensen and Meckling (1976) emphasized that managers tend to maximize their own utility instead of that of the company. Especially the issues of overinvestment by spending inefficiencies by managers in order to maintain their power is one major reason for agency-costs. One way to reduce this behavior of managers is the use of debt. As proposed by Jensen's (1986) "free cash-flow theory", debt can serve as a discipline device that reduces the excess of free cash flow available to managers. Therefore, high debt ratios may be used as a way to reduce the waste of cash flow by managers. In their study**,** Margaritis and Psilakki (2010) investigated the effect of capital structure on firm efficiency and found evidence that leverage is associated with higher firm performance.

Based on these arguments I hypothesize that: H1a: *Leverage and performance have a positive relationship.*

During times of economic instability, such as crisis, raising external finances becomes increasingly difficult and expensive. Empirical studies have identified that during banking crises credit to the private sector and aggregate output decline supporting the argumentation that banking crises affect the real economy (Kaminsky and Reinhart, 1999; Eichengreen and Rose, 1998). With a shortage of credit supply and increasing prices, firms face higher costs in order to reach the point of value maximization, introduced by the trade-off theory. Moreover, following the argumentation of the agency-cost theory, in order to reduce the agency costs debt should be employed as a discipline device. However, with increasing costs to finance debt, it becomes unprofitable for firms to rely on debt which decreases the performance. Therefore, I hypothesize that: H1b: *Leverage and performance have a negative relationship during the financial crisis.*

In the post-crisis period, the interest rates in Germany dropped below 1%, which made debt a cheap financing source, (Trading Economist, 2018) thus offering firms an inexpensive way to make use of an optimal debt level proposed by the trade-off theory. This also applies to the agency-cost theory, as firms can easily reduce the "free-cash-flow" of managers by increasing debt levels resulting in money being invested into positive net present value projects. Therefore, I hypothesize that: H1c: *Leverage and performance have a significantly positive relationship during the post-crisis period.*

As mentioned earlier, according to the trade-off theory the benefits of debt financing are only present up to a certain point which balances the cost of financial distress associated with debt. Therefore, if the optimal debt level has trespassed, the threat of default increases leading to higher bankruptcy and financial distress costs. Thus, using too much debt as a source of financing will lead to a decrease in value of the firm. Additionally, agency costs can also exist between debt and equity investors which result in underinvestments due to debt financing. Myers (1977) emphasizes that highly levered firms will pass upon positive net profit value projects because possible future earnings might be shared with the debtholders of the firm. In this situation, the debt will have a negative effect on the value of the firm. This view is supported by Berger and Bonnaccorsi (2010) who predict that once the leverage ratio becomes too big, the sign of the relationship between leverage and performance switches as the agency costs of outside debt overwhelms the agency costs of outside equity and leverage increases agency costs.

Therefore, I hypothesize that: H2a: *Leverage and performance have an inverted u-shaped relationship.*

As explained above, as a result of the financial crisis a tremendous negative shock to the supply of external finance took place resulting in higher prices to finance debt. According to Busch et al. (2010), since autumn 2008 Germany experienced a loan supply shock of great magnitude. Therefore, assuming that an inverted relationship of leverage with performance exists would imply that leverage has a positive effect on performance until a certain threshold, which is unrealistic as debt becomes increasingly expensive. Therefore, I hypothesize that: H2b: *Leverage and performance do not have an inverted u-shaped relationship during the financial crisis.*

During the post-crisis period, the same argumentation holds as for hypothesis H2a since debt is relatively cheap with interest rates around 1%. Therefore, I hypothesize that: H2c: *Leverage and performance have an inverted u-shaped relationship during the post-crisis period.*

This paper focusses on the financial performance of a firm. To be precise accounting based measures are used. According to Richard et al, (2009) accounting measures are the "most common and readily available means of measuring organizational performance" (p.727). The validity of accounting measures has been proven by existing literature. Danielson & Press (2003) found a correlation of above 75% between accounting measures and economic rates of return. However, this performance measure approach also has its disadvantages. First of all, these measures emphasize historic events rather than on future performance **(**Keats, 1988). Moreover, they critically dependent on the accounting standards used (Richard et al, 2009). Additionally, as with every performance measure, they are prone to human errors. However, these problems can be neutralized by using a cross-sectional time series design to account for performance measure over time. Moreover, as this study only includes one country, the accounting standards do not affect the relative outcome of the performance measure. Finally, possible data errors can be solved by winsorizing the data in order to exclude outliers. For this paper, the focus is on two proxies for performance, namely, Return on Equity (ROE) and Return on Assets (ROA). ROE is a shareholder-oriented performance measure; therefore, ROE is looking at the shareholders' return for their invested equity during the year (Hiller et al., 2014). On the other hand, ROA measures the generated net income of the company relative to its total assets in a given time period (Hiller et al., 2014). Therefore, ROA provides a more general performance overview as it does not only focus on one financing source but focusses on the total return of the company

Table 1. Definition of variables

Variable	Definition
Dependent variables	
ROA	Net income divided by total assets
ROE	Net income divided by total equity
Independent variables	
STD	Current-liabilities divided by total assets
LTD	Non-current liabilities divided by total assets
TD	Total liabilities divided by total assets
Control variables	
Size	Natural logarithm of total assets
Efficiency	Sales divided by total assets
Profitability	EBIT divided by total assets
Tangibility	Fixed-tangible assets divided by total assets
CrisisDummy	A dummy variable equal to (1) for the crisis period and equal to (0) for the post-crisis period
Robustness Check	
ROA (E)	EBIT divided by total assets
ROE (E)	EBIT divided by total equity
Tobin's Q	Market capitalisation plus book value of total debt divided by total assets

4. METHODS

4.1 Variable definition

4.1.1 Dependent variables

As discussed in section two, many different performance measures exist. For this study, return on assets (ROA) and return on equity (ROE) are selected to measure the performance of firms. The capital structure is operationalized as short-term debt, long-term debt, and total debt. The control variables are size, efficiency, profitability, and tangibility. Additionally, a dummy variable is included to account for the period of financial crisis.

Return on Assets and Return on Equity are very common performance measures used in this field of research (Ahmad et al., 2012; Majumdar & Chhibbert, 1997; Vatavu, 2015; Gleason et al., 2000; Abor 2005). However, also other performance measures such as Tobin's Q are common indicators to capture the performance of firms (Vithessonthi & Tongurai 2015). Therefore, Tobin's Q is used for the robustness check in section six.

Unfortunately, the literature does not provide a clear agreement on how the performance measures are calculated. Some suggest the use of net income (Ahmad et al, 2012; Vatavu, 2015; Gleason et al, 2000; Salim & Yadav, 2012) while others prefer the use of earnings before interest and taxation (EBIT) (Abor, 2005 Ahmad et al, 2012). EBIT is a measure of operational performance as it ignores interest payments as well as taxes. Therefore, focusing solely on the operating profit. Net income, on the other hand, represents the performance of the firm as a whole as it includes taxes and interest payments. For the

purpose of this study, net income will be used to measure firm performance, because the debt level within the capital structure of firms is decisive for the interest paid. However, EBIT is used to check for the robustness of my findings and is included in section 6 to calculate the performance measures. Hence, ROA is calculated as the net income divided by the total assets, following the approach of Ahmad et al (2012); Vatavu, (2015). ROE is calculated as the net income divided by the total equity.

4.1.2 Independent variables

The capital structure is operationalized as short-term debt, long-term debt, and total debt. According to Jonny Jermias (2007), capital structure theories suggest the use of market value terms when calculating financial leverage, however, most of the empirical work make use of the book values for financial leverage due to the fact that book values are more objective. Additionally, Stonehill et al., (1974) conducted a survey and found out that most financial managers prefer the use of book values when discussing financial leverage. Therefore, book values are used to calculate leverage. Short-term debt is calculated as the book value of short-term debt to total assets; long-term debt as the book value of long-term debt to totals assets and total debt as the book value of total debt to total assets. Following the approach of Brav (2009), the explanatory variables will be lagged by one year to account for possible endogeneity problems.

4.1.3 Control variables

The capital structure alone is not responsible for the influence on performance. Therefore, variables are included that control the impact on performance besides capital structure. Based on the previous literature four control variables have been identified, namely size, efficiency, profitability, and tangibility.

Size is one factor that is likely to affect the performance of firms. According to Margaritis & Psilakki (2010), larger firms tend to be more diversified and better managed, therefore being more efficient. Moreover, Himmelberger et al. (1999) suggest that larger firms make use of economies of scale regarding monitoring their managers and therefore decreasing agency costs. Size is measured by the natural logarithm of total assets (Margaritis & Psilakki, 2010; Maury, 2005; Jonny Jermias, 2007). Efficiency is the second control variable. It is measured as sales divided by total assets (Ahmad et al., 2012). Efficient firms tend to make better use of their resources thus, resulting in better firm performance. Profitability is the third control variable included. Profitable firms tend to be more efficient and well managed, therefore they should perform better (Margaritis & Psilakki, 2010). Profitability is measured by the ratio of profits (EBIT) to total assets. Tangibility is the last variable. Tangible assets can be used as collaterals for credits and to downsize agency conflicts (Margaritis & Psillaki, 2010). Moreover, tangibles are easily monitored. It is measured as the ratio of fixed tangible assets divided by total assets of a firm (Margaritis & Psillaki, 2010).

To account for the effects of the financial crisis and its consequences on the performance of firms a dummy variable is included for the period of financial crisis. Therefore, the crisis period is equal to (1) and the post-crisis period is equal to (0).

4.2 Model

To investigate the impact of the capital structure on the performance of firms during and after the financial crisis, a cross-section time series analysis is used, which is also called panel data. This method is used when data points of different subjects of interest across different time periods are analyzed.

Four models will be employed to give answers to the Hypotheses.

Model one to four are displayed below following the approach of Margaritis and Psillaki (2010):

(1)

$$Perf_{i,t} = a_0 + a_1 Lev_{i,t-1} + a_2 Z_{1i,t-1} + \varepsilon_{i,t}$$

(2)

$$Perf_{i,t} = a_0 + a_1 Lev_{i,t-1} + a_2 Lev^2_{i,t-1} + a_3 Z_{1i,t-1} + \varepsilon_{i,t}$$

(3)

$$Perf_{i,t} = a_0 + a_1 Lev_{i,t-1} + a_2 Z_{1i,t-1} + a_3 DummyCrisis + \varepsilon_{i,t}$$

(4)

$$Perf_{i,t} = a_0 + a_1 Lev_{i,t-1} + a_2 Lev^2_{i,t-1} + a_3 Z_{1i,t-1} + a_4 DummyCrisis + \varepsilon_{i,t}$$

$$i=1\ldots N \text{ and } t=1\ldots 9$$

where $Perf_{i,t}$ represents the dependent variable which can either be ROA or ROE. $LEV_{i,t}$ gives the capital structure of the firm which can either be short-term debt, long-term debt or total debt. $Z_{1i,t}$ is a vector of control variables; $\varepsilon_{i,t}$ is a stochastic error term (Margarities and Psillaki, 2010). The Dummy Crisis is added to the model to account for the effects of the financial crisis on performance with regards to leverage.

As explained in section three, we expect a positive relationship between leverage and performance. However, as noted the possibility of a non-linear relationship exists, meaning that at sufficiently high levels of leverage the relationship turns negative. Therefore, the quadratic specification ($LEV^2_{i,t}$) is included in the models (2) and (4) to account for the possibility of a non-monotonic relationship between leverage and firm performance. Along with Margaratis & Psilakki (2010), the inverse U-shaped relationship between leverage and performance holds for values of $a_2 < 0$.

In order to decide whether random or fixed effect models are better suited for the data, a Hausman test was conducted for both models. It rejected the H_0, implying that a fixed effect model is most appropriate. According to Greene (1991), the fixed-effect assumption implies that the independent variables are correlated with the individual specific effect.

In order to run regressions, the assumptions for multicollinearity and autocorrelation have to be checked. The Durbin-Watson test shows that the values for all regressions are close to 2 which indicates that there is no autocorrelation within the model. Furthermore, the variance inflation factor (VIF) is used to check for multicollinearity. The test resulted in multicollinearity. Therefore, each independent variable is regressed separately to ensure no multicollinearity exists within the regression (Wooldrige, 2012).

Models 1 and 2 are used to investigate hypotheses H1a and H2b. The whole panel is used to carry out the analyses and no separation between the period of crisis and the period of post-crisis is made. Model 3 investigates hypotheses H1b and H1c, thereby investigating the differences between the period of financial crisis and post-crisis period. Model 4 is used to give answers to hypotheses H2b and H2c which again is separated into the two periods of crisis and post-crisis. Each model is run twice, employing ROA and ROE in separate regressions.

5. DATA

The data for this study will be obtained from the Bureau van Dijk Database Orbis. The database is easily accessible and contains datasets of large and publicly listed firms worldwide and is, therefore, a reliable and valid source of datasets for German listed firms. My data sample consists of German firms that are listed on the German stock exchange market.

In order to fully grasp the impact of the financial crisis starting in 2008, the sample period has to be defined. Therefore, the GDP growth rate of Germany is used to define the length of the crisis for Germany. In 2008 the GDP growth rate starts to decline, hitting the lowest point in the first quarter of 2009 with -4.5%. At the beginning of 2010, the GDP growth rate hits the 0% line and slowly starts to increase and stabilize (Trading Economics, 2018).

Therefore, based on the GDP growth rate the sample period should include the years 2008 and 2009. Following the approach of lagged explanatory variables to account for endogeneity problems, data from the previous years (t-1) is used to measure the performance in year t (Brav, 2009). Since the data is not available for the year 2007, performance cannot be measured in the year 2008. Hence, the period which is investigated includes the years 2009 and 2010 as the capital structure in 2009 still affects the performance in 2010.

Firms within the financial sector will be excluded (SIC 6000 – 6700). This is due to the nature of the industry which is subject to heavy governmental regulations (Brav, 2009). Moreover, firms that fall within the classification of Public Administration (9100-9729) are excluded as well. This results in a sample of 3372 firm-year observations. In order to clear the data from possible outliers, the data set will be winsorized at the 2.5 and 97.5 percent level.

Table 2. Summary of descriptive statistics

Variable	Mean	Median	Std. Dev.	Min	Max	N
Full sample						
ROA	-0.002	0.033	0.166	-0.802	0.226	3372
ROE	0.013	0.082	0.362	-1.635	0.668	3372
STD	0.298	0.271	0.170	0.010	0.830	3372
LTD	0.244	0.222	0.177	0.001	0.751	3372
TD	0.541	0.548	0.228	0.049	1.110	3372
Size	12.128	11.970	2.460	6.691	17.498	3372
Efficiency	1.068	0.983	0.663	0	3.000	3372
Profitability	0.027	0.054	0.149	-0.551	0.267	3372
Tangibility	0.214	0.171	0.193	0	0.750	3372
Crisis period						
ROA	-0.012	0.028	0.186	-0.802	0.226	687
ROE	-0.005	0.070	0.399	-1.634	0.6695	687
STD	0.306	0.284	0.168	0.010	0.830	687
LTD	0.240	0.220	0.173	0.001	0.751	687
TD	0.544	0.574	0.221	0.049	1.110	687
Size	12.041	11.865	2.360	6.691	17.497	687
Efficiency	1.078	0.971	0.664	0	3.000	687
Profitability	0.025	0.048	0.141	-0.551	0.267	687
Tangibility	0.214	0.175	0.194	0	0.750	687
Post-crisis period						
ROA	0.001	0.034	0.160	-0.802	0.226	2685
ROE	0.018	0.084	0.352	-1.635	0.669	2685
STD	0.296	0.267	0.171	0.010	0.830	2685
LTD	0.245	0.222	0.178	0.001	0.751	2685
TD	0.540	0.540	0.230	0.049	1.110	2685
Size	12.151	11.983	2.485	6.691	17.498	2685
Efficiency	1.065	0.987	0.663	0	3.000	2685
Profitability	0.028	0.056	0.151	-0.551	0.267	2685
Tangibility	0.213	0.170	0.193	0	0.750	2685

Std. Dev. is the abbreviation for standard deviation. N is the abbreviation for number of observations. All variable as defined in table 1.

6. RESULTS

6.1 Descriptive results

In table 2 the descriptive statistics of the full sample are displayed. Following the approach by Brav (2009), all the data displayed is winsorized at the 2,5% and 97,5% level.

For the full panel, the average performance measured in ROA is -0,2% with a median of 3,3%. Thus, return on assets is slightly skewed to the left. ROE has a value of 1,3% and a median of 8,2%, resulting in a slight skewness to the left as well. ROA's value is close to the one of Vatavu's (2015) with -3%. ROE is in line with the findings of Salim and Yadav's (2012) 3%. Based on the literature, ROE seems to outperform ROA which is also the case in this sample (Ahmad et al, 2012). When looking at the capital structure, German publicly listed firms are highly leveraged with a mean of 54%. These findings are in line with Gill et al. (2011) and Abor (2005), who also found evidence that debt makes up for more than half of the capital structure of firms. However, Ahmad, Vatavu, and Salim have findings where debt is below 50%. In this sample, short-term debt is slightly larger than long-term debt with values of 29% and 24%. The results are consistent with Ahmad, Vatavu, Salim, and Abor.

Since the main focus of this paper lies on the difference between the crisis period and the post-crisis period each sample

is evaluated. When looking at the performance measures during the financial crisis, ROA and ROE both become negative with values of -1,2% and -0,5% respectively. Since both means are below the median, the performance measures are slightly skewed to the left. The change of ROE is due to the decreasing share price which decreases the equity amount resulting in a loss of shareholder return. Comparing this with the post-crisis period, it becomes obvious that the financial crisis had a negative effect on the performance of firms as the values for ROA and ROE during the post-crisis period are positive with 0,1% and 1,8% as shown by the outcomes. During the crisis period, STD has a value of 30,6% and is slightly skewed to the right. LTD has a value of 24%. This adds up to the total debt amount which is equal to 54,4%. Compared to the post-crisis period, TD is 0,4 percentage points higher. The total debt amount during the post-crisis period consists of 29,6% STD and 24,5% LTD.

Looking at the control variables, efficiency is slightly higher during the financial crisis (1,078) compared to the post-crisis period (1,065). This result is surprising, as the efficiency is expected to be higher in times of economic growth due to increased sales. Profitability has a higher value of 0,3 percentage points in the post-crisis period compared to the crisis, implying that the earnings increased after the financial crisis. The variables size and tangibility remain constant.

this means that STD tends to have a slightly negative effect on the performance.

Long-term and total debt both are negatively related to return on assets, though not significantly. Regarding return on equity LTD and TD are significantly and slightly positive related to ROE. Thus, leverage positively affects the return of shareholders. Efficiency is both significantly positively correlated with ROA (0,131) and ROE (0,087). This implies that efficient firms tend to perform better due to the efficient employment of resources. Furthermore, size is positively correlated with ROA (0,271) as well as with ROE (0,203). Therefore, larger firms tend to outperform smaller firms for example due to greater diversification and economies of scale. Moreover, profitable firms also perform better since profitability has a significantly strong positive relationship with both ROA (0,682) and ROE (0,417). According to Margaritis and Psillaki (2010), profitable firms tend to be better managed and therefore can achieve higher returns with regards to assets and equity. Tangibility is significantly positively related to both performance measures ROA and ROE with 0.133 and 0.066 respectively. Thus, firms with fixed tangible assets perform slightly better than their counterparts. The independent variables are also correlated, however, as they measure the same concept this is not surprising. Size is significantly and strongly positively correlated with LTD (0,2609) and TD (0,2518). As mentioned by Tittman (1988), larger firms are

Table 3. Pearson correlation matrix

Variable	ROA	ROE	STD	LTD	TD	Size	Efficiency	Profitability	Tangibility
ROA	1.000								
ROE	0.627*	1.000							
STD	-0.076*	0.009	1.000						
LTD	-0.005	0.074*	-0.071*	1.000					
TD	-0.043*	0.062*	0.657*	0.683*	1.000				
Size	0.271*	0.203*	0.046*	0.261*	0.252*	1.000			
Efficiency	0.131*	0.087*	0.445*	-0.095*	0.245*	-0.057*	1.000		
Profitability	0.682*	0.417*	-0.133*	-0.029	-0.110*	0.298*	0.181*	1.000	
Tangibility	0.113*	0.066*	-0.171*	0.433*	0.218*	0.231*	-0.080*	0.126*	1.000

All values with an asterisk (*) are at 5% significant. All variables as defined in table 1.

6.1.1 Pearson Correlation Matrix

The Pearson correlation matrix is displayed in table 3. The matrix is used to identify the strength and significance among the variables in the model. Since the Pearson correlation matrix only shows the bivariate coefficients, a linear relationship is displayed (Huizignh, 2007). Therefore, possible non-linear relationships have values close to zero if a strong correlation between two variables exists. The dependent variables ROA and ROE are significantly correlated with each other (0,627). This is due to the fact, that both performance measures are accounting measures and tend to measure the same thing. Short-term debt correlates significantly negative with ROA (-0,076), more diversified and less at risk of bankruptcy risk, therefore relying more on leverage than smaller firms. Profitability has a significantly negative relationship with all three leverages measures. Since profitable firms perform better they are less dependent on external finance. Thus, investments can be financed internally following the argumentation of the pecking-order as explained in section 1. (Myers and Majluf, 1984). Size is significantly negatively related to efficiency (-0,0573), as larger firms have more people involved in the day-to-day operations which can make operations inefficient. Tangibility has a strong positive significant relationship with LTD (0.433) and TD (0.218). Since fixed tangible assets can be used as collaterals for debt, the positive relationship is not surprising.

Table 4. Results of the fixed effect regression model

Panel A. Results for the full sample

	Model 1a			Model 1b			Model 2a			Model 2b		
Dep. Var	ROA	ROA	ROA	ROE	ROE	ROE	ROA	ROA	ROA	ROE	ROE	ROE
Indep. Var.	STD	LTD	TD	STD	LTD	TD	STD2	LTD2	TD2	STD2	LTD2	TD2
	0.081**	0.113***	0.146***	0.139*	0.449***	0.528***	0.300***	0.241**	0.249***	1.144***	0.723**	1.210***
	(3.27)	(4.89)	(7.12)	(1.98)	(6.83)	(9.05)	(3.74)	(2.72)	(4.63)	(5.00)	(2.87)	(7.95)
STD	-	-	-	-	-	-	-0.163*	-	-	-0.791***	-	-
	-	-	-	-	-	-	(-2.34)	-	-	(-3.98)	-	-
LTD	-	-	-	-	-	-	-	-0.045	-	-	-0.024	-
	-	-	-	-	-	-	-	(-0.72)	-	-	(-0.13)	-
TD	-	-	-	-	-	-	-	-	-0.142*	-	-	-0.869***
	-	-	-	-	-	-	-	-	(-2.16)	-	-	(-4.70)
Control Var.												
Size	-0.036***	-0.040***	-0.036***	-0.093***	-0.010***	-0.090***	-0.034***	-0.040***	-0.030***	-0.084***	-0.094***	-0.056**
	(-5.77)	(-6.43)	(-5.78)	(-5.18)	(-5.65)	(-4.83)	(-5.36)	(-6.10)	(-4.73)	(-4.65)	(-5.31)	(-3.15)
Efficiency	-0.016	-0.008	-0.019*	-0.026	-0.009	-0.048*	-0.015	-0.007	-0.017*	-0.025	-0.006	-0.038
	(-1.93)	(-1.04)	(-2.35)	(-1.13)	(-0.42)	(-2.11)	(-1.88)	(-0.89)	(-2.11)	(-1.07)	(-0.26)	(-1.71)
Profitability	0.362***	0.348***	0.381***	0.455***	0.436***	0.555***	0.368***	0.346***	0.388***	0.480***	0.429***	0.587***
	(15.08)	(14.83)	(15.97)	(6.63)	(6.53)	(8.17)	(15.35)	(14.74)	(16.28)	(7.01)	(6.42)	(8.73)
Tangibility	-0.017	-0.060	-0.064	0.018	-0.141	-0.142	-0.012	-0.060	-0.053	0.037	-0.144	-0.089
	(-0.47)	(-1.64)	(-1.77)	(0.18)	(-1.37)	(-1.39)	(-0.33)	(-1.66)	(-1.47)	(0.36)	(-1.39)	(-0.88)
Constant	0.425***	0.466***	0.376***	1.115***	1.139***	0.824***	0.431***	0.459***	0.369***	1.137***	1.118***	0.789***
	(5.26)	(5.93)	(4.73)	(4.83)	(5.10)	(3.64)	(5.34)	(5.84)	(4.65)	(4.94)	(5.01)	(3.53)
#Obs	3372	3372	3372	3372	3372	3372	3372	3372	3372	3372	3372	3372
R-squared	0.080	0.084	0.092	0.023	0.037	0.049	0.084	0.086	0.099	0.031	0.040	0.069
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B. Results for linear relationship

	Financial crisis period						Post-crisis period					
	Model 3a			Model 3b			Model 3a			Model 3b		
Dep. Vari.	ROA	ROA	ROA	ROE	ROE	ROE	ROA	ROA	ROA	ROE	ROE	ROE
Indep. Var.	STD	LTD	TD	STD	LTD	TD	STD	LTD	TD	STD	LTD	TD
	-0.0930	0.248*	0.126	0.0883	1.081***	1.029***	0.183***	0.143***	0.235***	0.167*	0.641***	0.736***
	(-0.89)	(2.40)	(1.22)	(0.30)	(3.74)	(3.61)	(6.55)	(5.49)	(10.19)	(2.03)	(8.45)	(10.93)
Control Var.												
Size	-0.219***	-0.235***	-0.223***	-0.552***	-0.623***	-0.589***	-0.040***	-0.046***	-0.040***	-0.071**	-0.077***	-0.058**
	(-5.44)	(-5.79)	(-5.52)	(-4.85)	(-5.51)	(-5.25)	(-5.37)	(-6.26)	(-5.51)	(-3.23)	(-3.58)	(-2.71)
Efficiency	-0.0604*	-0.0598*	-0.0667*	-0.0873	-0.0717	-0.117	-0.013	0.002	-0.014	-0.016	0.008	-0.045
	(-2.32)	(-2.32)	(-2.56)	(-1.18)	(-1.00)	(-1.61)	(-1.40)	(0.21)	(-1.47)	(-0.58)	(0.28)	(-1.67)
Profitability	0.109	0.137	0.138	0.104	0.190	0.283	0.296***	0.260***	0.310***	0.369***	0.324***	0.486***
	(1.35)	(1.71)	(1.68)	(0.46)	(0.85)	(1.24)	(11.10)	(9.87)	(11.79)	(4.69)	(4.26)	(6.34)
Tangibility	-0.255	-0.315	-0.187	-0.185	-0.739	-0.133	-0.015	-0.076	-0.096*	-0.060	-0.300*	-0.295*
	(-1.34)	(-1.71)	(-1.04)	(-0.34)	(-1.44)	(-0.27)	(-0.31)	(-1.56)	(-2.02)	(-0.43)	(-2.13)	(-2.13)
Constant	2.768***	2.881***	2.711***	6.748***	7.473***	6.677***	0.440***	0.535***	0.389***	0.851**	0.839***	0.418
	(5.52)	(5.77)	(5.44)	(4.76)	(5.36)	(4.83)	(4.62)	(5.69)	(4.14)	(3.02)	(3.08)	(1.53)
#Obs	687	687	687	687	687	687	2685	2685	2685	2685	2685	2685
R-squared	0.086	0.099	0.088	0.067	0.104	0.102	0.000	0.003	0.000	0.008	0.005	0.001
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B. Results for non-linear relationship

	Financial crisis period						Post-crisis period					
	Model 4a			Model 4b			Model 4a			Model 4b		
Dep. Var.	ROA	ROA	ROA	ROE	ROE	ROE	ROA	ROA	ROA	ROE	ROE	ROE
Indep.Var	STD2	LTD2	TD2	STD2	LTD2	TD2	STD2	LTD2	TD2	STD2	LTD2	TD2
	0.223	-0.215	0.172	0.735	0.00616	1.452	0.220*	0.219*	0.257***	0.843**	1.162***	1.144***
	(0.73)	(-0.56)	(0.63)	(0.85)	(0.01)	(1.93)	(2.41)	(2.17)	(4.19)	(3.13)	(3.98)	(6.42)
STD	-0.262	-	-	-0.471	-	-	0.001	-	-	-0.530*	-	-
	(-1.03)	-	-	(-0.65)	-	-	(0.01)	-	-	(-2.23)	-	-
LTD	-	0.387	-	-	1.077	-	-	0.001	-	-	-0.118	-
	-	(1.44)	-	-	(1.43)	-	-	(0.01)	-	-	(-0.58)	-
TD	-	-	-0.0681	-	-	-0.609	-	-	-0.067	-	-	-0.609**
	-	-	(-0.21)	-	-	(-0.68)	-	-	(-0.89)	-	-	(-2.77)
Control Var.												
Size	-0.215***	-0.236***	-0.217***	-0.539***	-0.623***	-0.537***	-0.038***	-0.045***	-0.033***	'-0.064**	-0.069**	-0.026
	(-5.28)	(-5.81)	(-5.21)	(-4.69)	(-5.49)	(-4.67)	(-5.10)	(-6.03)	(-4.42)	(-2.90)	(-3.19)	(-1.19)
Efficiency	-0.0566*	-0.0622*	-0.0646*	-0.0750	-0.0717	-0.0983	-0.013	0.004	-0.011	-0.017	0.0156	-0.032
	(-2.13)	(-2.38)	(-2.45)	(-1.00)	(-0.98)	(-1.35)	(-1.42)	(0.38)	(-1.17)	(-0.59)	(0.58)	(-1.21)
Profitability	0.111	0.136	0.140	0.111	0.190	0.292	0.303***	0.258***	0.317***	0.392***	0.315***	0.518***
	(1.37)	(1.69)	(1.69)	(0.48)	(0.85)	(1.28)	(11.29)	(9.81)	(12.09)	(4.97)	(4.14)	(6.81)
Tangibility	-0.241	-0.339	-0.157	-0.138	-0.739	0.115	-0.008	-0.077	-0.085	-0.036	-0.310*	-0.245
	(-1.26)	(-1.79)	(-0.85)	(-0.26)	(-1.39)	(0.22)	(-0.17)	(-1.59)	(-1.79)	(-0.26)	(-2.21)	(-1.78)
Constant	2.737***	2.892***	2.673***	6.645***	7.473***	6.360***	0.445***	0.530***	0.371***	0.866**	0.814**	0.339
	(5.44)	(5.78)	(5.32)	(4.67)	(5.35)	(4.58)	(4.67)	(5.64)	(3.96)	(3.08)	(3.00)	(1.25)
#Obs	687	687	687	687	687	687	2685	2685	2685	2685	2685	2685
R-squared	0.087	0.100	0.089	0.069	0.104	0.112	0.000	0.003	0.000	0.006	0.004	0.013
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

t-statistics in parenthesis. *,**,*** significant at 10%, 5% and 1% respectively. Dep. Var., Indep. Var., Control Var. and #Obs are abbreviations for Dependent variable, Independent variable , Control Variable and Observations. FE stands for fixed effect model. All variables as defined in table 1.

6.2 Regression results

In order to give answers to the research question, multiple fixed effect regressions have been conducted. The findings are reported in table 4. For model 1a the independent variables explain around 8 – 10% of the variance in leverage. For Model 1b, it is less with R-square values of 2-5%. All the leverage measures across both performance measures are highly significant and positive, thus aligning with the assumptions made by the trade-off theory and the agency-cost theory that leverage and performance have a positive relationship. The leverage coefficients for ROE are larger than for ROA, indicating that more debt improves the return for shareholders. This is not surprising as the return from investment financed by debt increases the ROE. Based on these findings hypothesis H1a is confirmed. The R-square values for model 3a and b for the crisis period vary around 10%. The results for the crisis period contradict the predictions made in section 3. For ROA only LTD shows a significant result, however with a positive sign indicating a positive relationship of leverage with performance. The same goes for ROE as LTD and TD show highly significant positive values. This is surprising as leverage is expected to be negatively associated with performance during the crisis, based on loan supply shocks and increasing interest rates. However, long-term debt with a maturity longer than the financial crisis can positively contribute to performance since no expensive debt has to be issued during the crisis. Again, the relationship between leverage and return of equity is stronger than for return on assets. However, H1b is rejected since the sign of the relationship is positive.

For the post-crisis period, the R-squares for Model 3a and b are quite low with values close to 0%. Looking at the results for the post-crisis period, all leverages across both performance measures are highly significant and positive, supporting the assumptions that leverage and performance have a positive relationship in the post-crisis period. As previously explained, low-interest rates provide an inexpensive financing source with debt. Therefore, hypothesis H2c is confirmed.

Since the literature assumes that leverage has an inverted u-shaped relationship with performance, all leverages are squared in order to account for that specific effect (Margaritis & Psillakki, 2010). As mentioned in section 3, an inverse u-shaped relationship exists, if $a_2<0$. For model 2 all leverage values are significant and positive. Thus, the values do not meet the requirement for an inverse u-shaped relationship, but gives evidence for a positive u-shaped relationship. Therefore, hypothesis H2a is rejected.

Looking at the financial crisis, the assumption that no inverted u-shaped relationship exists is confirmed as STD2, LT2 and TD2 are not significant for ROA and ROE. No general interpretation can be made due to the insignificance of the findings.

For the post-crisis period, again all leverage values are significant but are positively related to both ROA and ROE, thus do not meet the requirement $a_2 <0$. Therefore, hypothesis 2c is rejected.

It is noteworthy that in every regression outcome, size has always a significantly negative coefficient. This implies that larger firms tend to perform worse than their smaller counterparts. This is contradicting to the literature, since larger firms are better able to diversify, and therefore should withstand crisis better. However, larger firms size might have inefficiencies due to bureaucracy. The results also show that performance increases with profitability for the whole panel and post-crisis period. However, for the financial crisis, no significant findings are found.

Looking at the values for R-squared, it has to be mentioned that the explanative power of all models is quite low, indicating that important factors that explain firms' financial performance were not included in the model.

6.2.1 Comparison with previous studies

The findings for Model 1a and 1b and Model 3b and 3a for the post-crisis period are in line with Berger and Bonaccorsi di Patti (2006), who also found evidence that leverage has a positive effect on performance. Moreover, Ahmad et al.'s (2012) study showed a positive relationship between STD and ROE. However, LTD had a negative impact on return on equity. Gill et al. (2011), also found a positive relationship between short-term debt and performance. Therefore, my findings are consistent with the existing literature regarding the positive relationship of leverage with performance during times of economic stability.

Comparing the leverage effect on performance during the financial crisis with the previous studies, my findings contradict to the one of Lins et al, (2017) who found a negative relationship between STD and LTD on performance during the financial crisis. Additionally, Abor (2005) found evidence that LTD had a negative effect on performance which is not in line with my findings. However, his findings show a positive effect of STD on ROE with the argumentation that during crisis short-term debt is relatively cheap and therefore preferred over long-term debt.

My findings for the models 2a, 2b, and 4a and 4b contradict to the ones of Margaritis and Psillaki (2010), as they found evidence for an inverted u-shaped relationship of leverage with regards to firm performance.

Since I am not aware of any study that has investigated the inverted u-shaped relationship in times of crisis, my findings cannot be compared with previous work.

6.3 Robustness Check

For the robustness check, three different performance measures are used. The findings are listed in table 5 and 6 (see Appendix). ROA is calculated using EBIT divided by total assets and ROE is calculated using EBIT divided by total equity, moreover, Tobin's q is used as an additional variable.

For the whole panel STD, LTD, and TD are highly significant and positively related to all three performance measures, thus supporting my previous findings that leverage and performance have a positive relationship. For the financial crisis STD is not significant for ROA, ROE and Tobin's q, however, LTD and TD are highly significant and positive for return on assets and return on equity. Again this is in line with the previous findings. Looking at the post-crisis period all three leverages are highly significant and positive for ROA, ROE and Tobin's q which supports the confirmation of hypothesis 1c

Regarding the assumption of an inverted u-shaped relationship of leverage with performance for the whole panel the findings for ROA are not significant, thus do not give any further evidence. For ROE, STD2 and TD2 are significant but positive, which is in line with my previous findings. However, LTD2 has a negative significant relationship with Tobin's q which implies that an inverted u-shaped relation exists. Thus this finding contradicts my results. For the financial crisis, the values for ROA and ROE are not significant, whereby STD2 and TD2 have a significant positive relationship. Again this is in line with my findings. During the post-crisis period, TD2 is significant for ROA and ROE, however with a positive sign. As

for the whole panel, LTD2 is negative and significant which again gives evidence for an inverted u-shaped relationship. One reason for evidence of an inverted u-shaped relationship when using Tobin's q could be the use of market value measures. Overall, my findings for the linear relationship for the whole panel, the crisis period, and post-crisis period are robust. Regarding the inverted u-shaped relationship, the positive values for leverages for ROA and ROE support my findings, only for the market based measure Tobins' q, the negative coefficients challenge my previous findings.

7. CONCLUSION

This paper investigated the impact of capital structure on firm performance during the financial crisis and post-crisis period using a fixed-effect model. The findings confirmed that leverage has a positive effect on performance for the whole period and during the post-crisis period. Surprisingly, the results show a positive relationship between leverage and performance during the financial crisis which contradicts the assumption. The financial crisis should have a negative impact on the relationship due to loan supply shocks, increasing interest rates, and weaker economic output. However, as mentioned LTD with a long maturity may improve firm performance, if the maturity exceeds the time period of the financial crisis. The inverted u-shaped relationship of leverages is not confirmed during the financial crisis and post-crisis period. Rather, the results suggest that there is a normal u-shaped relationship which needs to be further investigated. To give an answer to the research question: "*To what extent does the capital structure of listed firms in Germany influence the performance during the financial crisis starting in 2008?"*, the financial crisis does not negatively affect the performance of German firms with regards to its capital structure.

This paper contributes to the body of research on the capital structure with regards to firm financial performance. It describes the effect of the financial crisis and allows implication towards understanding the consequences of leverages within the capital structure as a source of finance during times of economic instability. Overall, using debt within the capital structure during times of crises does not lead to weaker financial performance. This finding can help managers when making decision with regards to their capital structure of the firm.

7.1 Limitations and future research

The data from Orbis does only provide financial information for the last 10 years. Therefore, the year 2007 is missing which restricts the calculation of values for the year 2008. Therefore, the period which is used to address the impact of the financial crisis does not quite correspond with the actual financial crisis. Moreover, only book values are used to calculate leverage. However, calculations based on market values provide better insight as they are more future-oriented and more accurate in terms of actual value of the firm.

Future studies should use databases which provide data for the whole period of the financial crisis. This would result in more valid outcomes. Moreover, different variables should be included which better explain firm performance such as maturity of debt. The common capital structure theories are very much static; hence it is not possible to investigate the adjustments made over time. However, it would be interesting to see how the adjustments differ between times of economic instability such as crisis and normal economic times.

8. ACKNOWLEDGEMENT

I would like to thank my family and friends for their continuous support. Also I would like to thank Dr. Henry van Beusichem, as well as Dr. Siraz Zubair for their advice and guidance throughout this thesis.

9. REFERENCES

Abor, J. (2005). The Effect of Capital Structure on Profitability: An Empirical Analysis of Listed Firms in Ghana. *The Journal of Risk Finance, 6*(5), 438-445.

Ahmad, Z., Abdullah, N. M., & Roslan, S. (2012). Capital Structure Effect on Firms Performance: Focusing on Consumers and Industrials Sectors on Malaysian Firms. *International Review of Business Research Papers, 8*(5), 137-155.

Allision, P. D. (n.d.). Fixed Effects Regression Methods in SAS. *Statistics and Data Analysis*.

Almeida, H., Campello, M., Laranjeira, B., & Weisbenner, S. (2009). Corporate Debt Maturity and The Real Effects of The 2007 Credit Crisis. *NBER Working Paper Series, 14990*.

Andersen, C. (2009, January 22). *International Monetary Fund.* Retrieved April 2018, from IMF Survey: Germany Faces Extended Downturn Despite Stimulus: https://www.imf.org/en/News/Articles/2015/09/28/04/53/socar012209a

Andersen, C. 2. (2009). *IMF Survey: Germany Faces Extended Downturn Despite Stimulus*. Retrieved April 18, 2018, from International Monetary Fund: https://www.imf.org/en/News/Articles/2015/09/28/04/53/socar012209a

Berger, A. N., & Bonaccorsi di Patti, E. (2006). Capital Structure and Firm Performance: A new approach to testing agency theory and an application to the banking industry. *Journal of Banking & Finance, 30*, 1065- 1102.

Brav, O. (2009). Access to capital, capital structure, and the funding of the firm. 263-308. *The Journal of Finance, 64*(1), 263-308.

Busch, U., Scharnagl, M., & Scheithauer, J. (2010). Loan Supply in Germany During The Financial Crisis. *Deutsche Bundesbank Eurosystem, 5*.

Campello, M., Graham, J. R., & Harvey, C. R. (2010). The Real Effects of Financial Constraints: Evidence from a Financial Crisis. *Journal of Financial Economics, 97*, 470-487.

Campello, M., Graham, J. R., & Harvey, C. R. (n.d.). The Real Effect of Financial Constraints: Evidence from a Financial Crisis.

Claessens, S., Djankov, S., Fan, J. P., & Lang, L. H. (2002). Disentangling the Incentive and Entrenchment Effects of Large Shareholdings. *The Journal of Finance, 57*(6).

Danielson, M. G., & Press, E. (2003). Accounting Returns Revisited: Evidence of their Usefulness in Estimating Economic Returns. *Review of Accounting Studies, 8*(4), 493-530.

DeAngelo , H., & Masulis , R. W. (1980). Optimal Capital Structure Under Corporate and Personal Taxation. *Journal of Financial Economics , 8*, 3-29.

Duchin, R., Ozbas, O., & Sensoy, B. A. (2010). Costly External Finance, Corporate Investment, and the Subprime Mortgage Credit Crisis. *Journal of Financial Economics, 97*, 418-435.

Eichengreen, B., & Rose, A. K. (1998). Staying afloat when the wind shifts: External factors and emerging market banking crises. *Working Paper, 6370*.

Gleason, K. C., Mathur, L. K., & Mathur, I. (2000). The Interrelationship between Culture, Capital Structure, and Performance: Evidence from European Retailers. *Journal of Business Research, 50*, 185-191.

Greene, W. (1991). Econometric Analysis. *Maxwell Macmillian, 16*(4).

Harvey, C. R. (2018). *The Free Financial Dictionary by Farlex*. Retrieved May 19, 2018, from Financial Dictionary: https://financial-dictionary.thefreedictionary.com/Publicly+listed+company

Hiller, D., Clacher, I., Ross, S., Westerfield, R., & Jordan, B. (n.d.). *Fundamentals of Corporate Finance* (Vol. 2). McGraw-Hill Education.

Himmelberg, C. P., Hubbard, G. R., & Palia, D. (1999). Understanding the Determinants of Managerial Ownership and the Link Between Ownership and Performance. *Journal of Financial Economics, 53*, 353-384.

Huizingh, E. (2007). Applied Statistics with SPSS. *Sage Publication*, 290-318.

Jensen, M. C. (1986). Agency Cost of Free Cash Flow, Corporate Finance, and Takeovers. *The American Economic Review, 76*(2), 323-329.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the Firm: Managerial Behavior, Agency Costs, and Ownership Structure. *Journal of Financial Economics, 3*, 303-365.

Johnny, J. (2008). The Relative Influence of Competitive Intensity and Business Strategy on The Relationship between Financial Leverage and Performance. *The British Accounting Review, 40*, 71-86.

Kaminsky, G. L., & Reinhart, C. (1999). The twin crises: The causes of banking and balance-of-payments problems. *American Economic Review, 89*(3), 473-500.

Keats, B. W. (1988). The Vertical Construct Validity of Business Economic Performance Measures. *Journal of Applied Behavioral Science, 24*, 151-160.

Lins, K. V., Servaes, H., & Tamayo, A. (2017, August). Social Capital, Trust, and Firm Performance: The Value of Corporate Social Responsibility during the Financial Crisis. *The Journal of Finance, 72*(4).

Majumdar, S. K., & Chhibber, P. (1999). Capital structure and performance: Evidence from a transition economy on an aspect of corporate governance. *Public Choice, 98*(3), 287-305.

Margaritis, D., & Psilakki, M. (2010). Capital Structure, Equity Ownership, and Firm Performance. *Journal of Banking & Finance, 34*, 621-232.

Maury, B. (2006). Family Ownership and Firm Performance: Empirical Evidence from Western European Corporations. *Journal of Corporate Finance, 12*, 321-341.

Modigliani, F., & Miller, M. H. (1958). The Cost of Capital, Corporation Finance and The Theory of Investment. *The American Economic Review, 48*(3), 261-297.

Myers, S. C. (1977). Determinants of Corporate Borrowing. *Journal of Financial Economics, 5*, 147-175.

Myers, S. C. (2001). Capital Structure. *Journal of Economic Perspective, 15*(2), 81-102.

Myers, S. C. (1984). The Capital Structure Puzzle. *The Journal of Finance, 39*(3), 575-592.

Pagano, M., Panetta, F., & Zingales, L. (1998). Why Do Companies Go Public? An Empirical Analysis. *The Journal of Finance, 53*(1).

Richard, P. J., Devinney, T. M., Yip, G. S., & Johnson, G. (2009). Measuring Organisational Performance: Towards Methodological Best Practice. *Journal of Management, 35*(3), 718-804.

Salim, M., & Yadav, R. (2012). Capital Structure and Firm Performance: Evidence from Malaysian Listed Companies. *Procedia - Social and Behavioral Sciences, 65*, 156-166.

Toy, N., Stonehill, A., Remmers, L., Wright, R., & Beekhuisen, T. (1974). A Comparative International Study of Growth, Profitability, and Risk as Determinants of Corporate Debt Ratios in the Manufacturing Sector. *Journal of Financial and Quantitative Analysis, 9*(5), 875-886.

Vatavu, S. (2015). The Impact of Capital Structure on Financial Performance in Romanian Listed Companies. *Procedia Economics and Finance, 32*, 1314-1322.

Vithessonthi, C., & Tongurai, J. (2015). The Effect of Leverage on Performance: Domestically-oriented versus Internationally-oriented Firms. *Research in International Business & Finance, 34*, 265-280.

Woolridge, J. M. (n.d.). Introductory Econometrics - A modern approach. *South-Western Cengage Learning*.

10. APPENDIX

10.1 Regression results for the Robustness check (ROA & ROE)

Table 5. Results of the fixed effect robustness check

Panel A. Results for the full sample

	Model 1a			Model 1b			Model 2a			Model 2b		
Dep. Var	ROA	ROA	ROA	ROE	ROE	ROE	ROA	ROA	ROA	ROE	ROE	ROE
Indep. Var.	STD	LTD	TD	STD	LTD	TD	STD2	LTD2	TD2	STD2	LTD2	TD2
	0.085***	0.104***	0.149***	0.236***	0.465***	0.573***	-0.007	0.081	0.054	0.553**	0.325	0.701***
	(4.82)	(6.28)	(10.18)	(4.22)	(8.92)	(12.46)	(-0.13)	(1.27)	(1.41)	(3.03)	(1.62)	(5.82)
STD												
							0.091			-0.214		
LTD							(1.82)			(-1.35)		
								0.051			0.252	
TD								(1.14)			(1.79)	
									0.086			-0.236
Control Var.									(1.84)			(-1.61)
Size	-0.018***	-0.022***	-0.018***	-0.063***	-0.074***	-0.058***	-0.018***	-0.021***	-0.016***	-0.059***	-0.071***	-0.041***
	(-3.96)	(-4.86)	(-3.97)	(-4.43)	(-5.28)	(-4.19)	(-3.96)	(-4.70)	(-3.60)	(-4.10)	(-5.07)	(-2.93)
Efficiency	-0.006	0.001	-0.009	0.016	0.039*	-0.002	-0.006	0.002	-0.009	0.016	0.041*	0.004
	(-1.07)	(0.25)	(-1.60)	(0.84)	(2.21)	(-0.10)	(-1.07)	(0.32)	(-1.52)	(0.89)	(2.30)	(0.20)
Profitability	0.361***	0.347***	0.380***	0.399***	0.362***	0.491***	0.361***	0.346***	0.382***	0.411***	0.358***	0.510***
	(21.02)	(20.62)	(22.39)	(7.30)	(6.82)	(9.18)	(20.95)	(20.57)	(22.44)	(7.52)	(6.76)	(9.57)
Tangibility	0.024	-0.016	-0.024	0.138	-0.032	-0.040	0.023	-0.016	-0.021	0.148	-0.033	-0.009
	(0.93)	(-0.63)	(-0.95)	(1.71)	(-0.39)	(-0.50)	(0.93)	(-0.64)	(-0.85)	(1.82)	(-0.41)	(-0.12)
Constant	0.214***	0.259***	0.167**	0.738***	0.833***	0.487**	0.214***	0.257***	0.165**	0.749***	0.823***	0.467**
	(3.70)	(4.62)	(2.95)	(4.02)	(4.70)	(2.73)	(3.69)	(4.57)	(2.92)	(4.08)	(4.64)	(2.64)
#Obs	3371	3371	3371	3372	3372	3372	3371	3371	3371	3372	3372	3372
R-squared	0.138	0.142	0.161	0.033	0.053	0.077	0.138	0.143	0.161	0.036	0.054	0.087
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B. Results for linear relationship

	Financial crisis period						Post-crisis period					
	Model 3a			Model 3b			Model 3a			Model 3b		
Dep. Vari.	ROA	ROA	ROA	ROE	ROE	ROE	ROA	ROA	ROA	ROE	ROE	ROE
Indep. Var.	STD	LTD	TD	STD	LTD	TD	STD	LTD	TD	STD	LTD	TD
	0.068	0.235***	0.279***	0.359	0.788***	0.989***	0.141***	0.107***	0.179***	0.179**	0.542***	0.627***
	(1.12)	(3.95)	(4.82)	(1.79)	(4.00)	(5.19)	(6.78)	(5.48)	(10.37)	(2.72)	(8.94)	(11.68)
Control Var.												
Size	-0.148***	-0.164***	-0.159***	-0.319***	-0.373***	-0.356***	-0.017**	-0.024***	-0.019**	-0.042*	-0.048**	-0.032
	(-6.34)	(-7.06)	(-6.97)	(-4.13)	(-4.85)	(-4.75)	(-3.36)	(-4.27)	(-3.48)	(-2.39)	(-2.81)	(-1.88)
Efficiency	-0.041**	-0.036*	-0.048**	-0.036	-0.017	-0.057	-0.004	0.008	-0.004	0.017	0.039	-0.005
	(-2.72)	(-2.47)	(-3.27)	(-0.73)	(-0.36)	(-1.19)	(-0.56)	(1.12)	(-0.58)	(0.75)	(1.82)	(-0.25)
Profitability	-0.138**	-0.122**	-0.092*	-0.378*	-0.337*	-0.227	0.327***	0.300***	0.336***	0.322***	0.277***	0.414***
	(-2.94)	(-2.66)	(-1.99)	(-2.44)	(-2.22)	(-1.48)	(16.38)	(15.18)	(17.15)	(5.10)	(4.54)	(6.78)
Tangibility	-0.220*	-0.370***	-0.233*	-0.244	-0.825*	-0.360	-0.016	-0.062	-0.078*	0.134	-0.071	-0.068
	(-2.00)	(-3.50)	(-2.31)	(-0.67)	(-2.36)	(-1.08)	(-0.45)	(-1.71)	(-2.20)	(1.19)	(-0.63)	(-0.61)
Constant	1.894***	2.075***	1.896***	3.929***	4.595***	3.989***	0.213**	0.290***	0.175*	0.497*	0.513*	0.154
	(6.51)	(7.25)	(6.75)	(4.09)	(4.85)	(4.31)	(3.00)	(4.09)	(2.50)	(2.21)	(2.36)	(0.70)
#Obs	687	687	687	687	687	687	2684	2684	2684	2684	2684	2684
R-squared	0.164	0.198	0.215	0.090	0.123	0.149	0.1750	0.0943	0.1607	0.002	0.005	0.057
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Panel B. Results for non-linear relationship

	Financial crisis period						Post-crisis period					
	Model 4a			Model 4b			Model 4a			Model 4b		
Dep. Var.	ROA	ROA	ROA	ROE	ROE	ROE	ROA	ROA	ROA	ROE	ROE	ROE
Indep.Var	STD2	LTD2	TD2	STD2	LTD2	TD2	STD2	LTD2	TD2	STD2	LTD2	TD2
	-0.045	-0.386	-0.041	0.388	0.094	0.444	0.029	0.023	0.107*	0.181	0.126	0.395*
	(-0.26)	(-1.75)	(-0.27)	(0.66)	(0.13)	(0.88)	(0.42)	(0.31)	(2.33)	(0.84)	(0.54)	(2.76)
STD	0.103			0.064			0.117			0.029		
	(0.69)			(0.13)			(1.95)			(0.15)		
LTD		0.485**			0.726			0.092			0.460*	
		(3.15)			(1.42)			(1.73)			(2.79)	
TD			0.325			0.488			0.053			0.162
			(1.78)			(0.81)			(0.93)			(0.92)
Control Var.												
Size	-0.149***	-0.167***	-0.160***	-0.312***	-0.372***	-0.340***	-0.018**	-0.023***	-0.016**	-0.040*	-0.047*	-0.021
	(-6.31)	(-7.18)	(-6.83)	(-4.00)	(-4.82)	(-4.41)	(-3.30)	(-4.22)	(-2.85)	(-2.29)	(-2.74)	(-1.20)
Efficiency	-0.042**	-0.040**	-0.048**	-0.030	-0.016	-0.051	-0.004	0.008	-0.003	0.017	0.040	-0.001
	(-2.72)	(-2.74)	(-3.27)	(-0.59)	(-0.33)	(-1.06)	(-0.56)	(1.14)	(-0.41)	(0.74)	(1.86)	(-0.05)
Profitability	-0.138**	-0.125**	-0.092*	-0.375*	-0.337*	-0.224	0.327***	0.298***	0.339***	0.327***	0.276***	0.425***
	(-2.94)	(-2.72)	(-2.00)	(-2.42)	(-2.21)	(-1.46)	(16.35)	(15.16)	(17.28)	(5.16)	(4.52)	(6.92)
Tangibility	-0.223*	-0.414***	-0.240*	-0.220	-0.815*	-0.284	-0.015	-0.062	-0.073*	0.139	-0.072	-0.050
	(-2.01)	(-3.83)	(-2.30)	(-0.60)	(-2.26)	(-0.83)	(-0.43)	(-1.71)	(-2.07)	(1.24)	(-0.64)	(-0.46)
Constant	1.901***	2.094***	1.905***	3.874***	4.590***	3.892***	0.214**	0.286***	0.168*	0.501*	0.510*	0.126
	(6.50)	(7.34)	(6.73)	(4.01)	(4.84)	(4.18)	(3.01)	(4.08)	(2.39)	(2.22)	(2.34)	(0.58)
#Obs	687	687	687	687	687	687	2684	2684	2684	2684	2684	2684
R-squared	0.164	0.205	0.215	0.091	0.123	0.151	0.177	0.094	0.186	0.002	0.005	0.073
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

t-statistics in parenthesis. *,**,*** significant at 10%, 5% and 1% respectively. Dep. Var., Indep. Var., Control Var. and #Obs are abbreviations for Dependent variable, Independent variable, Control Variable and Observations. FE stands for fixed effect model. All variables as defined in table 1.

10.2 Regression results for robustness check (Tobin's q)

Table 6. Resuts for fixed effect model robustness check Tobin's q

Panel B. Results for linear relationship									
	Full sample			Financial crisis period			Post-crisis period		
	Model 1			Model 3					
Dep. Var	Tobin'sQ	Tobin'sQ	Tobin'sQ	Tobin'sQ	Tobin'sQ	Tobin'sQ	Tobin'sQ	Tobin'sQ	Tobin'sQ
Indep. Var	STD	LTD	TD	STD	LTD	TD	STD	LTD	TD
	0.886***	0.373**	0.713***	-0.272	0.502	0.209	0.444***	0.519**	0.651***
	(6.25)	(2.79)	(5.98)	(-0.78)	(1.45)	(0.61)	(2.74)	(3.43)	(4.81)
Size	0.037	-0.000	0.019	-0.269*	-0.300*	-0.275*	0.267***	0.251***	0.268***
	(1.03)	(-0.01)	(0.53)	(-2.01)	(-2.22)	(-2.05)	(6.18)	(5.88)	(6.27)
Efficiency	0.220***	0.288***	0.240***	-0.111	-0.112	-0.125	0.351***	0.392***	0.346***
	(4.72)	(6.29)	(5.21)	(-1.28)	(-1.31)	(-1.44)	(6.37)	(7.25)	(6.37)
Profitability	0.543***	0.383**	0.547***	-0.115	-0.051	-0.057	0.831***	0.738***	0.880***
	(3.93)	(2.81)	(3.95)	(-0.43)	(-0.19)	(-0.21)	(5.36)	(4.85)	(5.71)
Tangibility	-0.039	-0.220	-0.299	-0.503	-0.572	-0.318	-0.157	-0.367	-0.379
	(-0.19)	(-1.04)	(-1.44)	(-0.80)	(-0.93)	(-0.53)	(-0.57)	(-1.31)	(-1.37)
Constant	0.709	1.312**	0.845	5.034**	5.224**	4.884**	-2.020***	-1.825**	-2.206***
	(1.52)	(2.88)	(1.83)	(3.03)	(3.14)	(2.95)	(-3.65)	(-3.36)	(-4.01)
#Obs	3372	3372	3372	687	687	687	2684	2684	2684
R-square	0.032	0.021	0.031	0.018	0.023	0.018	0.045	0.045	0.044
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Panel B. Results for non-linear relationship									
	Full sample			Financial crisis period			Post-crisis period		
	Model 2			Model 4					
Dep. Var	Tobin'sQ	Tobin'sQ	Tobin'sQ	Tobin'sQ	Tobin'sQ	Tobin'sQ	Tobin'sQ	Tobin'sQ	Tobin'sQ
Indep. Var	STD2	LTD2	TD2	STD2	LTD2	TD2	STD2	LTD2	TD2
	0.518	-1.432**	0.159	5.041***	-1.406	3.303***	0.281	-1.932**	0.519
	(1.12)	(-2.79)	(0.51)	(5.16)	(-1.10)	(3.73)	(0.53)	(-3.31)	(1.44)
STD	0.465			-4.105***			0.211		
	(1.16)			(-5.03)			(0.45)		
LTD		1.310***			1.412			1.782***	
		(3.62)			(1.57)			(4.35)	
TD			0.530			-3.518***			0.040
			(1.39)			(-3.34)			(0.09)
Size	0.041	-0.011	0.022	-0.177	-0.310*	-0.155	0.269***	0.238***	0.283***
	(1.15)	(-0.32)	(0.62)	(-1.36)	(-2.29)	(-1.15)	(6.20)	(5.55)	(6.43)
Efficiency	0.221***	0.281***	0.241***	-0.026	-0.128	-0.082	0.351***	0.378***	0.352***
	(4.74)	(6.13)	(5.22)	(-0.32)	(-1.47)	(-0.97)	(6.37)	(7.00)	(6.46)
Profitability	0.555***	0.397**	0.551***	-0.069	-0.059	-0.035	0.839***	0.754***	0.894***
	(4.01)	(2.91)	(3.97)	(-0.27)	(-0.22)	(-0.13)	(5.39)	(4.96)	(6.80)
Tangibility	-0.031	-0.215	-0.292	-0.181	-0.733	0.247	-0.149	-0.351	-0.356
	(-0.15)	(-1.02)	(-1.40)	(-0.30)	(-1.16)	(0.41)	(-0.54)	(-1.25)	(-1.28)
Constant	0.719	1.354**	0.841	4.329**	5.295**	4.162*	-2.015***	-1.782**	-2.242***
	(1.54)	(2.97)	(1.82)	(2.69)	(3.18)	(2.55)	(-3.64)	(-3.28)	(-4.07)
#Obs	3372	3372	3372	687	687	687	2684	2684	2684
R-square	0.032	0.024	0.031	0.091	0.026	0.057	0.045	0.054	0.042
FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

t-statistics in parenthesis. *,**,*** significant at 10%, 5%, 1% respectively. Dep. Var., Indep. Var., Control Var. and #Obs are abbreviations for dependent variable, independent variable, control variable and observations. FE stands for fixed effect model. All variables as defined in table 1.