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Ownership Structure and Firm Performance: An Analysis of Publicly Listed Firms in The Netherlands

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ABSTRACT

This study's main goal is to find an answer to the question what effect the ownership structure of Dutch publicly listed firms have on their performance. It was expected that there is a positive effect at first, but that this positive effect would become negative when ownership becomes too concentrated. This relationship was tested by calculating the ownership concentration levels for Dutch publicly listed firms by using two measures of ownership concentration: the share of capital held by the five largest shareholders and the share of capital held by the largest shareholder. Firm performance was measured by using three variables: the ROA and MBV ratios and Sales Growth. The effect of ownership identity on performance was also examined. The results of the regression analyses show that there is not a lot of statistically significant evidence available that supports the view that the ownership structures of firms have a large effect on firm performance. Statistically significant evidence is found, however, after adjusting the original models during the robustness checks.

Keywords
Ownership concentration, concentrated ownership, diffused ownership, ownership identity, firm performance, agency-theory.

5th IBA Bachelor Thesis Conference, July 2nd, 2015, Enschede, The Netherlands.

1. INTRODUCTION

The separation of ownership and control is a phenomenom that is at the heart of modern corporations. The individuals that are the owners of the firm are typically not the same as the individuals that manage it. According to the research of Berle and Means (1932), the interests of the individuals who own firms (the shareholders) need not be the same as the interests of the managers of the firm. This leads to divergent interests between these two groups. Maximizing the wealth of the shareholders could be the most important goal for the owners of the firm, while management prefers to act in their own best interests and pursue other goals that benefit them more. Jensen and Meckling (1976) proposed the phenomena called agency theory in their research, stating that small shareholders have less of an inventive to monitor the actions of management compared to large shareholders. This division of ownership and control is one of the aspects of a firm's ownership structure. A firm's ownership structure essentially explains the distribution of the firm's shares among different shareholders. The identity of these shareholders also plays a role.

The main goal of this study is to empirically investigate the relationship between the ownership structures of publicly listed firms in The Netherlands and their financial performance. It will be investigated whether firms with large shareholders perform better compared to firms with more diffuse ownership structures. A distinction between different types of shareholders can also be made (i.e. Governments, Financial Institutions and Families) and this paper will also investigate if certain types of shareholders perform better than other types. The research question of this study is:

What is the relationship between the ownership structures of publicly listed firms in The Netherlands and their performance?

The analysis will include observations of firms listed on the Dutch stock exchanges between 2011 and 2013. The financial performance of the firms is defined by using two measures: the Return-On-Assets (ROA) and Market-To-Book (MTB) values. The ownership structures of the firms will be analyzed by using three measures. First, the share of equity held by the largest shareholder will be documented. The second measure is similar to the first, except data on shareholdings by the five largest investors will be collected. And third, the identity of these shareholders will be investigated and documented, in order to be able to distinguish between different types of shareholders and see if there are performance differences between the groups of shareholders.

Research on the relationship between ownership structures and firm performance has been conducted by multiple studies. There are studies that focus on multiple countries and analyze the differences and similarities between these countries and there are studies that focus on only one country. There are a few studies available on this topic for The Netherlands, but not a lot and herein lies the academic contribution of this paper. Practical relevance can be found in this paper because firms in The Netherlands can assess their ownership structures and see whether their ownership structure is beneficial to their performance or not. Firms will be able to see if their ownership structure aligns with their corporate strategy. Therefore it will provide the shareholders and stakeholders of the firm an extra insight into the effectiveness of their ownership structure.

A review of the relevant literature on this topic and the hypotheses that will be derived from the literature will be discussed in the next section. The third section of this paper will explain the methodology and data used for this research. In the fourth part the results of the analysis will be discussed and the fifth part will be a summary of the results and its implications.

2. LITERATURE REVIEW

2.1 The separation of ownership and control

There is a branch of literature that states that large shareholders have a beneficial effect on the performance of the firm. In their paper, Berle and Means (1932) mention the separation of ownership and control in modern corporations. One result of this separation is that managers will not always act in the best interests of the shareholders who own the firm. The authors state that this is particularly common for firms who do not have large shareholders and thus a diffuse ownership structure. In a diffuse ownership structure, managers hold more power, which gives these managers the opportunity to pursue their own interests. The pursual of these interests of management could not necesseraly lead to the goal of owners, namely maximizing the wealth of the shareholders. According to Gedaljovic and Shapiro (1998) management can pursue two different types of goals. Firstly, managers can ignore the long-term performance objectives of the firm and follow a strong focus on attaining short-term goals, which lead to a maximization of non-salary income for management. And secondly, management can engage in empire-building activities, which leads to a focus on the growth of the firm. This growth, however, does not have to lead to an improvement in firm performance and is mostly done in order to improve the prestige of the management. This branch of literature states that a concentrated ownership structure with large shareholders is more beneficial to the performance of the firm. Large shareholders have more power to control the actions of management and ultimately align the interests of shareholders with those of management (Jensen and Meckling, 1976).

On the contrary, there is also a branch of literature that does not support the view that large shareholders have a beneficial effect on the firm. Large shareholders have more power compared to smaller shareholders. These large shareholders can abuse their power to expropriate private benefits of control at the expense of other shareholders (Fama and Jensen, year; Connelly et al. 2010; Barclay and Holderness, 1989). Ownership concentration is more concentrated in Continental Europe than it is in other parts of the world. Therefore, this abuse of power by large shareholders will be more prevalent in firms in this part of the world (Thomsen et al. 2006).

2.2 The influence of concentrated ownership

The ownership structure of firms is one important aspect of firms that influences the extent to which the interests between shareholders and managers are the same (Daily, Dalton, & Cannella Jr., 2003). The influence of concentrated ownership structures is documented by the research of Shleifer and Vishny (1986) and Claessens et al. (2002), stating that a concentrated ownership structure has a positive effect on the performance of the firm, because of the existence of large shareholders who have an incentive to monitor the performance of management. This incentive is created by the investment of a large amount of funds in to the firm by these shareholders. Consequently, the large shareholder has something to gain from monitoring management's performance and aligning their own interests with those of management. As large shareholders invest more in to the firm, they become more interested in supporting wealth-creating activities (Mikkelson and Ruback, 1985) A dispersed

ownership structure does not lead to this incentive for management to control management because of the absence of large shareholders who are considerably financially invested in the firm. Forcing a change in management would provide the shareholders of firms with dispersed ownership structures some gains, but these gains do not outweigh the costs of forcing the change needed. The incentive to monitor management is also absent, as these smaller shareholders do not have a large enough stake in the firm to absorb the costs of monitoring the management (Grossman & Heart, 1980). Because large shareholders have invested a considerable amount of funds in to the firm, they have an incentive to monitor the performance of management and to overcome the principal-agent problem caused by the separation of ownership and control. So based on the literature there is a positive effect to be observed from large shareholders but there is also a negative effect of large shareholders. The positive effect is that large shareholders have more power to monitor the actions of management, which should lead to an alignment of interests between the management of the firm and its shareholders. But there is also a negative effect, because when large shareholders become too powerful they have the opportunity to expropriate minority shareholders.

A difference in ownership concentration can also be observed around the world. In the United States we can observe more dispersed ownership levels of firms, while ownership tends to take more concentrated levels in Continental Europe (Thomsen et al. 2006). This finding is supported by the work of Shleifer and Vishny, who state the following about concentration levels: "In the United States, large share holdings and especially majority ownership, are relatively uncommon." As well as: "In the rest of the world, large share holdings in some form are the norm." According to the work of La Porta et al. (1999) and Barca and Brecht (2001), ownership concentration tends to be more concentrated in countries situated in Continental Europe. The country of focus in this study is The Netherlands, so according to these findings we should expect a concentrated ownership structure to be the dominant form of ownership in Dutch firms. The research of Donker et al. (2009), however, states that ownership structures of Dutch firms are more similar to those of their counterparts in the United Kingdom and the United States, where diffuse ownership is more prevalent. This provides an interesting situation, as The Netherlands turns out to be different from the other countries situated in Continental Europe.

Previous studies on the relationship between ownership structures and performance state mixed outcomes. Demsetz and Lehn (1985) noted that they did not find a relationship between firm performance and ownership structures, which was confirmed by a later study on the subject. In their study, Demsetz and Villalonga (2001) conclude that they were also unable to find evidence that changes in the ownership structures of firms lead to changes in the performance of these firms. The fact that there should be no relationship is because the ownership structures of firms most suit the conditions in which they operate.

Thomsen & Pedersen (2000) find a positive and a negative effect of ownership concentration on firm performance and they state the following: "the relationship between ownership concentration and economic performance is nonlinear so that ownership concentration beyond a certain point leads to entrenchment and has adverse effects on performance." So at first there is a positive effect of large shareholdings on firm performance, but when the concentration level of shareholdings becomes too high the performance of the firms will be lower. Other studies conducted by Morck, Shleifer and Vishny (1988) and McConnell and Servaes present the same results.

For The Netherlands, Chirinko et al. (2003) have conducted a study on the effects of investor protections, concentrated ownership structures and performance. This study concluded that ownership concentration does not have a considerable impact on the performance of firms, caused by a dual-role of large shareholders. On the one hand, large shareholders minimize agency costs between management and its owners, on the other hand these large shareholders increase agency costs because large shareholders have more power to expropriate smaller shareholders. This study also suggests that there is a positive effect at first, which levels off when a shareholder gains too much power.

Based on the literature and previous studies about this topic, there should be an inverted U-shape relationship between ownership concentration and performance. Therefore, the following hypothesis has been constructed:

> *H1: The relationship between ownership concentration and firm performance is bell-shaped.*

2.3 Ownership identity and firm performance

Besides investigating the relationship between a firm's ownership concentration and its performance, Thomsen and Pedersen (2000) have also documented on the effect that different types of large shareholders have on the performance of the firm. The authors argue that the identity of the shareholder is equally important as the concentration of shareholdings, when it comes to performance. A division can be made between different types of shareholders, each one having their own distinct relationship with firm performance. These different categories of shareholders also have their own goals for the firms they own. Higher market-to-book values can be found with firms that have a financial institution as a large shareholder. Sales growth is more preferred when (member of) a family is a large shareholder, while this growth of sales is lower when the firm has got an institutional investor as a large shareholder (Thomsen and Pedersen, 2000). Differences in performance can also be observed. Anderson and Reeb (2003) found that family ownership does not lead to value creation for the firm and the other shareholders of the firm.

Different categories of shareholders can also take different roles on them, as has been documented by Kabir et al. (1997) in their study of Dutch firms. Institutional investors like banks, insurance companies, pension funds and mutual funds are expected to be more involved in controlling management's performance: "They are in a better position to invest resources for increased monitoring so that management's inclination to adopt defense mechanisms decreases." Since institutional investors have more financial resources available to them, they are more inclined to control the management of the firm in which they have a shareholding.

Based on the literature on the relationship between the identity of the shareholders and the performance of the firm, the following hypotheses have been derived:

> *H2: Shareholder value creation will be higher when the largest shareholder of a Dutch firm is an institutional investor.*
>
> *H3: Sales growth will be higher when the largest shareholder of a Dutch firm is a family (member), individual or foundation.*

3. METHODOLOGY AND DATA

3.1 Models

The relationship between the ownership structures of publicly listed firms in The Netherlands and their financial performance will be analyzed in this paper. This section of the paper will explain how this relationship is tested. As stated in the first hypothesis, it is expected that the relationship between ownership concentration and performance takes a bell-shaped form. This bell-shaped form is chosen because ownership concentration is expected to have a positive effect on performance up to a certain point where ownership becomes too concentrated. At first, shareholders will have an incentive to control the management and their actions, which should have a positive effect on firm performance. Also, shareholders will be less inclined to extract private benefits of control from the firm, because doing so would harm the firm and lower its value. But after a certain point, the shareholders will become too powerful, which has got negative consequences for the performance of the firm. Shareholders will be able to extract private benefits of control, as they have acquired to right amount of power to do so (Claessens et al. 2002). Based on these findings, a model is constructed that resembles the relationship between ownership concentration and firm performance. This model is stated as follows:

$$\textit{Firm performance} = \alpha + \beta 1 * \textit{Ownership Concentration} + \beta 2 * \textit{CONTROL} + \varepsilon$$

The performance of the firm will be measured by using two variables. The first variable that will be used is the Return-On-Assets (ROA) ratio while the second variable used will be the Market-to-Book-Value (MBV) ratio. Ownership concentration will also be measured by using two variables: the share of capital held by the five largest shareholders of a firm (T5) and the share of capital held by the largest shareholder (T1). Because it is expected that there will be a positive effect at first and a negative effect after a certain point, we have to include the squared definitions of T5 and T1, which will be called $T5^2$ and $T1^2$ respectively. The squared variables will account for the non-linearity that is expected in the relationship. These two measures are chosen because different papers use different variables to calculate ownership concentration. This paper will use these two commonly used variables and combine them in one analysis. It should provide a more complete view of the effect of ownership concentration on firm performance, as the influence of the five largest shareholders and the influence of the largest shareholder alone will be tested. In order to test the effect of these two measures of ownership concentration, two variations on this model will be used. One model will incorporate the T5 variable while the other will use the T1 variable of ownership concentration. This model will also use control variables to check for the effect of other variables that are known to have an effect on firm performance. The control variables that will be used are the debt-equity ratio, sales growth, the logarithm of total assets, year dummies and industry dummies. Both variations of the model will use the same control variables. In order to analyze the data, correlation analysis will be performed to see how the variables correlate with each other. After this, regression analyses will be conducted to test the relationship between ownership concentration and firm performance

The second and third hypotheses will be tested by using the following equation:

$$\textit{Firm performance} = \alpha + \beta 1 * \textit{Ownership Concentration} + \beta 2 * \textit{OWNID} + \beta 3 * \textit{CONTROL} + \varepsilon$$

This model incorporates the effect that different categories of shareholders are expected to have on the performance of the firm. These different categories of shareholders will be resembled by the OWNID part of the regression model. The model will be similar to the previous model that tests the first hypothesis: the same variations of ownership concentration variables will be used, as well as the same control variables. As stated before, we expect firms that have a (non-bank) financial institution as the largest shareholder to have higher MBV values and firms with a family (member) as the largest shareholder are expected to have higher values for sales growth. The variables that are used in the analysis will be explained in more detail in the next section

3.2 Variables

3.2.1 Dependent Variables

Three dependent variables will be used in this paper: the ROA and MBV ratios and sales growth. The ROA ratio is used to measure the accounting performance of the firm, while the MBV ratio will be used to measure the firm value performance of the firm. The ROA ratio is used in multiple studies to analyze the financial performance of firms in relation to their ownership structures (Thomsen et al. 2000; Van Ees et al. 2003; Krivogorsky, 2006) and for this reason it will also be included in this analysis of firm performance. The ROA ratio provides information on how well the management of a firm has performed when looking at the amount of profits a firm has generated with respect to its assets. The ROA ratio is calculated by dividing a firm's net income by its total assets and multiplying this figure with 100 in order to arrive at a percentage. The ROA ratios will be obtained from the ORBIS database.

The second measure of firm performance that will be used is the Market-to-Book-Value ratio (MBV) (Thomsen and Pedersen 2000; Claessens et al. 2002). This ratio will give information about the market value of firms and their book values. Low MBV's indicate that a firm's stock is undervalued while high MBV's indicate that the stock is overvalued. ORBIS provides this ratio as a part of their database.

The third hypothesis, which measures the relationship between different categories of shareholders and sales growth, requires the use of a third dependent variable. In this case sales growth will be used as a dependent variable. Sales growth is measured as the total sales of a firm in one year, minus the sales of the previous year. This number is then divided by the sales of the previous year. As stated before, the sales growth variable will be used as a dependent variable for testing the third hypothesis and it will be used as a control variable when the other hypotheses are being tested Measuring sales growth is an appropriate method to proxy for growth opportunities of firms and it is therefore expected to have a positive effect on firm performance (Thomsen & Pedersen 2000; Claessens et al. 2002). According to the third hypothesis, Sales growth is believed to be higher for firms that have a family member as a large shareholder when compared to other types of shareholders.

3.2.2 Independent variables

One of the aspects of a firm's ownership structure is the ownership concentration. Shareholders are obliged by Dutch

law to disclose their shareholdings of a firm when these shareholdings exceed a certain threshold (5 per cent, 10 per cent, etc.). The shareholder who exceeds a threshold will have to notify the AFM and the company that issued the shares in the first place. The AFM has made a register on their website where a publicly accessible database can be found on all the notifications issued by shareholders. Almost all of the firms in the sample disclose their major shareholders in their annual reports, stating their name and total ownership percentage. In some annual reports the company only states that a shareholder has exceeded a certain threshold and that the shareholder should own a stake between two thresholds (i.e. between 25 and 30 per cent). When this was the case, the register of the AFM on shareholder disclosures was consulted in order to obtain the correct figure.

Ownership concentration will be measured by calculating the share of capital held by the five largest investors in a firm (T5). All shareholders holding more than five per cent of a firms stock will be included in the analysis. When there are more than five shareholders who own more than five per cent of a firm's stock, only the five largest shareholders will be considered (Demsetz and Villalonga, 2001). Next to this measure of ownership concentration, the share of capital owned by the largest investor will also be considered (T1). The same minimum threshold of owning five per cent of a firm's stock is used here as well (Thomsen & Pedersen, 2000; Claessens et al. (2002). The reason for only including shareholders who own more than five per cent of the shares is that when a shareholder owns less, it will be hard to find an accurate number because the shareholder is not obliged to disclose his holding. Thomsen & Pedersen (200) also had hypothesized that there would be a bell-shaped relationship between ownership concentration and firm performance. In order to test whether the relationship is indeed bell-shaped, the authors added a squared definition of ownership concentration to their analysis. Therefore this measure will also be included in this analysis. Industry effects will also be accounted for by including a measurement to identify different types of industries.

Ownership identity will also be used as an independent variable. There are different categories of shareholders prevalent. The classification used by Thomsen and Pedersen (2000) will be used to distinguish between different categories of shareholders:

- **B** = Bank
- **C** = (nonfinancial) Company
- **FA** = Family, single person or foundation
- **G** = Government
- **I** = Institutional investor

Dutch firms report the identity of their largest shareholders in their annual reports. Based on these reports and further investigation in to the identity of these shareholders, we can classify a majority shareholder as belonging to one of the beforementioned categories.

An other control variable that will be included in the analysis is *firm size*. Claessens et al. (2002) and Anderson and Reeb (2003) state in their studies that firm size is an appropriate control variable to include in the analysis, because larger firms have a lower risk of financial distress. This is so for a number of reasons. Large firms disclose information in a better way than small firms, also their trading is more liquid and these firms get more attention from analysts. Because of these reasons, it is expected that firm size and firm performance will be positively correlated. The log measure of the total assets will be used to measure this variable.

A distinction between different industries will also be made, in order to account for valuation differences between industries (Thomsen & Pedersen, 2000; Claessens et al. 2002). To distinguis between the different types of industries, the 'NACE rev 2 Main Section' will be used, which provides a total of thirteen industries in The Netherlands. Year dummies will also be included in the analysis, which allows year-by-year analyses to be made. The Debt/Equity ratio will also be included as a control variable (Thomsen & Pedersen, 2000). This ratio is calculated by adding up the current and non-current liabilities and then dividing this number by the shareholder's funds.

3.3 Data

As mentioned before, the firms will be analyzed for the period spanning from 2011 till 2013. Information from the year 2014 is not included in the analysis, because not all of the annual reports for this year are available in Orbis at the moment on which this research is being conducted. The sample used in this research consists of all publicly listed firms in The Netherlands, with the exception of financial companies. Financial companies are excluded because it is difficult to analyze data on profitability and valuation for these firms (Claessens et al. 2002). All firms that are prevalent in the sample are listed companies for the 2011-2013 period. Firms that are not listed on the Dutch stock exchanges for the entirety of the period of analysis or firms for which no data can be found in either the annual reports or the register of the AFM will be excluded from the sample.

Information on the ownership structures of the firms in the sample has been obtained in two ways. Shareholders of Dutch firms are required by the Dutch financial authority (AFM) to notify both the company and the AFM when their ownership stake exceeds a certain threshold (i.e. 5%, 10%, etc.). The AFM holds a register of these notifications on their website, which is publicly accessible. The second method to obtain the required information is to consult the annual reports of the firms. Information on the largest shareholders can be found in these reports. These annual reports will be used as the primary source of information, as they provide a more accurate view of the significant shareholdings in the firm. The register of the AFM lists all notifications for a firm for the whole period on which the firm is listed and can thus contain double entries of data. The identity of these major shareholders is also stated in the annual reports as well as in the AFM register. Further research on the exact identity of these major shareholders can be done by consulting the internet, if the annual report does not provide sufficient data.

All variables have been controlled and adjusted for outliers by using the 'Winsorize' method. All entries below the 5^{th} percentile and above the 95^{th} percentile have been adjusted according to this method. This method leads to a more reliable set of data, because the extreme values that influence the data set as a whole will be adjusted.

4. RESULTS

This part of the paper will state the results of the different analyses performed. The first part of this section will clarify the descriptive statistics of the sample used in the analysis. The second part will cover the analysis of the correllations between the different variables. After this, the outcomes of the regression analyses will be presented and discussed.

4.1 Descriptive statistics

In the table below, the descriptive statistics for the sample used in this research are shown. A total of 231 observations have been included in the analysis, which leads to the conclusion that

77 firms have been included in the analysis. Quite some firms have been excluded for the analysis for a number of reasons. Not all firms listed in the ORBIS database had information available for all of the three years that will be analysed in this study. Firms that did not have this information available have been excluded. There were also firms in the ORBIS database with inconsistent data entries. As an example, there were firms that had considerable sales in one year and zero sales in the following year, followed by considerable sales in the next year. Companies that had inconsistencies in their data like explained before have also been excluded. This leads to the sample that will be analysed in this study.

As can be seen from the table, the mean value for T5, which represents the total ownership share held by the five largest shareholders, is 45.00 per cent for the period of 2011-2013, while the mean value for T1 is 24.85 per cent. Mean ROA and MBV values are 1.78 and 1.62 respectively. The descriptive statistics have also been analysed on a year-to-year basis. These tables will not be presented in this section and these can be found in the Appendix of the paper. What we can observe from this year-to-year analysis is the following. Firstly, ownership concentrations remain fairly stable over the period on which the analysis is focussed. No large changes in ownership structure appear during the period, when looking at the mean values of both definitions of ownership concentration (T5 and T1). Second, there are large variations in the mean value for the ROA ratio, before adjusting the variables by using the winsorizing method. The mean value for this ratio in 2011 is quite higher compared to the value for 2012: 2.09 per cent in 2011, 1.39 percent in 2012 and 1.88 percent in 2013. The ROA variable changes a lot over time and this provides a motivation for additionally analysing the years separately. The MBV ratio remains somewhat constant over the period of analysis. Sales growth takes the highest value in 2011 with a mean value of 7.08 per cent.

Table 1. Descriptive Statistics.

	N	Min	Max	Mean	St. Dev.
T5	231	10.00	85.61	45.00	22.22
T1	231	5.04	73.00	24.85	18.65
ROA	231	-17.78	14.06	1.78	7.82
MBV	231	0.42	4.81	1.62	1.06
Sales Growth	231	-16.37	34.10	4.75	12.93
D/E Ratio	231	36.26	513.92	160.25	121.29
logTA	231	9.82	18.54	13.69	2.38

The following variables are in percentages: T5, T1, ROA, MBV, Sales Growth and D/E Ratio. logTA is a logarithm.

Table 2 presents the distribution of ownership concentration amongst different categories for the two measures of ownership concentration that are used in this research. When we look at the T5 measure of ownership concentration it can be observed that the concentration level of shareholdings is well distributed from 20 per cent until 89 per cent, with each of the groups holding approximately the same amount of observations in it. So the observations for the T5 measure of ownership concentration are well distributed around the different categories, but the same cannot be said for the T1 measure of ownership concentration. This measure, that represents the ownership stake of the largest shareholder, is more concentrated around the lower end of the categories with the largest part of the observations focussing around 10 till 49 per cent. This is not a surprising finding, as there are not a lot of publicly listed companies in The Netherlands that are wholly owned by one entity or individual. What this means, however, is that most of the extreme values lie on the right side of the mean value for this variable, which is confirmed when looking at the frequency table for this variable.

Table 2. Frequency Table.

	T5	T1
<10%	7 (3.0)	6 (2.6)
10-19%	5 (2.2)	35 (15.2)
20-29%	24 (10.4)	75 (32.5)
30-39%	28 (12.1)	52 (22.5)
40-49%	38 (16.5)	23 (10.0)
50-59%	32 (13.9)	16 (6.9)
60-69%	36 (15.6)	3 (1.3)
70-79%	28 (12.1)	21 (6.54)
80-89%	33 (14.3)	

The amount of observations is showed in the table, with percentages in brackets.

Table 3 presents the frequencies for the identity of the largest shareholders. As can be seen from the table, two categories are prominently represented in our sample: families and institutional investors. Large shareholdings by the government are not very common in our sample, with only three counts found in the data, but because we observed the firms for a period of three years we can state that only one firm has the government as the largest shareholder. Quite some banks in The Netherlands are (partially) owned by the Dutch government, but since these companies were excluded from the analysis these firms do not appear in the dataset.

Table 3: Owner identity frequencies

	Frequency	Percentage
B	22	9.5%
C	21	9.1%
FA	83	35.9%
G	3	1.3
I	96	41.6
Total	*231*	*100%*

Frequencies are counted by calculating the number of observations. The percentage collumn shows that, i.e. 9.5% of the observations fall in the B category.

4.2 Correlation analysis

This section will present and discuss the Pearson correlation between the variables. The correlation table can be found in the Appendix part of the paper.

Looking at the relationship between ownership structures and firm performance, the following can be observed from the correlation table. Firstly, all measures of ownership concentration are negatively correlated with the MBV measure of firm performance. The correlation is not strong but it is, however, significant for all measures of ownership

concentration. The other measure of firm performance, the ROA ratio, is positively correlated with all measures of ownership concentration. All of these correlations are statistically significant. The correlations is not very strong, just

like what was observed with the MBV ratio. Ownership concentration is slightly stronger correlated with the MBV measure of firm performance than it is with the ROA measure. The third measure of firm performance, sales growth, correlates positively with all definitions of ownership concentration. These correlations are also not very strong, but they are statistically significant. The measures of ownership concentration all correlate significant, strong and positively with each other.

4.3 Regression Analyses

4.3.1 Ownership concentration

Table 3 presents the results of the different regression analyses that have been performed in relation to the first hypothesis. As can be seen in the table, four models have been used to test the hypotheses. Model one and two measure the relationship between the level of ownership concentration of firms, as measured by the T5 and $T5^2$ variables, and firm performance (ROA in model 1 and MBV in model 2). The third and fourth models examine the same relationship as the first two models do, but only a different measure of ownership concentration is used (T1 and $T1^2$).

Table 3. Regression: ownership concentration

	ROA	MBV	ROA	MBV
	1	2	3	4
T5	.057 (.512)	.024 (1.620)	.	.
$T5^2$	0.000 (-.291)	.000** (-2.216)	.	.
T1	.	.	-.037 (-.358)	-.016 (-1.192)
$T1^2$	.	.	.001 (.461)	.00007 (.399)
Log_TA	.641* (2.614)	.080** (2.432)	.573** (2.413)	.078** (2.430)
Sales Growth	.112* (2.903)	.010*** (1.943)	.117* (3.064)	.012** (2.295)
D/E Ratio	-.013* (-2.679)	.002* (2.820)	-.014* (-2.962)	.002* (2.595)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
R^2	.228	.239	.225	.229

: significant at 99.9 per cent; ** significant at 95 per cent; * significant at 90 per cent. Beta coefficients listed, t-statistics in brackets. Performance measure stated at the top of the table indicates the dependent variable used in the model. Industry and year dummies have been included in all models in this table.*

This section contains the results of the different regression analyses that have been done. The first four models will be discussed here, as they all relate to the first hypothesis. Return-On-Assets is positively influenced by the T5 measures of ownership concentration, but this effect is not significant as the p-values are not low enough. The Market-to-Book-Value ratio is also positively influenced by the T5 variable. Only the $T5^2$ measure has a significant effect on the MBV ratio, but its effect is close to zero. These results indicate that there is a positive effect of the concentration level of shareholdings on the performance of the firm, but that this effect levels of when a certain level of ownership concentration is reached. No evidence is found that there is a negative effect of ownership concentration on firm performance, when ownership reaches a certain level. These results are not entirely in line with what was expected in the hypothesis, but the part that there is a level of ownership after which the effect on performance levels off is an encouraging sign. The models that were using the T5 variables of as measures of ownership concentration have R^2-values of 0.228 and 0.239 respectively and are both statistically significant at the 99.9 per cent level. The variables used in these models account for around 23 per cent of the variation in firm performance. When we take a look at the other measure of ownership concentration, T1, different results can be seen. Both linear measures of ownership concentration appear to have a negative effect on both measures of firm performance. The effect is not significant though, because of the high p-values. The squared measures of T1 have a positive and non-significant effect on firm performance. Although the coefficients are not significant, it is remarkable to see that the opposite of what was hypothesized can be seen in these results. Both of the models are again statistically significant at the 99.9 per cent level and have R^2-values of 0.225 and 0.229 respectively. While the T5 ownership variables behave almost in-line with the hypothesis, the T1 variable do not. The share of capital held by the five largest shareholders does seem to have a positive effect on firm performance, up to a certain point. But no strong conclusions can be made from these results, as all but one of the coefficients are not statistically significant. Also, both measures of ownership concentration do not have a large economic significance, as their effect on the dependent variables are not very large. This implies that ownership concentration does not have a large effect on the performance of firms in The Netherlands. The squared variables of ownership concentration have a very low economic significance with regard to firm performance. All of the squared variables have an effect on firm performance that is close to zero. A robustness check will be performed to check if there are changes to be observed when we exclude the squared definitions of ownership concentration from the models.

4.3.2 Ownership identity

The results of the regression models that test the 2^{nd} (5^{th} and 6^{th} models) and 3^{rd} (7^{th} and 8^{th} models) hypotheses will be presented in this section. It was hypothesized that the MBV ratio would be higher when the largest shareholder of a firm was an institutional investor. But as we can see in the table below, this is not the case for the data sample used in this research. Family ownership has a slightly more positive influence on the MBV ratio than institutional ownership has. Although the model is significant at the 99.9 per cent level, the coefficients for family ownership and institutional investor ownership are both not statistically significant, so yet again it is hard to bind strong conclusions to these results. In short, no evidence is found to support the hypothesis that institutional ownership leads to better performance on the MBV ratio. When

we take a look at the models that resemble the third hypothesis, the following can be observed. Institutional ownership has a more positive effect on sales growth than family ownership. Both coefficients are not far apart from each other. But it was hypothesized that family ownership would lead to higher sales growth and it can be seen from the regression results that the opposite is true. No evidence is found that supports the third hypothesis, as can be seen in the table. A surprising finding is that the T5 variables of ownership concentration have a statistically significant effect on the MBV ratio when the identity of the largest shareholder is also taken in consideration. The share of capital held by the five largest shareholders positively influences sales growth and this effect is also statistically significant. So while no statistically significant evidence is found that supports the second and third hypotheses, there is evidence that states that ownership concentration has a statistically significant effect on the MBV ratio and on Sales Growth.

Table 4. Regression: Owner Identity

	MBV	MBV	SalesGr.	SalesGr.
	5	6	7	8
T5	.027*** (1.729)	.	.341*** (1.665)	.
$T5^2$	.000** (-2.314)	.	-0.003 (-1.453)	.
T1	.	-.020 (-1.395)		.172 (.901)
$T1^2$	.	.000 (.478)		-.001 (-.433)
logTA	.079** (2.380)	.070** (2.165)	-.340 (-.769)	-.413 (-.963)
Sales Growth	.010*** (1.915)	.012** (2.305)	.	.
D/E ratio		.002* (2.621)	.001 (.077)	-.001 (-.160)
Family	-.138 (-.681)	.060 (.293)	1.599 (.592)	1.563 (.570)
Inst.	-.270 (-1.430)	-.239 (-1.281)	2.965 (1.076)	3.224 (1.305)
Industry dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
R^2	.250	.245	.110	.107

: significant at 99 per cent; ** significant at 95 per cent; * significant at 90 per cent. Beta coefficients listed, t-statistics in brackets. Performance measure stated at the top of the table indicates the performance measure used. SalesGr. is an abbreviation of Sales Growth.*

4.3.3 Robustness checks

As observed in the descriptive statistics section, 2011 has a higher mean value for the ROA ratio compared to the other years of the analysis period. In this section the results of year-by-year regression analyses will be presented, in order to check if there is a difference between the years on which this study focusses. The same regression models that have been used in the previous sections will be used here as well. The robustness check will start with the analysis of 2011, followed by 2012 and finishing with 2013.

From this robustness analysis we can see that there are changes between the years of analysis, especially for the ROA measure of firm performance. In 2011, both the T5 and the T1 measures of ownership concentration have a negative effect on ROA, while the $T5^2$ and $T1^2$ measures have a positive effect on firm performance. This is the opposite of what was expected from previous studies. The values for ownership concentration more or less take their previously predicted values in the other years. When looking at the MBV ratio only small effects of ownership concentration on firm performance can be seen. All these effects on the MBV ratio are rather small and do not always take the expected form. All coefficients are not statistically significant, which yet again confirms that there is no significant relationship between ownership concentration and firm performance.

Table 3. Robustness checks ROA & MBV

ROA	T5	$T5^2$	T1	$T1^2$
2011	-0.259	0.003	-0.258	0.003
2012	0.269	-0.003	0.053	-0.001
2013	0.126	-0.001	0.073	0.000
MBV	T5	$T5^2$	T1	$T1^2$
2011	0.025	0.000	-0.028	0.000
2012	0.020	0.000	-0.002	-0.00009
2013	0.023	0.000	-0.021	0.000

Beta coefficients listed in the table. The top half uses the ROA variable as the dependent variable and the bottom half uses the MBV variable as the dependent variable.

The regression analyses all showed that the squared variables of ownership concentration have a very low effect on firm performance. Therefore, robustness checks have been carried out to see whether the exclusion of the squared variables of ownership concentration produces different results. First the results relating to the first hypothesis will be discussed. When the ROA variable is used as the dependent variable, no changes are observed in the results. Ownership concentration still does not have a statistically significant effect on the ROA ratio. Both the T5 and T1 coefficient take a positive sign, with beta coefficients of 0.025 and 0.009 respectively. Stronger results are found when the MBV ratio is used as the dependent variable. Both variables of ownership concentration have a negative effect on the MBV ratio and both variables are statistically significant at the 99% level, with beta coefficients of -0.008 for the T5 variable and -0.011 for the T1 variable. The coefficients do not have a strong economical significance though, as their values are close to zero. But the exclusion of the squared variables of ownership concentration does yield more statistically significant results. When the models for the second and third hypothesis are re-run we find no different results. No statistically significant evidence is found to support the hypotheses.

5. CONCLUSION AND IMPLICATIONS

5.1 Conclusion

This study's main goal was to find an answer to the question what effect the ownership structures of Dutch publicly listed firms have on their performance. It was expected that there was a positive effect at first, but that this positive effect would become negative when ownership becomes too concentrated. This relationship was tested by calculating the ownership concentration levels for Dutch publicly listed firms by using two measures of ownership concentration: the share of capital held by the five largest shareholders and the share of capital held by the largest shareholder. Firm performance was measured by using three variables: the ROA and MBV ratios and Sales Growth. The effect of ownership identity on performance was also examined. The results of the regression analyses show that there is not a lot of statistically significant evidence available that supports the view that the ownership structures of firms have a large effect on firm performance. Statistically significant evidence is only found after adjusting the original models during the robustness checks.

The first hypothesis stated that a quadratic relationship was expected between ownership concentration and firm performance. Based on previous literature ownership concentration was expected to have a positive effect on firm performance up to a certain level, after which the positive effect would turn into a negative one. This was based on the findings in the literature that large shareholders have the incentive to monitor the performance of the management, because these shareholders have invested a significant amount of their wealth in the firm. But when these large shareholders become too powerful, they should be able to expropriate the minority shareholders and extract private benefits of control from the firm. The results of this paper show that there is indeed a positive effect of the share of capital held by the five largest shareholders on firm performance prevalent. But instead of finding a negative effect at a certain point of ownership concentration, only a levelling-off of the effect is observed and not a negative effect on performance. When the influence of the largest shareholder alone is analysed, we see the opposite. At first there is a negative effect on firm performance and after a certain level of ownership by this largest shareholder the effect on firm performance becomes positive. These findings are not strong because the results are not statistically significant. The robustness checks that were performed also did not provide significant evidence. When the observations of the year 2011 were excluded from the analysis, more consistent results were found. The linear variables of ownership concentration had a positive effect on the performance of the firm and the quadratic components had a negative effect on firm performance. Although these coefficients were not statistically significant, it hints in the direction that there is a bell-shaped curve for the relationship between ownership concentration and firm performance. But based on the data used in this study, it is hard to make strong conclusions.

The second and third hypothesis related to the effect that the identity of the largest shareholder has on the performance of the firm. Based in previous findings, institutional ownership was expected to have a more positive effect on the MBV ratio of firms than other types of ownership would have and family ownership should have a more positive effect on the growth of sales of firms. This effect was tested by analyzing the ownership structures of firms and checking who the largest shareholder of the firm was. Following this, the shareholders were divided amongst different categories and then a regression analysis was performed. What we can see from these results is actually the opposite of what was expected. The analysis showed that firms who had a shareholder of the family category as their largest investor had higher MBV ratios than firms with an institutional investor as the largest shareholder, but the results were not statistically significant. When we take a look at the results that relate to the third hypothesis, we see that institutional ownership has a more positive effect on sales growth than family ownership. Both types of ownership had a positive effect on the sales growth of a firm but both effects were not statistically significant. Ownership identity proves to be an aspect to take in mind when considering a firm's ownership structure in relation to its performance. An interesting finding from the regression models that relate to the second and third hypotheses is that the effect of ownership concentration (T5) on the MBV ratio becomes statistically significant when shareholder identity is included in the regression models. Sales Growth is also influenced positively and statistically significant by the T5 measure of ownership concentration.

In short, no strong evidence was found that supports the hypothesis that there is a bell shaped curve for the relationship between ownership concentration and firm performance. One of the reasons for this is that the market responds to the forces that are at the heart of ownership structures of firms. And this removes any predictable relation between ownership structures and performance of firms (Demsetz and Villalonga, 2001). Because most of the coefficients were not statistically significant, caution must be taken in drawing conclusions from these results. But the results point in the direction that there is a positive as well as a negative effect of ownership concentration on firm performance to be observed. For the relationship between the identity of owners and the performance of the firm evidence is found that the identity of the owner does matter to the performance of the firm. The effect of the share of capital held by the five largest shareholders of a firm on the MBV ratio became statistically significant after the identity of the largest shareholder was also included in the regression analysis. This finding could point in the direction that there are more factors that influence the effect of ownership concentration on firm performance than the factors that have been included in this paper's regression models. Authors of different papers use different variables in their models and the variables used in this paper's analyses could prove not to be the optimal mix of variables. Future research for Dutch publicly listed firms could thus choose to use a different set of variables

5.2 Limitations

There are some limitations to this study that hinder the generelization of the results to other settings. Firstly, the sample size is small when compared to the samples used by other studies. Using a larger sample could provide more accurate results or different findings. Repeating the study for a longer period of time provides more observations, which could make the results more reliable compared to this paper's results. Secondly, only firms that were listed for the entire period of 2011-2013 were included in the sample of this study. Although, not a lot of companies were found in ORBIS that were either only listed for one or two years or went bankrupt during the period of this study, including these firms could provide a more accurate view of the situation which publicly listed firms in The Netherlands face. Thirdly, although most of the results found in this study hint at a relationship between ownership structures and performance, it is not possible to draw strong conclusions from this study. Repeating the study with the inclusion of more observations could provide stronger results that are generalizable to other situations.

5.3 Practical implications

This study has analyzed the relationship between the ownership structures of publicly listed firms in The Netherlands and their performance. Ownership concentration does not have a statistically significant influence on the performance of the firms in this sample, but it does hint in the direction that there is a certain point of ownership after which the positive effect of concentrated shareholdings diminishes. Companies can keep this finding in mind when analyzing their ownership structures and if possible take appropriate actions to ensure that their ownership concentration levels fit their strategic goals. For the relationship between the identity of the largest shareholder and performance stronger conclusions can be drawn, because results were found that were statistically significant. The identity of the largest shareholder does play a role in influencing the performance of firms. Some types of shareholders have a more positive influence on firm performance than others. This finding is helpful for firms, as they can see whether the largest shareholder of their firm fits the goals that they want to achieve. In example, Institutional investors have higher sales growth levels compared to other groups.

5.4 Acknowledements

I would like to use the final part of my paper to thank the whole supervisory team of the Finance and Accounting track of the University of Twente. Special thanks to Ms. Huang for her helpful advice, which helped me during the whole process.

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7. APPENDIX

7.1 Descriptive statistics per year (post winsorizing)

Some of the Minimum and Maximum values can be the same during the three years of observation. This is the case because the data has been adjusted for outliers by using the winsorizing method. All numbers in the tables are percentages, except for the logTA numbers. These numbers are the logarithm of Total Assets.

2011:

	Min.	Max.	Mean	Std. Dev.
T5	10.00	85.50	44.36	22.16
T1	5.04	73.00	24.76	18.82
ROA	-17.78	14.06	2.09	8.01
MBV	0.42	4.81	1.71	1.03
Sales Growth	-16.37	34.10	7.06	15.08
D/E Ratio	36.26	513.92	158.76	118.52
logTA	9.82	18.54	13.68	2.40

2012:

	Min.	Max.	Mean	Std. Dev.
T5	10.00	85.50	45.49	21.87
T1	5.04	73.00	24.96	18.64
ROA	-17.78	14.06	1.39	8.24
MBV	0.42	4.81	1.54	1.07
Sales Growth	-16.37	34.10	3.38	12.76
D/E Ratio	36.26	513.92	167.76	125.57
logTA	9.82	18.54	13.69	2.40

2013:

	Min.	Max.	Mean	Std. Dev.
T5	10.00	85.50	45.13	22.87
T1	5.04	73.00	24.83	18.72
ROA	-17.78	14.06	1.88	7.27
MBV	0.42	4.81	1.61	1.07
Sales Growth	-16.37	34.10	3.80	10.38
D/E Ratio	36.26	513.92	154.23	120.86
logTA	9.82	18.54	13.71	2.38

7.2 Pearson Correlation Matrix

	T5	$T5^2$	T1	$T1^2$	ROA	MBV	Sales Growth	D/E Ratio	logTA
T5	1	0.973*	0.789*	0.696*	0.125**	-0.178*	0.161*	-0.118**	-0.136**
$T5^2$	0.973*	1	0.815*	0.761*	0.121**	-0.190*	0.144**	-0.103***	-0.098***
T1	0.789*	0.815*	1	0.961*	0.108***	-0.163*	0.177*	-0.092***	-0.072
$T1^2$	0.696*	0.761*	0.961*	1	0.118**	-0.138**	0.170*	-0.076	-0.047
ROA	0.125**	0.121**	0.108***	0.118**	1	0.276*	0.211*	-0.208*	0.133**
MBV	-0.178*	-0.190*	-0.163*	-0.138**	0.276*	1	0.095***	0.136**	0.024
Sales Growth	0.161*	0.144**	0.177*	0.170*	0.211*	0.095***	1	-0.048	-0.004
D/E Ratio	-0.118**	-0.103***	-0.092***	-0.076	-0.208*	0.136**	-0.048	1	0.043
logTA	-0.136**	-0.098***	-0.072	-0.047	0.133**	0.024	-0.004	0.043	1

*: significant at 99 per cent; ** significant at 95 per cent; *** significant at 90 per cent.

The influence of short selling on stock returns - Evidence from the Netherlands

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ABSTRACT

In this paper, the influence of short selling on stock returns is investigated by means of data from the Netherlands. The sample consists of 1,119 observations of announced total net short positions in the register of the AFM for 25 Dutch listed firms over the period from January 2013 to December 2014. It is found that the net short position taken in a firm has a statistically significant impact on the abnormal return of the stock of that firm. This result is consistent with findings from prior literature. Furthermore, there seems to be some evidence to suggest that the availability of options for a stock has a negative effect on the abnormal return as well. Finally, a significant influence of short sales which were announced in the last three trading days of a tax year on stock returns was not found.

Keywords

Short selling, stock return, the Netherlands, informed short selling, uninformed short selling, stock market, options, tax

5th IBA Bachelor Thesis Conference, July 2nd, 2015, Enschede, The Netherlands.

1. INTRODUCTION

It seems that short selling is quite a controversial topic, both in research and in practice (Boehmer & Wu, 2013). Short selling, also called 'going short' or 'taking a short position', occurs when an investor expects the price of a stock to fall. The investor then chooses to sell a stock which he borrows and intends to buy the stock back at a lower price in order to return it to the lender. By doing this, the investor attempts to make a profit by selling at a higher price and buying at a lower price.

Several researchers have investigated the relationship between short selling activity and returns on stock. However, not all of these researchers have come to the same conclusions (Aitken, Frino, McCorry & Swan, 1998). Therefore, it is interesting to do further research on the subject of short selling. Nevertheless, as the literature review of this paper will show, many researchers believe short selling has an informational value and, thus, impacts stock returns, at least to some extent.

The literature discussed in this paper also indicates that many researchers have investigated short selling and its relationship to abnormal returns in countries outside Europe, mainly in the United States. As a consequence, research on this relationship in European countries is an interesting opportunity. One of these countries which has not been researched very often with regard to short selling is the Netherlands. There are some studies which do include the Netherlands in their sample, such as Bris, Goetzmann, and Zhu (2007), Beber and Pagano (2013), and Bernal, Herinckx, and Szafarz (2014). Nevertheless, these papers merely study the effect of short selling bans, restrictions, and regulations on the stock market by performing cross-country comparisons.

The fact that the Netherlands have not been researched in many studies with regard to short selling might be due to the fact that the records regarding short selling were not publically available before November 2012. Due to a change in the European regulation with regard to short selling, initiated in November 2012, European market authorities are now obligated to publish notifications of net short positions when reaching 0.5% of the total outstanding share capital of a firm (AFM, n.d.). The Dutch market authority (the AFM) has thus published these notifications from November 2012 onwards.

For these reasons, researching the relationship between short selling and stock returns in the Netherlands is an interesting opportunity to contribute to the existing body of knowledge. Furthermore, insight into this relationship contributes to practice as it can provide useful guidance for investors in the Dutch stock market with regard to their short selling strategies, as well as the interpretation of short selling data. Hence, the research question of this paper is *'How does short selling influence stock returns in the Netherlands?'*

The rest of this paper is structured as follows. Section 2 will provide a review of the existing literature and the theoretical framework used in this paper. Further, in section 3 and 4 the methodology and data used in this research will be described. After this, in section 5 the results of the model will be discussed. Finally, section 6 will provide the conclusions of this research as well as a number of limitations of this study and some recommendations for further research and for practice.

2. LITERATURE REVIEW & HYPOTHESIS

In this section, a systematic review of the existing literature on the influence of short selling on stock returns is provided. On top of that, the hypothesis regarding the influence of short selling on stock returns in the Netherlands will be developed.

2.1 Literature review

In the past few decades, quite some research on short selling has been done. First of all, some researchers have investigated the effect of short selling bans, restrictions, and regulations (see for example: Bris et al., 2007; Beber & Pagano, 2013; Bernal et al., 2014). Moreover, authors have written about the influence of short selling on the price discovery process or price efficiency (see for example: Boehmer & Wu, 2013; Chang, Luo & Ren, 2015). Furthermore, researchers have tested the relationship between short selling and stock returns, the subject of this paper. While researchers have yielded different results, they do not unanimously agree on the existence, nor the strength, of this relationship. A number of these authors and their results will be discussed and compared in this section. In general, there are two views regarding short selling which are adopted by researchers, each with its own implications: informed short selling and uninformed short selling. These two views are discussed below.

2.1.1 Informed short selling

Many researchers assume that short selling is informed, or informative. Informed short selling indicates that it is assumed that investors sell short because they have information that leads them to believe that a certain stock is overpriced.

For example, a study that is often quoted by other authors to back up the hypothesis that short selling is informed, is the study of Diamond and Verrecchia (1987). They state that informed short sellers also have access to private information, whereas uninformed short sellers only have access to public information. Hence, when the amount of short sales in a certain stock unexpectedly increases, indicating that certain negative information was not reflected in the stock price yet, stock returns decline. Moreover, the fact that informed short sellers have access to private information means that informed short sellers are more likely to be willing to bear the costs associated with short selling. Senchack and Starks (1993) confirm the notion of Diamond and Verrecchia (1987) after conducting research on a sample of firms in the United States. Their results indicate that increases of short interest in a stock lead to negative price reactions. Next to this, their findings suggest that a more negative price reaction to short selling will occur when the change in unexpected short selling is larger.

Additionally, Figlewski and Webb (1993), by extending on Figlewski (1981), also find that short positions in a certain stock negatively influence excess returns for that stock in firms which are listed in the United States. They find that this relationship is statistically significant as well. Furthermore, Aitken et al. (1998), by doing research on the Australian stock market, find evidence that short sales are informative. Their results show a negative abnormal return following short sales in the stock of companies. They state that "short sales are almost instantaneously bad news" in a transparent stock market, such as the Australian stock market (p. 2221).

Dechow, Hutton, Meulbroek, and Sloan (2001) add to this view by researching firms which are listed in the United States. They describe short sellers as rational investors, who invest based on information in order to maximise their returns. More precisely, they argue that investors take short positions in stocks which have low fundamental-to-price ratios and are believed to be overpriced. Short sellers are also found to look for stocks which do not have high transaction costs related to short selling, to distinguish between several underlying reasons for low fundamental-to-price ratios, and to use additional information to fundamental-to-price ratios to predict future stock returns. On top of that, Desai, Ramesh, Thiagarajan, and Balachandran (2002) performed empirical tests on firms in the Nasdaq

market, which showed that short selling is informed. They also found that the abnormal returns on stocks tend to increase with the rise of short interest in these stocks. Finally, Boehmer & Wu (2013) base their research on the impact of short selling in the price discovery process entirely on the assumption that short selling is informative.

Nevertheless, there are also authors who do not find a consistent (negative) relationship between short selling and stock returns. For example, Brent, Morse, and Stice (1990) do not find enough evidence to suggest that short selling negatively influences stock returns on the New York Stock Exchange. They state that short selling does not seem to be useful to predict stock returns in the short run. Another research that does not find a negative relationship between stock returns for firms listed in the United States, is the paper of Woolridge and Dickinson (1994). They suggest that, therefore, short sales are not necessarily informed. This suggests there is another theory regarding the motives of investors to engage in short selling.

2.1.2 Uninformed short selling

This other view regarding short selling is opposite to the theory of informed short selling. This theory, called uninformed short selling, assumes that the investor does not have specific information that gives him reason to believe that the price will drop. Merely, the investor chooses to take a short position in a stock because of different reasons. In the short selling literature, several factors that increase the likelihood of informed short selling are brought up.

First of all, Diamond and Verrecchia (1987) indicate that reducing short selling costs may lead to more uninformed short selling. They argue that when short selling costs are high, only the investors which are most likely to gain benefits from selling short will actually sell short. As informed short sellers have a strong expectation the value of a stock will decrease, they will sell short, whereas uninformed short sales will take place to a lesser extent. However, when short selling costs decrease, more uninformed short sales will start to take place again. Diamond and Verrecchia (1987) mention that one way to reduce these short selling costs is by introducing options. Figlewski and Webb (1993) support this notion by stating that options can reduce the impact of short selling constraints. More specifically, they find that options appear to reduce the negative influence that short sales have on excess stock returns. According to them, their results seem to be in accordance with the hypothesis that options improve the informational efficiency of the market with regard to negative information. Likewise, Aitken et al. (1998) find evidence to suggest that short sales in optioned stocks, which relate to hedging or arbitraging, do often not have an informational motivation.

On top of that, Aitken et al. (1998) incorporate another variable that controls for arbitrage into their model, a second basis for uninformed short selling. By focusing on index-related arbitrage, they find arbitrage is a reason for short selling which is not informative. Brent et al. (1990) also discuss arbitrage as a motive for uninformed short selling. They indicate that simply holding a short and a long position in the same stock does not yield a profit. Therefore, an additional security is needed. This security can take several forms, for example a convertible security or a stock index future, but options can also be used for this purpose. Brent et al. (1990) found that more short sales occurred in stocks of firms for which such an additional security was available. Figlewski and Webb (1993) and Senchack and Starks (1993) also recognise that arbitrage can have an influence on short selling, but do not cover this subject in-depth in their paper.

A third motive which does not relate to information-based short selling is tax-related short selling. Brent et al. (1990) explain that, on the one hand, investors can go short in the same stock which they hold long in order to "lock in a profit, but delay the recognition of a capital gain" (p. 275). On the other hand, Brent et al. (1990) state that it is also possible that an investor wants to "lock in and postpone the recognition of a loss to the following year" (p. 275). Furthermore, they indicate that it is more likely that shareholders will participate in tax-related short selling when they have invested in a security which is more volatile and, thus, poses more risk to the investor. Nevertheless, their results only show a weak tendency to go short for the purpose of delaying taxes to the next financial year. On top of that, the results of Aitken et al. (1998), also controlling for tax-related short selling, show some evidence in support of the expectation that short sales which occur near the end of the financial year are more likely to be uninformed.

2.1.3 Conclusion on prior literature on short selling

All in all, it seems that investors choose to engage in short selling both because of negative information they have access to and for other reasons, as summarised in Table 1.

Table 1: Reasons for short selling

Category	Implication
1. Informed short selling	Stock is sold short because investors have negative information, causing them to believe the stock price will drop. Therefore, the announcement of a short sale has a negative effect on stock returns.
2. Uninformed short selling	Stock is not sold short based on negative information, but for other reasons. The negative effect of short selling on stock returns is mitigated. Most cited reasons are option-, arbitrage-, and tax-related short selling.
2.1 Options	Options reduce the influence of short selling constraints and the costs of short selling. In addition, options improve the informational efficiency of the stock market, which reduces the impact of short sales on stock returns. Options can also be used for arbitrage reasons.
2.2 Arbitrage	By holding a certain security in addition to simultaneously holding a short and a long position in a certain stock (for example, a convertible security or a stock index future), an investor can yield an arbitrage profit.
2.3 Tax	Investors may want to lock in a capital gain or loss and suspend it to the next financial year. This can be done by holding a long and a short position at the same time at the end of the financial year. This is not related to certain (negative) information.

2.2 Hypothesis

As described in the literature review in section 2.1, there are two views on the reasons for short selling within the theoretical framework of short selling: informed short selling and uninformed short selling. On the one hand, the theory of informed short selling suggests that short sales are informative

and that the stock market will respond to the announcement of short positions in the form of a price reaction. On the other hand, the theory of uninformed short selling assumes that short sales are not motivated by information and, thus, will not lead to a stock price reaction.

Although little research has been performed on the Netherlands until now, some studies have included the Netherlands in their multi-country samples. For example, in their cross-sectional and time-series study on short sale restrictions and their effects on price efficiency, involving several countries including the Netherlands, Bris et al. (2007) find some evidence that short sale constraints seem to lead to less efficient price discovery. On the other hand, Beber and Pagano (2013), who also include the Netherlands in their cross-country study, conclude that the lift of short selling bans in all researched countries, except for the United States, did not lead to a significant change in abnormal returns. Likewise, Bernal et al. (2014) find negative stock returns for the Netherlands after lifting the regulations on short selling, but again those results are not significant.

Nevertheless, while Bris et al. (2007) and Bernal et al. (2014) do find an effect on stock returns when short selling restrictions or bans are lifted, it is reasonable to make the assumption that short selling in the Netherlands will (negatively) influence stock returns to some extent. Hence, the hypothesis of this paper is:

H1: Short selling has a negative influence on stock returns in the Netherlands

3. METHODOLOGY

In this section, the model used in this research will be developed. Next to this, an overview of the variables used in this paper will be provided.

3.1 Model

In order to test the hypothesis as formulated before, the following regression model, based on the model used by Aitken et al. (1998), will be used:

$$AR_{it} = \alpha_0 + \beta_1 SHORT_{it} + \beta_2 OPTIONED_i + \beta_3 MONTH_t + \varepsilon_{it} \quad (1)$$

In this model, AR_{it} is the abnormal return of stock i at time t, over a given period, taking any value in percentages. $SHORT_{it}$ is the net short selling position in stock i at time t, as announced in the register of the AFM, taking any value between 0% and 100%. $OPTIONED_i$ is a binary variable, indicating whether options were also available for stock i, taking a value of either zero (no optioned stocks) or one (optioned stocks). $MONTH_t$ is also a binary variable, indicating whether the short sale was announced within the last three trading days of the financial year, taking a value of either zero (not announced within the last three trading days) or one (announced within the last three trading days).

Finally, α_0 is the intercept, β_1, β_2 and β_3 represent the coefficients of the variables $SHORT_{it}$, $OPTIONED_i$, and $MONTH_t$ respectively, and ε_{it} represents the model errors. On the one hand, coefficient β_1 is expected to take on a negative value, because it is expected that the higher the percentage of a stock that is sold short, the lower the abnormal return will be. On the other hand, the coefficients β_2 and β_3 are expected to take on a positive value, because the variables $OPTIONED_i$ and $MONTH_t$ are believed to be uninformative and, thus, mitigate the negative effect of short sales on abnormal returns.

3.2 Variables

3.2.1 Dependent variable: abnormal returns

The dependent variable in this paper is the abnormal return of a stock over a given period as a percentage of the expected return. While the abnormal return can take any value in percentages, it is a continuous variable. Although there are several ways to calculate the abnormal return of a stock, this paper adopts a method which is similar to the one used by Dechow et al. (2001). These researchers calculate abnormal returns by comparing each stock's return to "the equal-weighted return for all NYSE and AMEX stocks over the same time period" (p. 85). However, in this research the return on the stocks is compared to the AEX Index instead, as it is related to the Dutch stock market.

The first period adopted in this paper is the trading day of the announcement of the short sale until the trading day following the announcement of the short sale (0,1), which is one of the periods used by Christophe, Ferri, and Hsieh (2010). The stock prices to calculate the abnormal returns are adjusted stock prices, meaning they are adjusted for dividends and splits. In order to calculate the abnormal return, the following procedure is adopted. First, the difference between the adjusted closing price of the stock on the day after the announcement and the adjusted closing price on the day of the announcement will be calculated in percentages. Second, the same will be done for the AEX Index. Finally, the result of step three will be subtracted from the result of step two, leading to the abnormal return for the stock in percentages of the expected return. Therefore, a positive percentage would mean that the abnormal return was higher than expected based on the return of the AEX Index, while a negative percentage would indicate the opposite. This process will be repeated for each announcement of a new or changed short position.

3.2.1.1 Alternative measures of abnormal returns

First of all, several other periods for calculating the abnormal returns will be used. The period adopted in the model (0,1) only takes into account the first day after the announcement of the short interest. It is also interesting to look at the reaction of the stock market on the announcement of a short sale over a longer period, since the market might take more time to react than just one day. Hence, two other periods are used in this research. One of these periods takes into account the period from the trading day of the announcement of the short sale until three trading days following this announcement (0,3). The other period starts on the trading day of the announcement of the short sale and ends fifteen trading days following the announcement of the short sale (0,15). These periods are derived from the periods taken by (Aitken et al., 1998) and (Senchack and Starks, 1993), as will be described next.

It is also valuable to take the response of the market into account over a period that includes the period before the event, because this allows to account for leakage of information prior to the announcement of the short selling position (see for example: Senchack and Starks, 1993). Hence, another period that will be used in this paper is the period of one day before the announcement of the short sale until one day following the announcement of the short sale (-1,1), one of the periods taken by Boehmer and Wu (2013). In order to look at a slightly longer term response of the market, a period of three days preceding the announcement of the short sale until three days following the announcement will be applied (-3,3), as adopted by Aitken et al. (1998)[1]. In addition, to look at the long-term reaction of the market, a period of fifteen days before until fifteen days

[1] Although Aitken et al. (1998) use three fifteen-minute intervals before until three fifteen-minute intervals after the short sale to calculate the abnormal return, the translation to three days before until three days after the event is believed to be a useful addition to this research, as it represents a slightly longer period than one day before until one day after the event.

after the event is used, which is similar to the method of Senchack and Starks (1993).

The model that will be used for the period (-1,1) is similar to the one which is formulated for the period (0,1). Nevertheless, a problem that comes up when using longer term periods, is that for some firms several announcements of new or changed net short positions take place in these periods. Hence, a dummy variable will be added to the regression model as described above to control for these multiple events. This variable, $MULTIPLE_{it}$, is a binary variable taking the value of either zero or one. A value of zero indicates only one announcement of a new or changed net short position in the mentioned period, whereas a value of one indicates multiple announcements of new or changed net short positions in the mentioned period. This leads to the following regression model for the abnormal return periods (0,3), (0,15), (-3,3), and (-15,15):

$$AR_{it} = \alpha_0 + \beta_1 SHORT_{it} + \beta_2 OPTIONED_i + \beta_3 MONTH_t + \beta_4 MULTIPLE_{it} + \varepsilon_{it} \quad (2)$$

In this model, β_4 is expected to take a negative value, assuming that more short selling activity will lead to a more negative abnormal return.

Furthermore, an adjusted method to calculate the abnormal returns will be applied. The method adopted in the model does not control for the differences in risks associated with the different firms (Dechow et al., 2001). Therefore, the abnormal returns will also be calculated by adapting the stock returns of the different firms by means of the 3-year betas of the stocks, as done by Figlewski (1981).

3.2.2 Independent variable: net short positions

The independent variable in this research is the total (net) short selling position taken in the stock of a company on a certain date, in percentages. The net short position is a continuous variable, as it can take any value between 0% and 100%. The measures for this variable are the total net short selling positions in a company, as reported on a certain date in the short selling register of the AFM, which is updated frequently. These net short selling positions cover the shares that an investor holds short in the stock of a company subtracted by the shares which the same investor holds long in that company.

3.2.3 Control variables

In addition to the dependent and independent variables, two control variables are added, based on prior research. The control variables relate to the the fact whether optioned stocks are available and to the fact whether the short sale is announced in the last three trading days of a financial year. These control variables are believed to be the most suitable to the Dutch stock market.

3.2.3.1 Optioned stocks

The first control variable relates to optioned stocks. Research has indicated that options can reduce the impact of constraints on short selling by reducing short selling costs (Diamond & Verrecchia, 1987; Figlewski & Webb, 1993). This means that short sales in optioned stocks are less likely to be informative. As a consequence, when options are available for a certain stock, the negative impact on abnormal returns is reduced. Therefore, this paper includes a binary variable to control for the fact whether optioned stocks are available for the stock in which investors take a net short position or not.

3.2.3.2 Stocks traded in the last three days of the financial year

The second control variable in the model of this paper relates to taxes. Some authors of academic articles have argued that investors might like to have a short position in a stock in which they also hold a long position, at the end of the financial year. By doing this, capital gains or losses can be locked in and carried into the next year (Brent et al., 1990; Aitken et al., 1998). Aitken et al. (1998) control for this possibility by determining whether a short position was taken in the last three trading days of the financial year. Hence, this paper also includes a binary variable to control for whether the short sale is announced in the last three trading days of the financial year (from January to December) or not.

4. DATA

In this section, the process of the collection and preparation of the data is described. On top of that, the descriptive statistics of the data will be provided.

4.1 Sample

In this study, the short selling data are obtained for several Dutch listed firms in the tax years 2013 and 2014, from January 2013 to December 2014. These are the only two full tax, or financial, years which are present in the short selling register of the AFM. The AFM collects information on net short positions in companies which are listed on the Dutch stock market. These net short positions are determined by subtracting the long position which a certain investor holds in a company from the short position which this investor holds in that company. An investor should report a net short position to the AFM as soon as a total of 0.2% of the outstanding share capital of a company or of a sovereign debt is reached and, after that, for every subsequent 0.1% above the 0.2% threshold. These notifications will be made public in the short selling register of the AFM when reaching 0.5% of the total outstanding share capital of a company and for every subsequent 0.1% above this 0.5% threshold. Net short positions in sovereign debts are not made available to the public. Net short positions appear for the last time in the register when they reach below the 0.5% threshold (AFM, n.d.). Therefore, the data used in this research solely consist of short positions in Dutch firms which are listed on the Dutch stock market and reported in the short selling register of the AFM as it was published on the 20th April 2015. The net short positions used are taken from both the current and archive parts of the AFM register for the years 2013 and 2014. These data include both new and changed net short positions, adding up to a total of 1,887 observations. Nonetheless, these data also contain several announcements of short sale positions in the same firm on the same date. Because this research considers the total announcement of a net short selling position on a certain date for a certain firm, the total net short selling positions per date for each firm are calculated. This leads to a total of 1,458 observations for 33 firms.

In order to make the dataset suitable for this research some adaptations were made. First of all, the companies which were in the register because they are listed on the Dutch stock market, but were not Dutch companies, were removed from the dataset. The reason for this is that this paper focuses on evidence from Dutch companies. Furthermore, the companies SNS Reaal N.V. and Corio N.V. were taken out of the dataset, because SNS Reaal N.V. was nationalised in February 2013 and Corio N.V. was taken over by Klépierre S.A. in July 2014. On top of that, there were no adjusted stock prices available for NSI N.V. and Wereldhave N.V. in the database and, thus, the data for these two companies were also erased from the dataset. After this, the net short positions of 0% were removed. Finally, two entries for Royal Imtech N.V. were taken out of the sample due to a lack of data. All in all, the final dataset contains 1,261 observations of announcements of new or changed net short positions for 26 firms. The other required data, including adjusted stock prices, the AEX Index, stock betas, and

information on whether optioned stocks were available for the company or not, are gathered from several other databases[2].

4.2 Descriptive statistics

In Table 2 the descriptive statistics are given for the dependent variable, the independent variable, and the control variables. As can be seen from this table, the standard deviations for the different measures of the abnormal returns are quite large. These high standard deviations are caused by some extreme observations of abnormal returns, which can be derived from the low minimum values and the high maximum values for all measures of abnormal returns. Therefore, another dataset was created where extreme outliers are excluded. According to De Veaux, Velleman, and Bock (2014), extreme outliers, or far outliers, are "data values farther than 3 IQRs from the quartiles" (p. 91). Hence, extreme outliers are defined as observations that lie outside a range of three times the interquartile range (IQR) below the first quartile (Q1) or above the third quartile (Q3) for either the period (-1,1), or the period (-3,3), or the period (-15,5)[3]. After doing this, 1,119 observations are left in the final sample, for 25 firms[4].

The descriptive statistics of the data after excluding the extreme outliers are presented in Table 3. When the extreme outliers are not taken into account, the standard deviations show a much lower value, also for the periods (0,1), (0,3), and (0,15). Also the minimum and maximum values for the different measures of abnormal returns take less extreme values. Especially the periods (0,3) and (0,15) still show some deviating values for the minimum and maximum values, but the standard deviations for these periods have also decreased by more than 50%. Overall, the means take logical values if compared to prior research, assuming that abnormal returns of shorted stocks are lower than expected: negative and becoming more negative when going from shorter periods to longer periods of time. Nevertheless, two values stand out. The abnormal return for the period (0,3) and the adjusted abnormal return for the period (0,3). These two means take positive values, while a negative value would be expected based on the hypothesis. Furthermore, the medians show the same negative direction as the means for most values, but again two values are different. These values concern the median of the abnormal return for the period (-3,3) and the median of the adjusted abnormal return for the period (-3,3). Regarding the net short position, the descriptive statistics show that the average total net short position announced is 1.253%, ranging from 0.050% to 7.870%. On top of that, the means for the categorical variables give some indication of the percentage of the total number of observations that takes a value of one. Hence, about 92% of the announcements of net short positions in the sample took place in optioned stocks. This number is higher than the average percentage found by Aitken et al. (1998), who found about 76% of the total short sales in their sample to be in optioned stocks. On the other hand, only about 0.9% of the short selling positions in the sample was announced in the last three trading days of a tax year, whereas Aitken et al. (1998) indicate that about 2% of the short sales in their sample occurred in the last three trading days of a tax year. Further, for all variables which account for multiple short sales within the period over which the abnormal return is calculated, more than half of the sample shows that multiple announcements took place in these periods. Additionally, this percentage grows as the period is longer. This would be logical, since the longer the period, the more opportunities to take a short position in a stock and the more information could find its way to the market.

5. RESULTS

In this section, the results of the model, as formulated in section 3.1, will be reported and discussed.

5.1 Period (0,1), (0,3), and (0,15)

The results of the regression models for the periods (0,1), (0,3), and (0,15) are reported in Table 4.

5.1.1 Abnormal returns

For the periods (0,1) and (0,15), the coefficients of the variable representing the announced level of net short interest are in the expected direction, namely negative. Nevertheless, the values are not very high. Firstly, the coefficient of the $SHORT_{it}$-variable for the period (0,1) takes a value of -0.001, which means that the model predicts that an increase in the announced total net short position of one percentage point would lead to a decrease in the abnormal return in the period (0,1) of 0.001 percentage point. Secondly, the same coefficient takes a value of -0.068 for the period (0,15). This means that an increase in the announced total net short position of one percentage point would lead to a decrease in the abnormal return over the period (0,15) of 0.068 percentage point, as predicted by the model. Interestingly, the coefficient of the variable $SHORT_{it}$ shows a positive value of 0.219 in the period (-3,3). Hence, the model for this period predicts that an increase of one percentage point in the announced level of net short interest would lead to an increase of the abnormal return over the period (-3,3) by 0.219 percentage point. Nevertheless, in none of these models the variable $SHORT_{it}$ is statistically significant. Furthermore, the models do not produce any statistically significant results for the control variables. Lastly, the model fits for these three periods are very low and the models are not significant. Hence, there is no evidence to assume that short selling impacts abnormal returns of stocks significantly in the periods (0,1), (0,3), and (0,15).

5.1.2 Adjusted abnormal returns

For the periods (0,1), (0,3), and (0,15), the models which take into account the abnormal returns which are adjusted for the stock betas do not yield remarkably different results from the models with the unadjusted abnormal returns. The coefficients of all variables do take slightly higher values, but are in the same direction. First of all, the coefficients of the $SHORT_{it}$-variables are in the expected (negative) direction for the periods (0,1) and (0,15), taking the values of -0.014 and -0.221 respectively. Thus, the model predicts that a rise in the announced total net short position in the stock of a firm by one percentage point would lead to a 0.014 percentage point lower abnormal return for the period (0,1) and a 0.221 percentage point lower abnormal return for the period (0,15). The variable $SHORT_{it}$ again shows a deviating value for the period (0,3),

[2] These databases were respectively Yahoo Finance, ORBIS, and the AEX.

[3] The reason why the outliers are not excluded for the periods (0,1), (0,3), and (0,15), although there seem to be some higher values left in these periods, is that these periods are already included in the periods (-1,1), (-3,3), and (-15,15). Therefore, most of the outliers for these period are already removed and taking out the other outliers for the periods (0,1), (0,3), and (0,15) would bias the results of the other periods by taking out values which are not deviating for these periods. Furthermore, creating two different samples would make comparisons among the different periods less meaningful, since they would not be based on the same observations.

[4] The two observations for Pharming Group N.V. both belong to the extreme outliers. As a consequence, this firm is not present in the final sample without extreme outliers anymore. See Appendix A for a detailed overview of the firms in this research.

Table 2: Descriptive statistics

Descriptive statistics of all the variables used in this paper (N = 1,261), with the variables in the rows and the descriptive statistics in the columns. Decimal numbers are rounded to three decimals.

Variable	Mean	Median	Mode (smallest)	Standard deviation	Minimum	Maximum
Abnormal return (0,1)	0.608%	-0.100%	-0.970%	20.200%	-68.181%	482.207
Abnormal return (0,3)	1.461%	-0.092%	-83.217%	27.599%	-83.217%	515.906%
Abnormal return (0,15)	-0.917%	-0.977%	-94.286%	28.392%	-94.286%	445.062%
Abnormal return (0,1) – adjusted	0.592%	-0.131%	-68.704%	20.200%	-68.704%	481.877%
Abnormal return (0,3) – adjusted	1.418%	-0.132%	-83.573%	27.613%	-83.573%	515.139%
Abnormal return (0,15) – adjusted	-1.076%	-0.730%	-96.934%	28.545%	-96.934%	447.122%
Abnormal return (-1,1)	0.845%	-0.087%	-75.893%	24.548%	-75.893%	508.171%
Abnormal return (-3,3)	0.855%	-0.119%	-82.428%	29.407%	-82.428%	512.686%
Abnormal return (-15,15)	-5.807%	-3.323%	-98.418%	24.183%	-98.418%	221.770%
Abnormal return (-1,1) – adjusted	0.825%	-0.087%	-76.565%	24.541%	-76.565%	507.678%
Abnormal return (-3,3) – adjusted	0.763%	-0.212%	-82.135%	29.349%	-82.135%	511.638%
Abnormal return (-15,15) – adjusted	-6.072%	-3.469%	-102.936%	24.252%	-102.936%	221.658%
Net short position	1.339%	0.920%	0.490%	1.056%	0.050%	7.870%
Options	0.926	1	1	-	0	1
Tax	0.008	0	0	-	0	1
Multiple announcements (0,3)	0.722	1	1	-	0	1
Multiple announcements(0,15)	0.929	1	1	-	0	1
Multiple announcements (-3,3)	0.868	1	1	-	0	1
Multiple announcements(-15,15)	0.987	1	1	-	0	1

Table 3: Descriptive statistics, after excluding extreme outliers

Descriptive statistics of all the variables used in this paper after excluding the extreme outliers (N = 1,119), with the variables in the rows and the descriptive statistics in the columns. Decimal numbers are rounded to three decimals.

Variable	Mean	Median	Mode (smallest)	Standard deviation	Minimum	Maximum
Abnormal return (0,1)	-0.012%	-0.012%	-0.970%	2.360%	-13.838%	20.736%
Abnormal return (0,3)	0.307%	-0.020%	-18.746	9.379%	-18.746%	224.389%
Abnormal return (0,15)	-0.996%	-0.768%	-58.453%	12.595%	-58.453%	214.585%
Abnormal return (0,1) – adjusted	-0.031%	-0.087%	-13.743%	2.351%	-13.743%	19.817%
Abnormal return (0,3) – adjusted	0.263%	-0.054%	-19.491%	9.422%	-19.491%	225.693%
Abnormal return (0,15) – adjusted	-1.098%	-0.626%	-59.105%	12.601%	-59.105%	215.574%
Abnormal return (-1,1)	-0.014%	-0.010%	-12.328%	3.259%	-12.328%	12.796%
Abnormal return (-3,3)	-0.267%	0.073%	-23.532%	5.810%	-23.532%	21.915%
Abnormal return (-15,15)	-3.547%	-2.548%	-56.355%	14.667%	-56.355%	46.443%
Abnormal return (-1,1) – adjusted	-0.037%	-0.038%	-12.360%	3.278%	-12.360%	12.744%
Abnormal return (-3,3) – adjusted	-0.362%	0.030%	-22.627%	5.812%	-22.627%	22.668%
Abnormal return (-15,15) – adjusted	-3.759%	-2.621%	-60.270%	14.680%	-60.270%	46.543%
Net short position	1.253%	0.890%	0.490%	0.978%	0.050%	7.870%
Options	0.920	1	1	-	0	1
Tax	0.009	0	0	-	0	1
Multiple announcements (0,3)	0.698	1	1	-	0	1
Multiple announcements (0,15)	0.921	1	1	-	0	1
Multiple announcements (-3,3)	0.856	1	1	-	0	1
Multiple announcements (-15,15)	0.986	1	1	-	0	1

Table 4: Results for the periods (0,1), (0,3), and (0,15)

The results for the regression models. The periods are represented in the columns, whereas the rows show the values for each of the variables in the models. For the description of each of the variables, see section 3.2. The first number in each cell indicates the coefficient in the regression model, while the value between brackets represents the result of the t-test. At the bottom, the adjusted R^2 and the F-statistic for each of the different models are reported. (N = 1,119)

	Abnormal return			**Abnormal return – adjusted for stock beta**		
	Period (0,1)	**Period (0,3)**	**Period (0,15)**	**Period (0,1)**	**Period (0,3)**	**Period (0,15)**
Intercept	0.147	0.498	-0.813	0.230	0.667	0.427
	(0.566)	(0.462)	(-0.458)	(0.893)	(0.617)	(0.240)
$SHORT_{it}$	-0.001	0.219	-0.068	-0.014	0.159	-0.221
	(-0.014)	(0.737)	(-0.173)	(-0.195)	(0.532)	(-0.563)
$OPTIONED_i$	-0.176	-0.545	0.836	-0.270	-0.669	-0.296
	(-0.671)	(-0.521)	(0.593)	(-1.031)	(-0.637)	(-0.210)
$MONTH_t$	0.504	0.308	3.947	0.569	0.277	3.745
	(0.671)	(0.103)	(0.984)	(0.760)	(0.092)	(0.933)
$MULTIPLE_{it}$	-	0.048	-0.979	-	0.014	-1.094
		(0.076)	(-0.686)		(0.022)	(-0.766)
Adjusted R^2	-0.002	-0.003	-0.002	-0.001	-0.003	-0.002
F-statistic	0.316	0.203	0.424	0.604	0.164	0.517

Table 5: Results for the periods (-1,1), (3,3), and (15,15)

The results for the regression models. The periods are represented in the columns, whereas the rows show the values for each of the variables in the models. For the description of each of the variables, see section 3.2. The first number in each cell indicates the coefficient in the regression model, while the value between brackets represents the result of the t-test. At the bottom, the adjusted R^2 and the F-statistic for each of the different models are reported. (N = 1,119)

	Abnormal return			**Abnormal return – adjusted for stock beta**		
	Period (-1,1)	**Period (-3,3)**	**Period (-15,15)**	**Period (-1,1)**	**Period (-3,3)**	**Period (-15,15)**
Intercept	0.695*	2.154***	4.521	0.904**	2.354***	5.666
	(1.950)	(2.950)	(1.176)	(2.526)	(3.230)	(1.481)
$SHORT_{it}$	-0.259***	-0.378**	-3.098***	-0.292***	-0.488***	-3.386***
	(-2.589)	(-2.082)	(-7.003)	(-2.909)	(-2.691)	(-7.688)
$OPTIONED_i$	-0.428	-1.536**	-1.101	-0.634*	-1.701***	-2.135
	(-1.185)	(-2.385)	(-0.691)	(-1.748)	(-2.648)	(-1.345)
$MONTH_t$	1.011	0.262	8.078*	0.908	-0.166	7.248
	(0.978)	(0.142)	(1.773)	(0.875)	(-0.90)	(1.598)
$MULTIPLE_{it}$	-	-0.625	-3.291	-	-0.626	-3.329
		(-1.236)	(-0.909)		(-1.242)	(-0.923)
Adjusted R^2	0.006	0.010	0.045	0.010	0.014	0.055
F-statistic	3.349**	3.687***	14.286***	4.595***	4.984***	17.407***

* *Significant at the 0.10 level*

** *Significant at the 0.05 level*

*** *Significant at the 0.01 level*

namely a positive value of 0.159. This would indicate that the model predicts that in the period (0,3) the abnormal return would increase by 0.159 percentage point if the total announced net short interest increases by one percentage point. Nevertheless, none of these values are statistically significant, as was also the case in the models with unadjusted abnormal returns. Furthermore, the control variables did not produce statistically significant results either. Finally, the model fits take low values and the models are not significant. Hence, the results of this model do not provide enough evidence to conclude that the variables which are included in the regression models have a significant impact on the adjusted abnormal stock returns in the periods (0,1), (0,3), and (0,15).

5.2 Period (-1,1), (-3,3), and (-15,15)

The results of the regression models for the periods (-1,1), (-3,3), and (-15,15) are reported in Table 5.

5.2.1 Abnormal returns

For the periods (-1,1), (-3,3), and (-15,15), the coefficient of the main variable of interest, the $SHORT_{it}$-variable, is in the expected direction, namely negative. Other studies also found this negative relationship, as discussed previously in section 2.1. Moreover, for all three models, the variable $SHORT_{it}$ was found to be statistically significant at the 0.01 level. The coefficient of the $SHORT_{it}$-variable takes a value of -0.259 for the period (-1,1). This value is relatively high, as it would indicate that the model predicts that the abnormal return over the period (-1,1) would decrease by 0.259 percentage point, when the announced level of net short interest increases by one percentage point. For the period (-3,3), the coefficient of the variable that represents the announced total net short position in a stock on a certain trading day takes a value of -0.378. Therefore, the model predicts that the abnormal return over the period (-3,3) would decrease by 0.378 percentage point, when the total announced net short position increases by one percentage point. Furthermore, the coefficient of the $SHORT_{it}$-variable for the period (-15,15) is -3.098, indicating that an increase of one percentage point in the announced total net short position would lead to a decrease of the abnormal return over the period (-15,15) by 3.098 percentage point. Hence, overall, the decreases in abnormal returns due to short selling become larger if the time period over which the abnormal return is measured is longer. All in all, the results for these periods seem to be supporting the hypothesis, formulated in section 2.2, which states that short selling has a negative impact on stock returns in the Netherlands.

Regarding the control variables used in this paper, only the $OPTIONED_i$-variable was found to be statistically significant in the period (-3,3) and the $MONTH_t$-variable was found to be statistically significant in the period (-15,15). The same results were found for the other periods, but the variables were not statistically significant there. The $MONTH_t$-variable takes a statistically significant positive value in the period (-15,15) at the 0.1 level. This positive direction is in accordance with findings from prior literature and the assumption that tax-related short selling mitigates the negative effect of short selling on abnormal returns. More remarkably, the $OPTIONED_i$-variable in period (-3,3) takes a statistically significant negative value at the 0.05 level. This is remarkable, since the expectation based on prior literature is that the availability of optioned stocks would mitigate the negative effect of short selling on abnormal returns. One reason why the $OPTIONED_i$-variable is negative might be that it interacts with the SHORTit-variable, because in the case of hedging or arbitraging an investor could take options in a stock at the same time as taking a (net) short position in a stock. In this model, there does seem to be a statistically significant positive correlation between the variables $OPTIONED_i$ and $SHORT_{it}$, which is higher than the correlation between the $OPTIONED_i$-variable and the abnormal return over the period (-3,3). Nevertheless, the tolerance is still very high and the variance inflation factor is low. In addition, the Pearson correlation with the abnormal return also takes a negative value at a statistically significant level. Finally, adding an interaction term, for the variables $SHORT_{it}$ and $OPTIONED_i$, to the original regression model does not yield a significant result for the interaction term[5]. Nevertheless, more research is necessary to determine the reason for the negative coefficient of the variable $OPTIONED_i$.

5.2.2 Adjusted abnormal returns

For the periods (-1,1), (-3,3), and (-15,15), the regression models which include the adjusted abnormal returns lead to slightly different results than the models which are based on the unadjusted abnormal returns. The $SHORT_{it}$-variable still takes increasingly negative values when increasing the length of the period. This variable takes the values -0.292, -0.488, and -3.386 for the periods (-1,1), (-3,3), and (-15,15) respectively. Hence, the model predicts that an increase of one percentage point in the total net short position which is announced would result in a decrease of the abnormal return of 0.292 percentage point for period (-1,1), of 0.488 percentage point for period (-3,3), and of 3.386 percentage point for period (-15,15). In addition, the $SHORT_{it}$-variable is statistically significant in all three models. Therefore, the model indicates that the announced short position on a certain date has a negative impact on the abnormal returns in the period (-1,1), (-3,3), and (-15,15). This is in accordance with the hypothesis formulated in section 2.2.

The control variables do not lead to statistically significant results with the exception of the $OPTIONED_i$-variable in the periods (-1,1) and (-3,3). Like for the model which was based on the unadjusted abnormal returns, the results imply that selling short in stocks for which options are available has a negative impact on the abnormal return of a stock in these two periods. However, this is opposite to the expectations based on prior literature as explained in the previous section. The possible reason for the negative coefficients of the $OPTIONED_i$-variable could be the interaction with the $SHORT_{it}$-variable, as described in section 5.2.1. For these models, the correlation between the variables $OPTIONED_i$ and $SHORT_{it}$ is also stronger than the correlation between the variable $OPTIONED_i$ and the abnormal return. However, in these models the tolerance is also very high, whereas the variance inflation factor is low. Additionally, the Pearson correlation with the abnormal return is also negative at a statistically significant level. Lastly, the addition of an interaction term does not lead to statistically significant coefficients for the interaction terms either.[6]

Altogether, both the model fits and the model significances are slightly higher for the models which include the adjusted abnormal returns rather than the unadjusted abnormal returns. This indicates that these models are slightly more useful in explaining the influence of short selling on stock returns. However, as indicated at the beginning of this section, the differences are relatively small.

6. CONCLUSIONS & RECOMMENDATIONS

In this final section, the conclusions of this paper will be discussed. Lastly, a number of limitations of this research as well as some recommendations for further research and for practice will be provided.

6.1 Conclusions

This paper focuses on the impact of short selling on stock returns in the Netherlands, a country which has not been researched often with regard to short selling. In order to do so, total net short selling positions which were announced for firms

[5] See Appendix B for an overview of the Pearson correlations, the tolerance, the variance inflation factor, and the regression results with the interaction term. An interaction term was chosen, because it shows the influence on abnormal returns of a possible interaction between the availability of options for a certain stock (that is, if $OPTIONED_i$ takes the value of one) and a short sale in this stock.

[6] See Appendix B.

on certain dates in the short selling register of the AFM are used. These data have been available since November 2012, due to a change in European regulation regarding short selling. The short selling data from January 2013 to December 2014 are used. The abnormal return is calculated by means of the adjusted stock prices for the firms involved. It is calculated in two ways: one measure is not adjusted in any way for the firm risk, whereas the other measure is adjusted for the stock beta. For both measures, the abnormal return is calculated over six different periods of time: (0,1), (0,3), (0,15), (-1,1), (-3,3), and (-15,15). Furthermore, two control variables are added to the model: one variable to control for the fact whether optioned stocks were available, or not, and one variable to control for the fact whether the short sale was announced in the last three trading days of a tax year, or not. Finally, for the periods (0,3), (0,15), (-3,3), and (-15,15) a variable is added to control for the fact whether more short sale announcements took place within these periods, or not.

The results of this paper show that there is a significant effect of the net short selling position taken in a stock on the abnormal return for the periods (-1,1), (-3,3), and (-15,15). Thus, there seems to be a stock price reaction due to the announcement of a net short position. Nevertheless, a significant impact was not found for the periods (0,1), (0,3), and (0,15). Since there is a significant influence for the periods that take into account one or more days before the announcement of a net short position, in addition to the same number of days after the announcement, it seems there is some leakage of information prior to the announcement of a net short position. This could explain why there is a significantly negative price reaction due to short selling in these periods, while there is no statistically significant result for the periods that do not take into account some days prior to the announcement. Hence, it can be assumed that the hypothesis, which states that short selling negatively influences stock returns in the Netherlands, is correct. This finding is consistent with the results found in prior academic literature in this field for other countries.

Next to this, an interesting finding is that stocks for which options were available tend to have a more negative effect on abnormal returns than stocks for which options were not available. Although this result is found in most models, it is only statistically significant in three models. A negative direction of the variable that accounts for optioned stocks is not compliant with the results from prior research, which indicate that stocks for which options are available reduce the negative effect of short selling. Nevertheless, this negative impact could be due to the interrelation between the availability of optioned stocks and short selling, although the interaction term is not found to be statistically significant in this study.

Furthermore, the variable that controls for the fact whether a short sale was announced in the last three trading days and the variable that accounts for multiple announcements of short sales for the longer periods are not found to be statistically significant. These findings suggest that tax-related short selling and multiple short sale announcements within a certain period do not significantly impact stock returns in the Netherlands.

All in all, it seems that short selling in the Netherlands does have an impact on stock returns. On top of that, while the control variables are not significant in all models, it seems that short selling is likely to be driven by information. Nevertheless, since this paper only covers a limited part of the variables which influence abnormal returns, no definite statement can be made about this. Moreover, it is relevant to say that the sample of this study only covers Dutch firms which are listed on the Dutch stock market. Hence, the conclusions of this research cannot be generalised and applied to other countries. Finally, it should be noted that the short selling data used in this paper consist of net short selling data, which differs from the data used in previous studies.

6.2 Limitations & Recommendations for further research

As stated above, this paper does not cover all possible explanations for abnormal returns and the influence of short selling on abnormal returns. Therefore, it is recommended to do further research on the factors that can influence the abnormal returns and the nature of its relation with short selling. Likewise, it would be highly recommended to take into account other events, next to the announcement of short interest, that occurred in the same time period. This could lead to a deeper understanding of short selling in the Netherlands and its influence on stock returns. Next to this, it is recommended to use a larger dataset. Because short selling data has been available only since November 2012, there is not much data publically available yet. It would be valuable to do further research on a larger sample in a few years' time. This data will probably contain more firms as well, which could also provide additional insights. In addition, in this paper, the three-year beta was used to calculate the adjusted abnormal return. Since this beta is an estimation, it could influence the results. Hence, it would be advised to do a similar study, but with other measures of abnormal returns to look at the impact on the results. Furthermore, a closer look at the longer periods over which the abnormal returns are calculated in this study would be recommended. The short interest in this study was not averaged over the longer periods in which more than one announcement of a total net short position in the stock of a firm occurred. On top of that, it could be interesting to investigate the reasons of investors to take a short position in Dutch firms. Finally, it is advised to further research the influence of the availability of optioned stocks on abnormal returns and the interrelation between the availability of optioned stocks and short selling. This could lead to an explanation of the surprising finding in this study that optioned stocks have a more negative influence on stock returns than non-optioned stocks.

6.3 Recommendations for practice

It seems that on the day immediately following the announcement of a new or changed short position, three days after the announcement, and fifteen days after the announcement, there is no significant impact of short selling on the stock price. Nevertheless, the results do show a strong influence of the announcement of net short positions on abnormal returns when taking into account some days prior to the event as well. As a consequence, it appears to be possible to make profits by means of short selling in the Netherlands. It is advised that investors monitor the market closely and adjust their investment strategies to the evidence found in this research, namely that short selling does have an influence on stock returns. Finally, it would be recommended to take into account the possibility of information leakage on the market prior to the announcement of a net short position. When investors use this information, it could help them to find opportunities to make short selling profits.

7. ACKNOWLEDGMENTS

I would like to thank the supervisory team of the Finance & Accounting track for supporting me in writing this paper. My special thanks go to Dr. X. Huang, who has given me continuous feedback and who has provided me with suggestions and help to improve my paper. Finally, I would like to thank my family and friends for their support.

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9. APPENDICES

9.1 Appendix A: The firms

In this appendix, an overview of the firms in the dataset, the sample including outliers, and the final sample excluding outliers is reported. For each of these, the number of observations for each firm, as well as the percentage of the total these observations represent, are reported.

Table A.1 Overview of the firms in the initial dataset, the sample including outliers, and the final sample excluding outliers

The different companies are reported in the rows. The frequencies of the observations and the percentages of the total dataset, the sample including outliers, and the final sample excluding outliers are reported in the columns for each company.

	Initial dataset		**Sample including outliers**		**Sample excluding outliers**	
Company	**Frequency**	**Percentage**	**Frequency**	**Percentage**	**Frequency**	**Percentage**
Accell Group N.V.	6	0,41%	6	0,48%	6	0,54%
AMG Advanced Metallurgical Group N.V.	24	1,65%	23	1,82%	23	2,06%
Aperam S.A.	114	7,82%	-	-	-	-
ArcelorMittal S.A.	11	0,75%	-	-	-	-
ASM International N.V.	8	0,55%	8	0,63%	8	0,71%
BinckBank N.V.	12	0,82%	12	0,95%	12	1,07%
Corbion N.V.	22	1,51%	22	1,74%	22	1,97%
Corbion N.V. (voorheen CSM N.V.)	5	0,34%	5	0,40%	5	0,45%
Core Laboratories N.V.	79	5,42%	79	6,26%	77	6,88%
Corio N.V.	12	0,82%	-	-	-	-
Eurocommercial Properties N.V.	4	0,27%	4	0,32%	4	0,36%
Exact Holding N.V.	2	0,14%	2	0,16%	2	0,18%
Fugro N.V.	180	12,35%	180	14,27%	165	14,75%
Gemalto N.V.	70	4,80%	70	5,55%	69	6,17%
Heijmans N.V.	52	3,57%	51	4,04%	51	4,56%
Koninklijke BAM Groep N.V.	108	7,41%	108	8,56%	98	8,76%
Koninklijke KPN N.V.	51	3,50%	51	4,04%	50	4,47%
Koninklijke Ten Cate N.V.	1	0,07%	1	0,08%	1	0,09%
Koninklijke Vopak N.V.	14	0,96%	14	1,11%	14	1,25%
NSI N.V.	12	0,82%	-	-	-	-
Nutreco N.V.	2	0,14%	2	0,16%	2	0,18%
Pharming Group N.V.	2	0,14%	2	0,16%	-	-
PostNL N.V.	80	5,49%	80	6,34%	75	6,70%
Royal Imtech N.V.	276	18,93%	272	21,57%	170	15,19%
SBM Offshore N.V.	105	7,20%	105	8,33%	101	9,03%
SNS Reaal N.V.	12	0,82%	-	-	-	-
TNT Express N.V.	24	1,65%	24	1,90%	24	2,14%
TomTom N.V.	79	5,42%	79	6,26%	79	7,06%
Unibail-Rodamco SE	8	0,55%	-	-	-	-
USG People N.V.	46	3,16%	46	3,65%	46	4,11%
Wereldhave N.V.	22	1,51%	-	-	-	-
Wolters Kluwer N.V.	11	0,75%	11	0,87%	11	0,98%
Ziggo N.V.	4	0,27%	4	0,32%	4	0,36%
Total	1,458	100%	1,261	100%	1,119	100%

9.2 Appendix B: Correlations, tolerances, variance inflation factors, and interaction terms

In this appendix, an overview is provided of the Pearson correlations, the tolerances, the variance inflation factors, and the regressions including interaction terms for the variables $SHORT_{it}$ and $OPTIONED_i$ for the period (-1,1) with the adjusted abnormal return and for the period (-3,3) both with the unadjusted and the adjusted abnormal return.

Table A.2a Pearson correlations for period (-1,1) with the adjusted abnormal return

The Pearson correlations for all variables in the regression model for the period (-1,1) with the adjusted abnormal return. For the description of each of the variables, see section 3.2. The first number in each cell indicates the correlation coefficient, while the value between brackets represents the p-value of the correlation. At the bottom, the tolerance and variance inflation factor (VIF) are reported for the independent variable and each control variable. (N = 1,119)

	AR_{it}	**$SHORT_{it}$**	**$OPTIONED_i$**	**$MONTH_t$**
AR_{it}	1	-0.093*** (0.002)	-0.063** (0.035)	0.030 (0.317)
$SHORT_{it}$	-0.093*** (0.002)	1	0.110*** (0.000)	-0.019 (0.526)
$OPTIONED_i$	-0.063** (0.035)	0.110*** (0.000)	1	-0.42 (0.158)
$MONTH_t$	0.030 (0.317)	-0.019 (0.526)	-0.042 (0.158)	1
Tolerance	-	0.988	0.986	0.998
VIF	-	1.012	1.014	1.002

Table A.2b Pearson correlations for period (-3,3) with the unadjusted abnormal return

The Pearson correlations for all variables in the regression model for the period (-3,3) with the unadjusted abnormal return. For the description of each of the variables, see section 3.2. The first number in each cell indicates the correlation coefficient, while the value between brackets represents the p-value of the correlation. At the bottom, the tolerance and variance inflation factor (VIF) are reported for the independent variable and each control variable. (N = 1,119)

	AR_{it}	**$SHORT_{it}$**	**$OPTIONED_i$**	**$MONTH_t$**	**$MULTIPLE_{it}$**
AR_{it}	1	-0.080*** (0.008)	-0.081*** (0.007)	0.011 (0.711)	-0.056* (0.059)
$SHORT_{it}$	-0.080*** (0.008)	1	0.110*** (0.000)	-0.019 (0.526)	0.212*** (0.000)
$OPTIONED_i$	-0.081*** (0.0007)	0.110*** (0.000)	1	-0.042 (0.158)	0.068** (0.024)
$MONTH_t$	0.011 (0.711)	-0.019 (0.526)	-0.042 (0.158)	1	-0.069** (0.020)
$MULTIPLE_{it}$	-0.056* (0.059)	0.212*** (0.000)	0.068** (0.024)	-0.069** (0.020)	1
Tolerance	-	0.946	0.984	0.994	0.949
VIF	-	1.057	1.016	1.006	1.054

* *Significant at the 0.10 level;*

** *Significant at the 0.05 level*

*** *Significant at the 0.01 level*

Table A.2c Pearson correlations for period (-3,3) with the adjusted abnormal return

The Pearson correlations for all variables in the regression model for the period (-3,3) with the adjusted abnormal return. For the description of each of the variables, see section 3.2. The first number in each cell indicates the correlation coefficient, while the value between brackets represents the p-value of the correlation. At the bottom, the tolerance and variance inflation factor (VIF) are reported for the independent variable and each control variable. (N = 1,119)

	AR_{it}	**$SHORT_{it}$**	**$OPTIONED_i$**	**$MONTH_t$**	**$MULTIPLE_{it}$**
AR_{it}	1	-0.099*** (0.001)	-0.091*** (0.002)	0.005 (0.872)	-0.060** (0.043)
$SHORT_{it}$	-0.099*** (0.001)	1	0.110*** (0.000)	-0.019 (0.526)	0.212*** (0.000)
$OPTIONED_i$	-0.091*** (0.002)	0.110*** (0.000)	1	-0.42 (0.158)	0.068** (0.024)
$MONTH_t$	0.005 (0.872)	-0.019 (0.526)	-0.042 (0.158)	1	-0.069** (0.020)
$MULTIPLE_{it}$	-0.060** (0.043)	0.212*** (0.000)	0.068** (0.024)	-0.069** (0.020)	1
Tolerance	-	0.946	0.984	0.994	0.949
VIF	-	1.057	1.016	1.006	1.054

Table A2.d: Regressions with interaction term

The results for the regression with the interaction term of the variables $SHORT_{it}$ and $OPTIONED_i$. The periods are represented in the columns, whereas the rows show the values for each of the variables in the models. For the description of each of the variables, see section 3.2. The variable $SHORT_{it}$ is centred to avoid multicollinearity. The first number in each cell indicates the coefficient in the regression model, while the value between brackets represents the result of the t-test. At the bottom, the adjusted R^2 and the F-statistic for each of the different models are reported. (N = 1,119)

	Abnormal return	**Abnormal return – adjusted for stock beta**	
	Period (-3,3)	**Period (-1,1)**	**Period (-3,3)**
Intercept	1.362 (1.361)	0.314 (0.637)	1.598 (1.600)
$SHORT_{it}$	-1.187 (-0.689)	-0.905 (-0.940)	-0.855 (-0.497)
$OPTIONED_i$	-1.243 (-1.390)	-0.410 (-0.815)	-1.569* (-1.757)
$MONTH_t$	0.287 (0.156)	0.922 (0.889)	-0.155 (-0.084)
$MULTIPLE_{it}$	-0.597 (-1.172)	-	-0.614 (-1.208)
Interaction term	0.816 (0.472)	0.620 (0.640)	0.370 (0.214)
Adjusted R^2	0.009	0.009	0.013
F-statistic	2.992**	3.547***	3.993***

* *Significant at the 0.10 level*

** *Significant at the 0.05 level*

*** *Significant at the 0.01 level*

Capital structure determinants in Europe: The effect of profitability and the moderating role of firm size

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ABSTRACT:

Background: A review of the literature indicates that the extant research generally focused on identifying which of the two main capital structure theories, the trade-off theory (TOT) or the pecking order theory (POT), performs best, with only few papers aiming to reconcile the two.

Purpose: This study seeks to assess the impact of size and profitability on capital structure, and to analyse the moderating role of size on the profitability–leverage relationship, in order to provide a means for reconciling POT and TOT.

Methodology: The impact of size and profitability on leverage was gauged through OLS regressions, on a sample of 10.688 firm-year observations from France, Germany and the United Kingdom during 2006–2013. The moderating role of size was analysed graphically, the coefficients being computed via the Johnson–Neyman technique.

Findings: In small and medium German and British firms profitability follows the predictions of TOT and has a positive effect on the debt level. Conversely, the effect of profitability in large firms is significant only in the British sample, and is negative, as predicted by POT. In French companies profitability negatively impacts leverage, which is consistent with POT. The effect, however, is significant only in the year 2006 and in the full period subsample, and only in medium and large companies. As regards firm size, the variable positively affects leverage across the studied years and countries, which is consistent with TOT.

Implications: The main implications of the findings are twofold. First, POT and TOT can and should be reconciled, rather than be viewed as competing capital structure models. Second, a new capital structure model should be developed, which would encompass existing theories and take into account firm size and country differences.

Keywords:

Capital structure; Determinants; Trade-off theory; Pecking order theory; Moderating effects; European firms; Profitability; Size.

5th IBA Bachelor Thesis Conference, July 2nd, 2015, Enschede, The Netherlands.

1. INTRODUCTION

A fundamental question in the field of finance, which has attracted considerable attention from scholars, is what determines the financial structure of a company. The interest in this issue is based on both practical and theoretical grounds. Practically, financing decisions are of interest because they are one of the most important decisions of a firm's management (Coricelli, Driffield, Pal & Roland, 2012). Theoretically, it is the paper of Modigliani and Miller (1958) which has motivated scholars to study the (determinants of) capital structure (Flannery & Rangan, 2006).

Several theories were developed in an attempt to explain the capital structure choice. The most influential of them are the pecking order theory (POT) and the static trade-off theory (TOT; de Jong, Verbeek & Verwijmeren, 2011). POT builds on the idea of asymmetric information between managers and outside investors (Chirinko & Singha, 2000). This implies the existence of certain preferences between means of financing, wherein firms opt to finance projects internally, while debt and equity (as a last resort) are the least preferred means (de Jong et al., 2011). Conversely, TOT posits that companies determine their capital structure based on the benefits and costs of debt, and increase their leverage ratio to the point where the marginal costs and benefits of debt are equal (Fama & French, 2002).

Despite extensive research on the two theories (de Jong et al., 2011), the results are still mixed (Dang, 2013) and partially support them both (Gonzalez & Gonzalez, 2012). Additionally, several academics highlighted the need for a model that combines elements of POT and TOT (Byoun, 2008; Fama & French, 2005). A step towards reconciling the contradictory predictions of the two theories is to consider potential interaction effects between capital structure determinants, which would allow for the applicability of one theory to vary across the values of a given determinant, such as size. However, researchers have generally not included, in their testing of POT and TOT, any interaction effects between the determinants of leverage (Gonzalez & Gonzalez, 2012; Vithessonthi & Tongurai, 2015).

There are, thus, only a limited number of scholars (e.g. Gonzalez & Gonzalez, 2012) who studied the moderating effects in financial structure determinants. Additionally, the extant studies have two main limitations. First, the moderating effects were measured using dummies, subsamples or simple interaction terms in tabulated form (e.g. in Gonzalez & Gonzalez, 2012; Vithessonthi & Tongurai, 2015). These approaches do not enhance the interpretability of the findings and may result in an inaccurate depiction of the nature of the relationship (Brambor, Clark & Golder, 2006). For example, the use of tabulated interaction terms obscures the *conditional* marginal effects of the moderating variable. Second, the previous studies covered only a limited number of countries (e.g. Spain, in Gonzalez & Gonzalez, 2012; Greece, in Voulgaris, Asteriou & Agiomirgianakis, 2004; Thailand, in Vithessonthi & Tongurai, 2015), and an either short or old time period.

Following the above-mentioned, the main objective of this paper is to extend the studies of Gonzalez and Gonzalez (2012), Vithessonthi and Tongurai (2015), and Voulgaris et al. (2004), by researching the moderating effect of size on the performance–leverage relationship in British, French and German firms between 2006–2013. The present paper employs the Johnson–Neyman (J–N) technique for computing the interaction coefficients (as suggested and explicated in Hayes & Matthes, 2009), and analyses the moderating effects graphically (following the recommendations of Brambor et al., 2006), which permits to maintain the continuous character of the moderating variable, thus addressing one of the drawbacks of the previous studies. As regards the study period, it was selected based on data availability, following a trade-off between the number of firms included in the study and the time-span.

This paper has several academic and practical benefits. With respect to the former, it contributes to the literature on capital structure determinants through a novel approach; namely, the paper investigates the moderating role of size on the performance–leverage relationship graphically and by maintaining the continuous character of firm size. Additionally, it indicates that POT and TOT can and should be combined in order to obtain a more complete capital structure theory, which supports the views of such authors as Fama and French (2005). As regards the practical benefit of the study, managers and consultants are provided with a better understanding of the linkage between profitability, company size and leverage, the findings thus supporting them in their capital structure decisions.

To conclude, the thesis aims to answer the following research question: How did the linkage between profitability, size and leverage of British, French and German firms change during the 2006–2013 period? The answer to this question was obtained by conducting several ordinary least squares (OLS) regression analyses. Since conventional, tabulated analyses of moderation effects only provide an incomplete picture (Brambor et al., 2006), the OLS regressions were complemented by a graphical inspection of the profitability–leverage relationship (size acting as a moderator).

The results indicate that the effects of profitability and size, as capital structure determinants, vary per country and year. Nonetheless, the following trends were observed. As regards profitability, in German and British firms it follows the predictions of TOT and has a positive and statistically significant effect on the debt level in small and medium firms. Conversely, in large companies the effect of profitability is significant only in the British sample, and is negative, as predicted by POT. Finally, in French companies leverage is negatively affected by profitability, which is consistent with POT. The effect, however, is significant only in the year 2006 and in the full period subsample, and only in medium and large companies. With regard to firm size, the variable consistently follows the predictions of TOT; i.e. it has a positive effect on the level of indebtedness.

The major implications of these findings are twofold. First, supporting the claims of such authors as Byoun (2008), POT and TOT can and should be converged, rather than be viewed as competing capital structure models. Second, building on the aforementioned, a new and more detailed theoretical model of financial structure should be developed, which would encompass existing theories (POT and TOT, among others) and take into account firm size and country differences.

The remainder of the paper is structured as follows. Section 2 offers a review of the literature on the effects of the two capital structure determinants (size and profitability); describes the conceptual framework of this paper; and lists the hypotheses derived from extant research. Section 3 discusses the data sources, the operationalisation of the variables, the treatment of the data, the summary statistics thereof, the multicollinearity issue, as well as the fulfilment of regression assumptions. In section 4 the results of the regression analyses are provided, along with the interpretation thereof. Section 5 concludes with a discussion on the gained insights and on the limitations of the paper, and provides suggestions for future research.

2. LITERATURE REVIEW

The capital structure literature has been dominated by two theories: POT and TOT (Fama & French, 2005). Some scholars (e.g. Dang, Kim & Shin, 2014) also acknowledge the emergence of a third influential lens through which to view the capital structure decisions of a company, namely the market timing hypothesis (Baker & Wurgler, 2002). The focus of this paper, however, is on POT and TOT.[1]

2.1 The trade-off theory

TOT posits that companies determine their capital structure based on the benefits and costs of debt, and increase their leverage ratio to the point where the marginal costs and benefits of debt are equal (Fama & French, 2002). The benefits and costs of debt are, among others, the reduction of tax liability and the increase in bankruptcy risk (as originally introduced to the corporate finance field by Kraus & Litzenberger, 1973), as well as the attenuation of the free cash-flow problem (Jensen, 1986) and the creation (or intensification) of shareholder and bondholder conflicts (Fama & French, 2005).

The reasoning behind TOT permits to make the following predictions. First, a positive relationship between profitability and leverage is expected, since debt enables firms to lower their tax expense and agency problems. Second, company size and leverage are also expected to be positively linked. The rationale is that larger firms are more diversified and thus less prone to bankruptcy (de Jong et al., 2011). Since size may be viewed as an inverse proxy for bankruptcy risk (de Jong, Kabir & Nguyen, 2008), larger firms have, consequently, a higher borrowing capacity and attempt to benefit from this. Additionally, smaller companies are able to borrow less because of higher agency costs (Dang, 2013). In view of the above, the following hypotheses are formulated:

> **H1a:** *Under TOT, the more profitable a company is, the higher its leverage ratio.*
>
> **H2a:** *The larger a company is, the higher its leverage ratio, following the arguments of TOT.*

2.2 The pecking order theory

POT explains capital structure decisions by focusing on the role of asymmetric information between a firm's managers and outside investors. Companies resort to internal financing in the first place, and if external funding is necessary, debt is preferred to equity, since the former is perceived as safer (Myers, 1984). The reason for this preference order resides in the cost associated with issuing securities: the actual costs of issuance, and the costs stemming from the managers' private knowledge of the firm's actual value (Fama & French, 2002).

Based on the POT arguments, the following predictions can be made regarding the effects of profitability and size on capital structure. First, more profitable firms are expected to be less leveraged, because their higher earnings enable them to avoid external financing (Dang, 2013). A negative relationship is expected between size and leverage as well, because larger firms are generally more profitable (Dang, Kim & Shin, 2012), have retained, over time, higher earnings (Frank & Goyal, 2009) and have, accordingly, a lower need for external financing. Thus, the following hypotheses are developed:

> **H1b:** *The more profitable a company is, the lower its leverage ratio, based on POT.*
>
> **H2b:** *Under POT, the larger a company is, the lower its leverage ratio.*

[1] The market timing hypothesis is excluded from the analyses because of limited data availability.

2.3 Empirical tests of the pecking order and trade-off theories

The evidence on the effects of profitability and size on leverage is mixed (Dang, 2013). To substantiate this, panel A of table A1 (see the appendix) provides a succinct overview of the findings of several studies on capital structure determinants.

With regard to profitability and leverage, several studies (e.g. Hovakimian, Hovakimian & Tehranian, 2004) found a positive relationship between the two, while others observed a negative link (e.g. Acedo-Ramirez & Ruiz-Cabestre, 2014; Booth, Aivazian, Demirguc-Kunt & Maksimovic, 2001). The literature also disagrees on how size affects capital structure. A number of papers reported a positive link between size and leverage (e.g. Fama & French, 2002), whereas others observed a negative (e.g. Faulkender & Petersen, 2006) or a statistically insignificant relationship (e.g. Acedo-Ramirez & Ruiz-Cabestre, 2014, in Spanish and Italian firms).

The sign and significance of the coefficients differ both between and within countries. The contradictory results between countries may be attributed to differences in institutional settings. On the other hand, the inconsistencies within countries (e.g. in Hovakimian et al., 2004; Fama & French, 2002) may be attributed to differences in operationalisation and methodology between studies. To illustrate, consider the findings of Faulkender and Petersen (2006), who report negative, positive and statistically insignificant coefficients for the effect of size on leverage, depending on how leverage is measured (through total or long-term debt), whether firms have credit ratings and whether zero-debt observations are included in the analysis.

2.4 Reconciling the trade-off and pecking order theories: The role of company size

The contradictions in the theoretical predictions of POT and TOT, as well as the mixed empirical results, highlight the need for a framework that reconciles the two theories (Byoun, 2008; Fama & French, 2005). As argued previously, introducing interaction effects in the discussion on capital structure determinants might provide the means to converge the two theories.

The literature has generally failed to consider the moderating role of some variables on the link between capital structure and its determinants. The studies that did include them, focused on the role of size and its influence on the performance–leverage relationship. Two competing perspectives exist on how size moderates the said relationship. The first viewpoint posits that there is a dynamic performance–leverage–performance link which varies in magnitude along the company size spectrum (Vithessonthi & Tongurai, 2015). The borrowing capacity grows with firm size, which enables companies to increase their leverage ratio and make more investments. This, in turn, increases profitability and firm size, thus establishing a positive link between financial performance and leverage. However, there are limited investment opportunities for large firms and a correspondingly lower necessity to borrow to finance projects. Hence, Vithessonthi and Tongurai (2015) claim that profitability and leverage are positively linked in small and medium companies, and negatively linked in large firms. This leads to the following hypothesis:

> **H3a:** *The moderating effect of size on the leverage–profitability relationship is positive (negative) in small (large) companies (Vithessonthi & Tongurai, 2015).*

The second perspective builds on the difference in information asymmetry between large and small firms. As such, Gonzalez and Gonzalez (2012) reach a different conclusion by arguing that in large firms information asymmetry is lower, therefore

the predictions of POT (TOT) are less (more) applicable. Thus, in smaller firms the profitability–leverage link is expected to be negative (following POT), while in larger firms the link is positive (following TOT). The strength of the relationship is deemed to increase as companies approach either end of the size spectrum, since the intensity of information asymmetry and size are directly proportional. Based on the arguments of Gonzalez and Gonzalez (2012), the hypothesis may be stated thusly:

> **H3b:** *The moderating effect of size on the leverage–profitability relationship is negative (positive) for small (large) companies (Gonzalez & Gonzalez, 2012).*

2.5 Evidence on the moderating role of size

The findings on the moderating role of size on the performance–leverage relationship are equally contradictory. Vithessonthi and Tongurai (2015), in a study of Thai firms, observed that the link between profitability and leverage is positive for small firms and negative for medium and large firms. The effect also strengthens at both ends of the size continuum: e.g. in large companies the negative link is stronger than in medium-sized companies. Conversely, Gonzalez and Gonzalez (2012) report negative coefficients across all company sizes (small, medium and large) in a sample of Spanish firms, with a significantly stronger effect being observed in smaller firms. Voulgaris et al. (2004), however, did not report any difference between small- and medium-sized enterprises and large firms, profitability being inversely related to leverage in all types of companies.

The difference in the results might be due to two factors. First, the three studies differ in the method through which size-based subsamples were created and the actual number thereof. While Vithessonthi and Tongurai (2015) based their subsampling method on asset size and divided the sample in six categories, Voulgaris et al. (2004) used employment as a selection criterion and conducted the analyses on two subsamples. Gonzalez and Gonzalez (2012), on the other hand, used both employment and turnover to differentiate between small, medium and large firms. Second, the difference in the findings may also be due, to a certain extent, to the fact that in Vithessonthi and Tongurai (2015) the moderating role of size was studied in models where leverage was the independent variable, whereas in Gonzalez and Gonzalez (2012) and Voulgaris et al. (2004) the effect of performance on leverage was analysed. In conclusion, the evidence on the moderating role of size is mixed, yet it indicates that in medium and large companies the performance–leverage relationship is negative.

2.6 Summary

This subsection provides a depiction (figure 1) of the reviewed factors that affect the financial structure of companies, based on POT, TOT and the interaction models, as well as the formulated hypotheses pertaining to each factor. A tabulated, concise summary of the reviewed papers is provided in the appendix (table A1), along with a graphical representation of the mechanisms underlying the linkage between size, profitability and capital structure (figure A1).

3. METHODOLOGY AND DATA

3.1 Focus variables

Following previous research on capital structure (e.g. Acedo-Ramirez & Ruiz-Cabestre, 2014; Brav, 2009; Gonzalez, 2013), leverage is operationalised as the ratio of book value of total debt to book value of total assets. It is customary in some studies for market leverage (book value of debt to market value of assets) to be employed in the analyses. However, book leverage was selected in order to maximise the sample size, since data for market value of assets was available for a limited number of firms and for a significantly shorter period of time. Additionally, the regression results are robust to differences in the operationalisation of leverage (Frank & Goyal, 2009).

The main independent variables of the present paper are firm size and profitability. The former is operationalised as the natural logarithm of total assets (Aggarwal & Zhao, 2007; Byoun, 2008; Chang, Chou & Huang, 2014). An alternative measure of size is the natural logarithm of total sales. However, this approach is forgone in order to maximise the sample size. The ratio of operating revenue to total assets is used as a measure of profitability (Byoun, 2008). In order to test the moderating role of size, an interaction term is also introduced, defined as the product of the variables *size* and *profitability*.

3.2 Control variables

3.2.1 Firm level

Following the literature on capital structure, a set of control variables are employed at the firm level: tangibility and liquidity. The former is defined as the ratio of fixed assets to total assets (Acedo-Ramirez & Ruiz-Cabestre, 2014; Antoniou, Guney & Paudyal, 2008; Dang, 2013) and the latter as the ratio of current assets to current liabilities (de Jong et al., 2008; Deesomsak, Paudyal & Peschetto, 2004).

With regard to tangibility, which Frank and Goyal (2009) classify as one of the core capital structure determinants, the rationale for including it is the following. Firms with more tangible assets are perceived as less risky, in view of the existing collaterals (Antoniou et al., 2008). Therefore, under TOT, more tangible firms would employ more debt in order to increase the debt benefits (Dang, 2013). POT, on the other hand, leads to a different conclusion, yet it still highlights the role of this variable as a capital structure determinant.

Liquidity is also deemed to influence the financing decision of

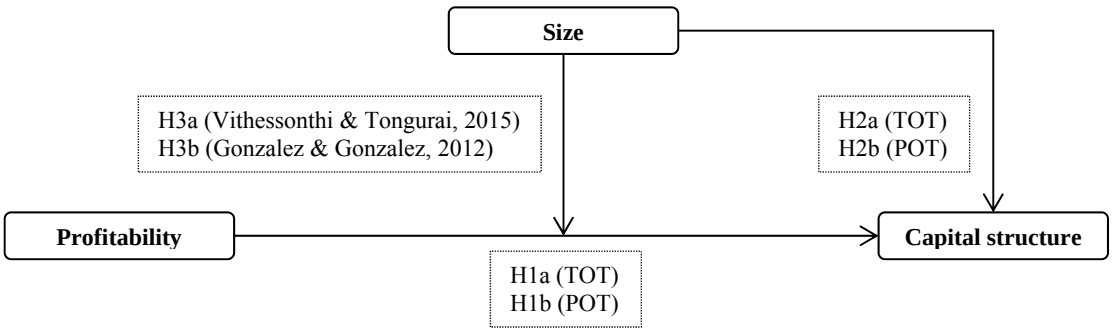


Figure 1. Overview of hypotheses and causal relationships

firms. Its significance can be illustrated under POT: more liquid companies are expected to borrow less, since their internal funds are larger (de Jong et al., 2008).

3.2.2 Industry level

Two controls are employed at the industry level. Several scholars (e.g. Aggarwal & Zhao, 2007; Hovakimian et al., 2004) employed median industry debt ratios to capture variance in leverage unaccounted for by firm-level variables (Chang et al., 2014). In fact, as argued in Frank and Goyal (2009), the industry effect is a robust and significant factor that influences capital structure. The median industry leverage is calculated for industries identified based on the two-digit SIC (Standard Industrial Classification) codes (Fan, Titman & Twite, 2012).

Second, following Chang, Lee and Lee (2009) and de Jong et al. (2008), an industry dummy is introduced to control for industry differences. Based on Chang et al. (2009), the machinery, equipment and other manufacturing industry (SIC 3400–3999) is selected as reference category. Chang et al. (2009) state that firms in this industry use less debt, their claim being based on Titman's (1984) argument that firms in the machinery and equipment production industry have higher liquidation costs.

3.3 Methodology

Several OLS regression analyses are conducted in order to test the hypotheses formulated in the previous section. The equations of the models are as follows:

$$(1)\ LEV_i = \beta_1*SIZE_i + \beta_2*PROF_i + \beta_3*SIZE\_PROF_i + \beta_4*TANG_i + \beta_5*LIQ_i + \beta_6*IND\_MED_i + \beta_7*IND\_DUMMY_i + \beta_0 + \varepsilon_i$$

$$(2)\ LEV_{it} = \beta_1*SIZE_{it} + \beta_2*PROF_{it} + \beta_3*SIZE\_PROF_{it} + \beta_4*TANG_{it} + \beta_5*LIQ_{it} + \beta_6*IND\_MED_{it} + \beta_7*IND\_DUMMY_{it} + \beta_8*YEAR\_DUMMY_{it} + \beta_0 + \varepsilon_{it}$$

The first four terms (LEV, SIZE, PROF and SIZE_PROF) represent the focus variables of this study: leverage, size, profitability and the interaction term, respectively. The interaction term, however, was only employed in the analyses of the moderating role of size. TANG and LIQ are the terms for tangibility and liquidity. The industry median, the industry dummy and the year dummy are represented by IND_MED, IND_DUMMY and YEAR_DUMMY, respectively. Finally, the intercept and the error term are denoted by β_0 and ε.

The first equation is employed for analysing the determinants of capital structure for each of the three countries per year, while the second equation represents the regression equation for the pooled model, wherein the capital structure determinants are tested across the entire 2006-2013 period.

The industry and year dummies require an elaboration. With regard to the former, the variable takes a value of 1 if the firm belongs to one of ten industry categories: agriculture, forestry, fishing and resources (SIC 0100–1499); construction (SIC 1500–1799); food (SIC 2000–2099); tobacco, textiles, wood and furniture (SIC 2100–2599); paper, printing and publishing (SIC 2600–2799); chemicals, pharmaceuticals, and petroleum (SIC 2800–2999); rubber, leather and stone (SIC 3000–3299); metallurgy (SIC 3300–3399); machinery, equipment and other manufacturing (SIC 3400–3999); transportation, trade and services (SIC 4000–9510). The categorisation is based on de Jong et al. (2008) and Chang et al. (2009).

The year dummy represents the variable employed in the pooled regressions to control for variation across years. Years 2006 and 2007 serve as reference categories, since in the subsequent period the European Union was affected by two crises: the global financial crisis (GFC), which started in 2008 (Beirne & Fratzscher, 2013), and the European debt crisis (EDC), which erupted in the year 2010 and ended in 2012 (de Grauwe & Ji, 2015). While the year 2013 is classified as the post-crisis period, it is not included in the reference period because the only the *acute* phase of the EDC ended in the previous year (Eichengreen, 2015).

The interaction term serves for capturing the moderating role of size on the profitability–leverage relationship. However, the analysis of moderation is incomplete and misleading when it is based on the conventional, tabulated results. To exemplify, if SIZE_PROF were statistically insignificant, this would not necessarily indicate that size does not have a moderating role, because the significance may vary across the values of the variable (Brambor et al., 2006). Therefore, following the suggestion of Brambor et al. (2006) and Hayes and Matthes (2009), the J–N method for probing interactions will be employed, with a graphical inspection of the results, in order to conduct a more thorough analysis.

3.4 Data source and selection criteria

The data was extracted from the Orbis database of Bureau van Dijk. The sample consists of 1.461 companies (388 French, 397 German, and 676 British firms) over the 2006-2013 period, with 10.688 firm-year observations (2.918 observations for German firms, 2.975 for French companies, and 4.795 for British firms).

The final sample was obtained after screening the data on several criteria. Following standard practice (Chang et al., 2014; Dang et al., 2014; Flannery & Rangan, 2006), financial and utility firms (SIC codes between 6000–6999 and 4900–4999, respectively) were excluded from the analysis due to the different regulatory and accounting practices they are subject to (Dang, 2013), as well as because their financial structure is different and signals different information than that of companies in other industries (Byoun, 2008).

In order to reduce noise in the sample, two additional restrictions were set. First, several of the employed variables were confined to specific intervals (Danis, Rettl & Whited, 2014). For example, leverage must lie in the closed interval between zero and unity (Alti, 2006; Baker & Wurgler, 2002; Hovakimian, 2006; Huang & Ritter, 2009). Second, as is customary in the literature, the influence of outliers was reduced by winsorising the variables at the 1st and 99th percentiles (Chang et al., 2014; Dang, 2011; Flannery & Rangan, 2006).

3.5 Summary statistics and multicollinearity

Table 1 contains the summary statistics and the correlations between the employed variables. As there are statistically significant correlations between several variables, the issue of multicollinearity was further analysed via the variance inflation factors (VIFs) specific to each variable, as reported in table 2.

The literature provides no formal thresholds for the VIFs, yet such cut-off values as 5 and 10 are commonly employed (Craney & Surles, 2002). The values are close to the minimum of 1 only for the variable SIZE, when the interaction term is not included. However, since the largest VIFs are below 5, it may be stated that the confidence intervals and the tests of statistical significant are likely to be unbiased (Berry & Feldman, 1985).

A seeming threat to the robustness of the results arises when the interaction term is included, which increases the inflation factors. The VIFs are still below the threshold of 5, with the exception of the interaction term and PROF. However, the high vari-

ance inflation factors do not indicate that the results are unreliable in the case of interaction models (Friedrich, 1982). Thus, including the multiplicative term does not influence the reliability of the results. Furthermore, multicollinearity is relatively irrelevant in this instance because the purpose of interaction models is to assess the conditional effect of the focus variable, rather than make general statements as to the impact of other variables (Brambor et al., 2006).

3.6 Regression assumptions

Before proceeding with the analyses, an investigation into the fulfilment of the linear regression assumptions was made. The linearity and homoscedasticity assumptions were tested by inspecting plots of standardised residual values against standardised fitted values (Osborne & Waters, 2002) per country, for each year in the 2006-2013 period. The results indicate that the linearity assumption is fulfilled, since the scatterplots do not exhibit signs of nonlinearity in the distribution of the residuals, yet they do indicate signs of heteroscedasticity (as an example, see figure A2 in the appendix) because the residuals are not equally spread across the mean of zero for the entire range of the standardised fitted values. Heteroscedasticity is milder in the case of British and German firms, and is more pronounced in the case of French firms. In order to alleviate this problem, heteroscedasticity-consistent standard error estimators will be employed, using Hayes and Cai's (2007) macros. The assumption of normality was tested both statistically, through Kolmogorov–Smirnov tests of normality (Osborne & Waters, 2002), and visually (see figure A3, as an example), by inspecting the histograms of the unstandardised residuals (Williams, Grajales & Kurkiewicz, 2013). The assumption was generally fulfilled, with few exceptions. However, since OLS regressions are robust to violation of this assumption (Osborne & Waters, 2002), the coefficients are unlikely to be biased. Finally, the assumption of independence of errors was tested with the Durbin–Watson test. The statistics are 1,388 (German sample), 1,584 (French sample) and 1,533 (British sample). Being between unity and two, the statistics indicate that while not a cause for concern (Field, 2009), autocorrelation might still affect the tests of significance in the full period subsamples by underestimating the standard deviation of the terms (Berry & Feldman, 1985).

Table 1. Correlations (two-tailed) and summary statistics

Panel A: British firms (Observations – 4795)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	Mean	Median	Standard deviation	Min.	Max.
LEV	(1)	1							0,50	0,50	0,20	0,08	0,98
PROF	(2)	0,38*	1						1,07	0,90	0,80	0	4,18
SIZE	(3)	0,31*	-0,10*	1					11,72	11,39	2,41	6,74	18,67
SIZE_PROF	(4)	0,44*	0,95*	0,15*	1				12,34	10,44	9,08	0	58,05
TANG	(5)	-0,07*	-0,51*	0,28*	-0,43*	1			0,54	0,56	0,24	0	1,00
LIQ	(6)	-0,55*	-0,14*	-0,16*	-0,18*	-0,45*	1		1,65	1,40	0,97	0,17	5,00
IND_MED	(7)	0,32*	0,22*	0,09*	0,25*	-0,11*	-0,17*	1	0,52	0,52	0,09	0,27	0,77

Panel B: French firms (Observations – 2975)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	Mean	Median	Standard deviation	Min.	Max.
LEV	(1)	1							0,58	0,59	0,17	0,08	0,98
PROF	(2)	0,19*	1						1,02	0,96	0,55	0,01	4,18
SIZE	(3)	0,26*	-0,16*	1					12,27	11,93	2,20	6,74	18,67
SIZE_PROF	(4)	0,25*	0,94*	0,15*	1				12,33	11,58	6,67	0,09	63,61
TANG	(5)	0,07*	-0,45*	0,43*	-0,32*	1			0,45	0,43	0,21	0	0,99
LIQ	(6)	-0,65*	-0,12*	-0,25*	-0,18*	-0,44*	1		1,59	1,38	0,82	0,17	4,98
IND_MED	(7)	0,26*	0,01	0,25*	0,08*	0,12*	-0,17*	1	0,54	0,52	0,08	0,27	0,77

Panel C: German firms (Observations – 2918)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	Mean	Median	Standard deviation	Min.	Max.
LEV	(1)	1							0,56	0,58	0,19	0,08	0,98
PROF	(2)	0,14*	1						1,20	1,11	0,66	0	4,18
SIZE	(3)	0,27*	-0,16*	1					12,26	12,01	2,33	6,74	18,67
SIZE_PROF	(4)	0,23*	0,92*	0,18*	1				14,52	13,42	7,69	0	56,02
TANG	(5)	0,06*	-0,49*	0,16*	-0,43*	1			0,49	0,47	0,20	0,02	1,00
LIQ	(6)	-0,53*	0,02	-0,19*	-0,04**	-0,45*	1		1,81	1,61	0,93	0,17	4,99
IND_MED	(7)	0,33*	0,03	0,13*	0,06*	0,12*	-0,19*	1	0,54	0,53	0,07	0,27	0,77

Note: Min. – minimum; Max. – maximum. For the definitions of the variables refer to section 3.3.
* and ** denote statistically significant correlations at the 1% and 5% level, respectively.

Table 2. Multicollinearity diagnosis: Variance inflation factors

	British sample		French sample		German sample	
	(1)	(2)	(1)	(2)	(1)	(2)
PROF	1,81	28,24	1,54	31,37	1,52	24,06
SIZE	1,18	3,00	1,35	4,26	1,21	3,93
SIZE_PROF		28,27		30,98		24,26
TANG	2,53	2,54	2,22	2,22	1,98	1,99
LIQ	1,72	1,72	1,57	1,59	1,47	1,47
IND_MED	2,41	2,42	1,88	1,88	1,80	1,81

Note: For the definitions of the variables refer to section 3.3.

4. RESULTS

4.1 Capital structure determinants

Several regression analyses were conducted, in order to test the previously-formulated hypotheses. To correct for heteroscedasticity, the standard errors were estimated using Cribari-Neto's (2004) heteroscedasticity-consistent estimator (HEC). As Hayes and Cai (2007) argue, this estimator is more robust to high-leverage observations, abnormally distributed errors and small samples than other commonly employed HECs, such as the one of White (1980; e.g. in de Jong et al., 2008).

Table 3 contains the outcome of the OLS regressions. While the results vary per time period and country, the models have statistically significant predictive capability for all countries, across all years. The variance in leverage explained by the models ranges from a minimum of 36,4% to a maximum of 56,9%.

With regard to profitability, the findings indicate that its effect on leverage depends on the country and time period under study. In the German sample, the coefficient of PROF is positive across all years, which leads to the rejection of H1b in favour of H1a. This is consistent with TOT, wherein debt is used to reduce tax expenses, within a trade-off between tax shield and bankruptcy risk. The effect, however, is statistically significant only in the three years of the 2009–2011 period and in the full period subsample. Profitability has a positive and statistically significant impact on leverage in British firms as well, across all studied periods, except in 2006, thus generally supporting the predictions of TOT. Conversely, in French companies the effect is consistently negative, yet it is significant only in the year 2006 and in the full period sample. This is consistent with POT, i.e. preference is given to internal financing rather than debt, due to information asymmetry.

Several conclusions may be drawn from the aforementioned. First, the results are mixed with regard to the effect of profitability on capital structure, the sign and significance of this variable being a function of time and country. Second, the prediction of TOT (H1a) is generally applicable in the case of British firms across all years; it is, however, only partially valid in the case of German companies, namely during the most critical moments of the crisis period (2009-2011). Thus, in the context of these two countries, the benefits and costs of debt are of importance when making capital structure decisions, rather than asymmetric information. Third, the pecking-order prediction is valid in French firms, yet only in two instances: before the onset of the crisis (2006), and in the full sample period. This indicates that capital structure decisions are influenced by concerns about information asymmetry, yet only in financially stable periods. A potential explanation for the observed statistical significance in the full sample is that the tests of significance were biased because of the autocorrelation of the error terms, which might have caused the confidence intervals to be too narrow (Berry & Feldman, 1985).

The findings pertaining to company size are consistent across time and countries. The coefficients are positive and statistically significant, which leads to the rejection of H2b and the failure to reject H2a. Hence, firm size positively affects capital structure, in a manner predicted by TOT, under the rationale that larger firms have a lower bankruptcy risk and can, therefore, reap greater benefits from debt.

4.2 The moderating role of company size

The moderating role of size on the profitability–leverage relationship was analysed graphically, using the J–N approach for probing interactions. Conventional OLS regressions (unreported) were conducted as well, yet these yielded inconsistent results, wherein the statistical significance and the sign of the effect of profitability on leverage varied highly both within (i.e. across years) and between countries. Additionally, tabulated results provide an incomplete picture of the actual relationship (Brambor et al., 2006). Hence, following the recommendation of Brambor et al. (2006), the interaction effects were assessed more thoroughly by visualising the computed coefficients of the focal predictor. The results are presented in figure 2. The solid lines indicate the marginal effect of profitability, whereas the dashed lines mark the 95% confidence interval. Statistical significance occurs in the areas where the confidence intervals do not include zero. The slopes and intercepts of the effects vary across countries and years, yet similar features persist, which led to the grouping of the results as indicated in figure 2.

In the case of the German sample, profitability exerts a positive and statistically significant effect on leverage only in the years 2009, 2011 and in the full period subsample. The impact is weaker in the year 2009 (figure 2.A) and stronger in the latter two subsamples (figure 2.B). In all three cases the effect weakens as firm size lowers and becomes insignificant upon reaching a certain threshold (81 million Euro in 2009, 273 million Euro in 2011, and 1741 million Euro in the full period subsample).

Table 3. Ordinary Least Squares regression results, with total debt ratio as dependent variable

	Germany								
	2006	2007	2008	2009	2010	2011	2012	2013	Full period
PROF	0,01	0,02	0,02	0,03**	0,03***	0,04**	0,03	0,02	0,02*
	0,50	*1,37*	*1,43*	*1,99*	*1,84*	*2,50*	*1,51*	*0,97*	*4,35*
SIZE	0,02*	0,02*	0,02*	0,01*	0,01*	0,01*	0,01*	0,01*	0,01*
	4,83	*4,96*	*5,17*	*3,49*	*3,34*	*3,30*	*2,73*	*2,72*	*11,04*
TANG	-0,21*	-0,17*	-0,13*	-0,16*	-0,25*	-0,18*	-0,15*	-0,26*	-0,19*
	-3,78	*-3,22*	*-2,70*	*-2,81*	*-4,24*	*-2,84*	*-2,59*	*-4,15*	*-9,56*
LIQ	-0,12*	-0,10*	-0,11*	-0,10*	-0,12*	-0,12*	-0,11*	-0,11*	-0,11*
	-9,54	*-8,65*	*-10,91*	*-8,35*	*-9,02*	*-7,96*	*-8,98*	*-9,26*	*-26,42*
IND_MED	0,58*	0,60*	0,65*	0,67*	0,70*	0,47*	0,68*	0,71*	0,64*
	4,75	*4,68*	*5,08*	3,71	*3,47*	*2,63*	*4,52*	*5,59*	*13,47*
Constant	0,35*	0,26*	0,23**	0,28**	0,32**	0,40*	0,30*	0,38*	0,31*
	3,76	*2,82*	*2,51*	2,34	*2,58*	*3,29*	*2,70*	*3,67*	*8,66*
Adjusted R^2	46,2%	42,8%	46,5%	37,3%	36,4%	39,7%	39,6%	38,7%	41,8%
F-statistic	28,71*	22,54*	29,83*	18,40*	17,27*	21,59*	19,43*	21,68*	124,99*
Observations	363	363	367	362	362	369	367	365	2918

Table 3 ***(continued)***

	France								
	2006	2007	2008	2009	2010	2011	2012	2013	Full period
PROF	-0,03***	-0,02	-0,01	-0,01	-0,02	-0,02	-0,00	0,01	-0,01**
	-1,80	*-1,54*	*-0,62*	*-0,58*	*-1,16*	*-1,38*	*-0,18*	*0,38*	*-2,53*
SIZE	0,01*	0,01*	0,02*	0,02*	0,02*	0,02*	0,01*	0,01*	0,02*
	2,92	*3,53*	*4,97*	*6,15*	*4,23*	*4,07*	*3,32*	*3,45*	*11,91*
TANG	-0,32*	-0,27*	-0,26*	-0,33*	-0,35*	-0,37*	-0,35*	-0,33*	-0,32*
	-5,13	*-5,15*	*-5,11*	*-7,00*	*-6,06*	*-6,04*	*-6,35*	*-6,09*	*-17,69*
LIQ	-0,18*	-0,16*	-0,15*	-0,15*	-0,16*	-0,16*	-0,18*	-0,17*	-0,16*
	-12,97	*-13,67*	*-11,18*	*-13,99*	*-12,66*	*-11,05*	*-13,44*	*-13,42*	*-39,11*
IND_MED	0,27**	0,18***	0,33**	0,37*	0,38**	0,39*	0,31*	0,36*	0,31*
	2,56	*1,69*	*2,52*	*2,61*	*2,46*	*2,65*	*2,59*	*3,22*	*7,58*
Constant	0,76*	0,72*	0,56*	0,53*	0,62*	0,62*	0,72*	0,65*	0,66*
	8,95	*9,55*	*6,25*	*6,16*	*6,34*	*6,58*	*8,55*	*8,78*	*23,04*
Adjusted R^2	54,4%	53,4%	54,8%	56,0%	53,8%	48,7%	55,0%	56,9%	54,9%
F-statistic	32,53*	29,45*	29,15*	33,39*	29,59*	19,42*	25,25*	28,42*	156,29*
Observations	370	375	379	372	371	372	369	367	2975
	United Kingdom								
	2006	2007	2008	2009	2010	2011	2012	2013	Full period
PROF	0,01	0,03*	0,03*	0,04*	0,03**	0,03*	0,02**	0,03*	0,26*
	1,25	*2,76*	*2,77*	*3,40*	*2,51*	*3,21*	*2,35*	*2,63*	*7,61*
SIZE	0,02*	0,03*	0,03*	0,03*	0,03*	0,03*	0,03*	0,03*	0,03*
	7,94	*9,52*	*11,18*	*9,80*	*9,35*	*9,01*	*9,54*	*9,97*	*27,35*
TANG	-0,38*	-0,31*	-0,30*	-0,29*	-0,34*	-0,32*	-0,37*	-0,37*	-0,33*
	-9,28	*-7,58*	*-7,76*	*-7,03*	*-8,22*	*-8,64*	*-11,08*	*-8,89*	*-23,98*
LIQ	-0,15*	-0,12*	-0,13*	-0,12*	-0,14*	-0,13*	-0,14*	-0,14*	-0,13*
	-16,26	*-15,17*	*-14,51*	*-12,97*	*-15,17*	*-14,87*	*-17,98*	*-14,25*	*-42,61*
IND_MED	0,32*	0,28*	0,26*	0,38*	0,48*	0,46*	0,45*	0,45*	0,37*
	3,73	*2,64*	*2,84*	*3,60*	*4,75*	*4,53*	*4,75*	*4,83*	*10,98*
Constant	0,50*	0,37*	0,36*	0,29*	0,33*	0,28*	0,35*	0,36*	0,37*
	7,71	*4,95*	*5,21*	*3,79*	*4,94*	*4,15*	*5,65*	*5,09*	*15,08*
Adjusted R^2	54,6%	53,1%	53,8%	49,7%	54,9%	55,5%	56,0%	55,2%	54,6%
F-statistic	48,85*	56,27*	48,28*	43,12*	45,82*	57,56*	61,53*	53,12*	278,27*
Observations	584	599	599	596	605	610	604	598	4795

Note: The coefficients for the yearly and full period models were computed following equations (1) and (2), respectively. The equations and the explanations of the variables are provided in section 3.3. All models include unreported industry dummies (as well as year dummies for the full period models). The reported t-statistics (italicised) and F-statistics were computed with Cribari-Neto's (2004) heteroscedasticity-consistent standard error estimator.
The 1%, 5% and 10% significance levels are flagged using *, ** and ***, respectively.

The results in the German context indicate that H3a and H3b should be rejected. Thus, they only partially support the claims of Vithessonthi and Tongurai (2015), and Gonzalez and Gonzalez (2012). Following the reasoning of the former authors, a positive and self-sustaining relationship exists between profitability and leverage in small and medium firms, in view of the growth opportunities these companies have. The reasoning of Gonzalez and Gonzalez (2012) finds confirmation only with regard to their claim that the effect strengthens as firm size decreases. However, the explanation of this effect may be different to theirs: the increase is not due to the intensification of information asymmetry issues, but to the higher growth opportunities of smaller firms. To conclude, by combining the findings and the theoretical arguments, it may be stated that profitability positively and more pronouncedly affects leverage in companies with higher growth (i.e. investment) opportunities, within a "growth opportunity–leverage–profitability" cycle.

In the case of French companies, profitability affects leverage negatively, the effect being statistically significant only in the full period subsample (figure 2.C), in companies with an asset base larger than 104 million Euro. Thus, the evidence leads to the rejection of H3a and H3b, and only partially supports the assertions of Vithessonthi and Tongurai (2015). Namely, profitability negatively impacts leverage within the "growth opportunity–leverage–performance" paradigm, because of the lower growth opportunities that large firms have. Yet the predictions with regard to small and medium firms are unsupported.

Profitability's influence is relatively erratic in the case of British companies, yet the effects may be categorised as follows. First, in the years 2008, 2009, 2011 and in the full period subsample (figures 2.D and 2.F) profitability positively impacts the leverage ratio of small and medium firms (i.e. with an asset base smaller than approximately 170 million Euro; in the full period the threshold is higher, at 585 million Euro), and negatively affects very large firms (i.e. total assets in the worth of billions of Euros). Second, the slope of the line that depicts the marginal effect of profitability on capital structure is steeper in the year 2009 (which may be viewed as the central year of the entire crisis period), and in the full period subsample, indicating a stronger effect. Third, consistent with the results in the previous subsection, profitability has no influence on the financing structure of firms in the year 2006 (unreported), irrespective of their size. Fourth, in the remaining years (figure 2.E), the coefficients of PROF are positive for small and medium firms (namely, fewer than approximately 160 million Euro in total assets), and are statistically insignificant for large firms. To

conclude, hypothesis H3b is rejected across all subsamples, whereas H3a is rejected in only several instances. Hence, the arguments of Vithessonthi and Tongurai (2015) generally find support in the British context: the influence of profitability as a function of firm size follows the prescriptions of their "growth opportunity–leverage–profitability" cycle, with the effect being stronger in small and large firms.

4.3 A summary of the results

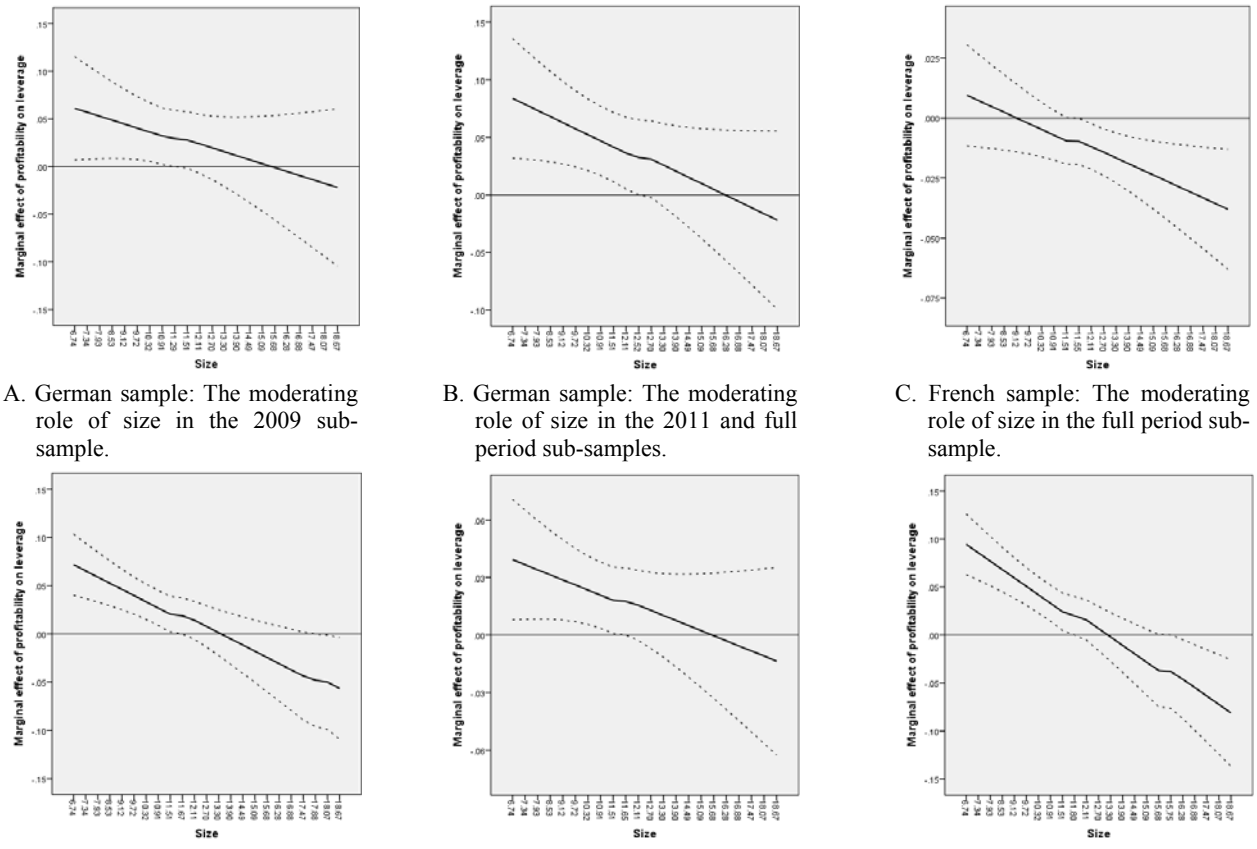
Several conclusions may be drawn from the discussed findings. First, a reliable factor in explaining capital structure decisions is company size, which positively affects leverage, irrespective of time period and country. Following the trade-off model, larger companies are able to borrow more and profit from greater benefits of debt, because of the lower bankruptcy risk they have compared to smaller firms.

Second, the influence of profitability is time- and country-specific and follows both TOT and POT. The TOT model may be used to describe the financing decisions in small and medium German and British firms. In the German case, however, the predictions are supported by the evidence only when economic distress is heightened, as it was in the years 2009 and 2011, at the peak of the two crises. Conversely, the POT model correctly describes the influence of profitability on leverage in large British firms, and in medium and large French companies. The predictions of the POT model, however, are only valid when the full French and British samples are analysed, correspondingly. Additionally, the model correctly predicts this determinant's influence in the case of British firms during the critical years of the GFC and the EDC.

It may be argued, therefore, that both POT and TOT have their merits in explaining capital structure decisions, and that both models are required to accurately describe the behaviour of leverage. Yet, not all factors under the two models are reliable. Size, tangibility, liquidity and the industry median debt ratio are consistently significant determinants (as evidenced by the invariant statistical significance and sign of the respective coefficients, reported in table 3). Profitability, however, is a less reliable predictor. This is contrary to previous research (e.g. Frank & Goyal, 2009) which categorised this variable as a reliable determinant.

5. CONCLUSION

Capital structure is a topic of interest to both academics and practitioners. Previous research generally focused on testing the two main capital structure theories, POT and TOT, separately, rather than acknowledging the merits of both and attempting to reconcile these competing models. Seeking to fill this gap in the literature, the present paper aimed to test and reconcile the POT and TOT theories by analysing the impact of two main capital structure determinants, profitability and size, and by investigating the moderating role of firm size.



A. German sample: The moderating role of size in the 2009 sub-sample.

B. German sample: The moderating role of size in the 2011 and full period sub-samples.

C. French sample: The moderating role of size in the full period sub-sample.

D. British sample: The moderating role of size in the 2008 and 2011 sub-samples.

E. British sample: The moderating role of size in the 2007, 2010, 2012 and 2013 sub-samples.

F. British sample: The moderating role of size in the 2009 and full period sub-samples.

Figure 2. The moderating effect of size on the profitability–leverage relationship

Note: The solid lines represent the marginal effect of profitability on leverage. The dashed lines represent the 95% confidence interval.

5.1 Review of the findings

The findings indicate that size is a reliable capital structure determinant, the impact of which follows the TOT model. Thus, size positively affects the debt level in British, German and French firms, irrespective of the studied time period, which is consistent with the majority of previous studies. With regard to profitability, the validity of POT and TOT's predictions as to this determinant's influence depends on the country and time periods that are studied. As such, in the German context the variable's impact is positive and extends solely to small and medium-sized firms, and only during the most critical periods of the financial crises. It may be stated, nonetheless, that TOT is generally applicable for German firms. In French companies, profitability exerts no statistically significant influence, apart from the case when a full period regression is conducted. The observed significance, however, may be due to autocorrelation. In the case of British companies, both POT and TOT are valid models which complement each other. Yet, profitability follows the POT predictions only in large companies, and only during the peaks of the financial crises.

The results are consistent with a growing number of studies (e.g. de Jong et al., 2008), which indicated that capital structure determinants affect firms to different degrees across countries. Adding to the literature, the present paper underscores that the methodology employed in testing financing structure models should be adapted so as to account for the influence of time-specific variables (e.g. financial crises). Using year-fixed effects in regressions might obfuscate the actual relationship between the studied variables, since the regression coefficients may vary highly when the analyses are conducted at *specific* time points, rather than in pooled samples.

5.2 Academic relevance

The academic relevance of the present study resides in the fact that it furthers the knowledge in the field of corporate finance, by studying several capital structure determinants in a European context, within a recent time period (specifically, 2006-2013). To this end, the study included moderating effects in its analyses, which permitted to obtain a better understanding of how the selected financial structure determinants interact with each other. Accordingly, the findings indicate that it is both possible and necessary to converge POT and TOT, and that their relevance in describing capital structure decisions depends not only on the studied time period, but also on the country. By the same token, the paper underscores the need to account for country differences when conducting cross-country research. Finally, it highlights the need to use more advanced methods for probing interactions than the conventional tabulated results.

5.3 Practical relevance

With respect to the practical implications of this paper, these are as follows. First, managers and consultants are provided with evidence on how profitability and size influence leverage, the findings on the moderating role of size permitting them to make better-informed decisions with regard to the financing structure of a firm. Furthermore, the importance of taking into consideration the role of country- and time-specific factors is also stressed. Finally, the importance of ensuring access to external financing for small and medium firms is emphasised, especially concerning German and British firms.

5.4 Limitations

Several limitations affect the results of this study. First, the findings may not be applicable to other countries and time periods, as indicated by the observed inconsistencies. The generalisability of the results is also limited because of the employed measures. Despite existing claims (e.g. Frank & Goyal, 2009) that regression results are robust to alternative operationalisations of leverage, this robustness may not apply, for example, to other measures of performance. Second, the paper employed a limited number of control variables, which does not permit to rule out the possibility of having observed a spurious relationship. Finally, the employed models explain only a moderate amount of the variance in debt ratio, indicating that significant predictors were omitted from the analyses.

5.5 Future research

The following avenues for future research are proposed. First, scholars may further analyse the moderating role of size on the profitability–leverage relationship by extending the extant studies to other countries and time periods. Second, the robustness of the present results should be verified, by resorting to alternative operationalisations of the employed variables. Third, more research may be conducted into the underlying mechanisms through which size influences the link between profitability and leverage. Namely, future research should investigate whether growth opportunities, bankruptcy risk or other factors underlie this relationship, by including these variables as controls and as moderators. Finally, a better, more complete theoretical framework should be developed, in order to fully account for the observed moderating role of size on the link between profitability and leverage.

ACKNOWLEDGEMENTS

I would like to express my thanks and gratitude to my supervisor, Dr. Samy Essa, for his feedback, which helped me in improving this thesis. Furthermore, I thank Prof. Dr. Rezaul Kabir and Dr. Xiaohong Huang for their support in writing this paper.

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APPENDIX

Table A1. Review of empirical studies on factors affecting capital structure

Panel A: Empirical studies on the impact of profitability and size on leverage

Effect on leverage	Profitability	Size
Positive	Hovakimian et al., 2004; Antoniou et al., 2008 for JP firms, using market leverage	Antoniou et al., 2008 (excepting US firms); Byoun, 2008; Dang, 2013; Fama & French, 2002
Negative	Acedo-Ramirez & Ruiz-Cabestre, 2014; Booth et al., 2001; Byoun, 2008; Dang, 2013; Fama & French, 2002; Antoniou et al., 2008, for FR, DE, UK and US firms, using market leverage; Antoniou et al., 2008, for firms in G5 countries, using book leverage	Faulkender & Petersen, 2006
Statistically insignificant		Acedo-Ramirez & Ruiz-Cabestre, 2014, for SP and IT firms; Antoniou et al., 2008, for US firms

Panel B: The impact of profitability on leverage, as a function of firm size – evidence from empirical studies

Company size	Positive	Negative
Small	Vithessonthi & Tongurai, 2015	Gonzalez & Gonzalez, 2012 (stronger); Voulgaris et al., 2004
Medium		Gonzalez & Gonzalez, 2012; Voulgaris et al., 2004; Vithessonthi & Tongurai, 2015
Large		Gonzalez & Gonzalez, 2012 (weaker); Voulgaris et al., 2004; Vithessonthi & Tongurai, 2015 (stronger)

Note: DE – German; FR – French; IT – Italian; JP – Japanese; SP – Spanish; UK – British; US – American.

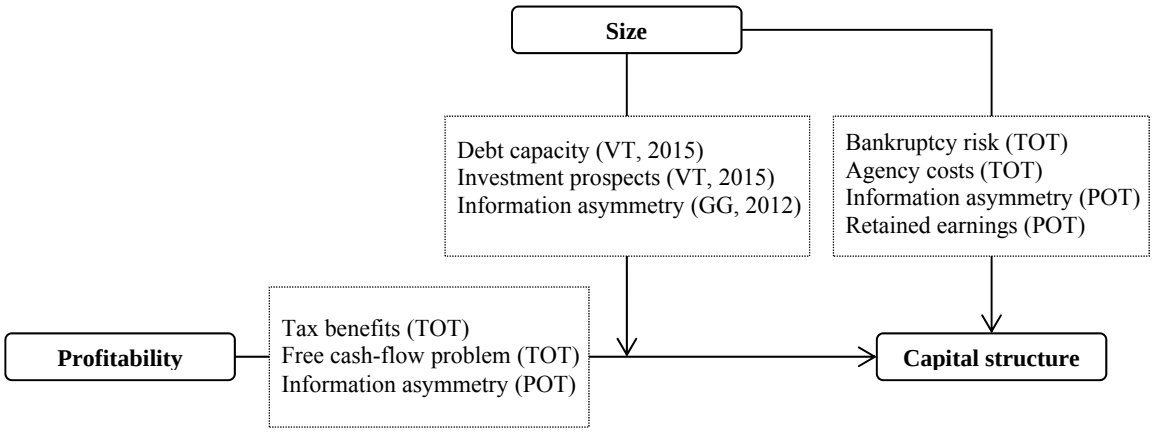

Figure A1. The mechanisms underlying the profitability, size and capital structure linkage

Note: GG – Gonzalez & Gonzalez (2012); POT – Pecking order theory; TOT – Trade-off theory; VT – Vithessonthi & Tongurai (2015).

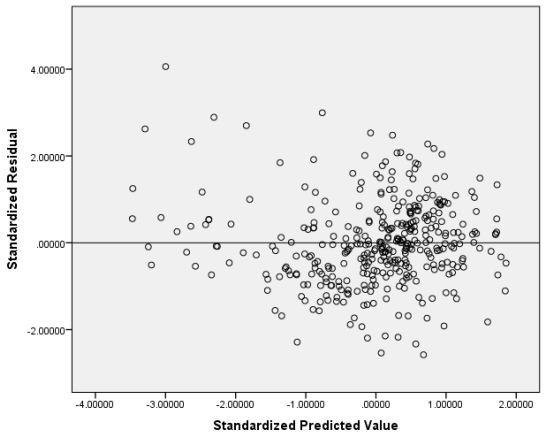

Figure A2. Illustration of the fulfilment of the heteroscedasticity and linearity assumptions (scatterplot based on the subsample of French firms in the year 2008)

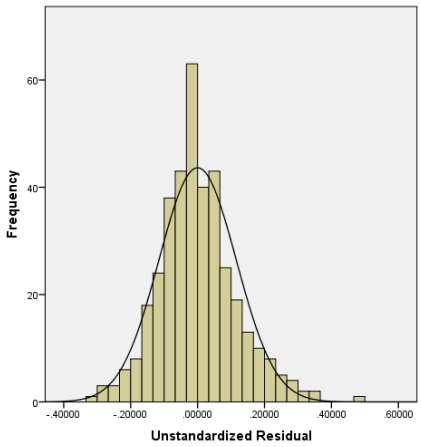

Figure A3. Illustration of the fulfilment of the normality assumption (histogram of unstandardised residuals for French firms in the year 2008)

The impact of macroeconomic variables on capital structure: A comparison between companies in E7 and G7 countries

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ABSTRACT

Although capital structure determinants have been the main focus of many research papers, it would appear that the 'capital structure puzzle' has yet to be solved. Hence, this study would like to contribute to this subject by conducting a time series analysis of companies in E7 and G7 countries over the period 2005-2014. In particular, multivariate regression models are used to examine the direct impact of macroeconomic variables on the capital structure choice of publicly traded non-financial companies. The results of this study state that macroeconomic variables like the real GDP growth rate, the corporate tax rate, bond market developments, financial freedom and law enforcement have similar relationships with capital structure across E7 and G7 countries. However, there is also evidence that the inflation rate, stock market developments, bank concentration, creditor protection and perceived level of corruption differ in the relationship with capital structure across E7 and G7 countries. Therefore, the findings in this paper add to the body of research that has already been published by providing up-to-date results.

Keywords

E7 countries, G7 countries, Macroeconomic variables, Capital structure, Multivariate regression, Long-term book debt, Long-term market debt

5th IBA Bachelor Thesis Conference, July 2nd, 2015, Enschede, The Netherlands.

1. INTRODUCTION

Globalisation is a process that has transformed supply and demand conditions across the global. Karadagli (2012) claimed that, in particular, political and social globalisation offer options for emerging countries to catch up with developed countries. Consequently, it is argued that globalisation is likely to affect a number of macroeconomic variables. Thus, the question arises as to what impact do those changing variables, such as GDP or inflation, have on companies and their capital structures?

The determinants of a company's capital structure have been the focus of much research since the 20th century. Particular attention has been paid to non-financial companies, operating in sectors such as, e.g. agriculture, construction, IT, manufacturing, mining, real estate, wholesale and retail as well as transport and warehousing, as these sectors, are effectively less regulated with respect their capital structure (Chipeta & Mbululu, 2013; Cho et al., 2014).

Modigliani and Miller's theorem, from 1958, arguably forms the basis of modern thinking on capital structure. In their so-called capital structure irrelevance proposition, they claimed that the choice of capital structure is irrelevant under the assumption of perfect markets where taxes and transaction costs do not exist. Hence the value of company would be independent of the capital structure. Nevertheless, subsequent studies have examined the determinants of capital structure and provided new theories. The main ones that have been used as background for hypotheses testing in this paper include: the pecking order theory, the trade-off theory, the agency and market timing theories. These theories offer different views on the determinants of capital structure but there is still no clear consensus as to exactly how capital structure is determined. Myers & Majluf (1984) described this phenomenon as the capital structure puzzle – apparently one that has yet to be solved.

The aim of recent empirical research has been to verify significant findings in this subject area. According to, Gungoraydinogluc & Öztekin (2011) the capital structure of company is not only determined by its intrinsic characteristics but is also a result of its external environment in which it operates. In this respect, De Jong et al. (2008) and Kayo & Kimura (2011) claimed that there are internal and external determinants that influence the capital structure of companies. While internal determinants, which are called firm-specific factors, have been analysed to a large extent, the external determinants have been relatively underrepresented in the literature (Booth et al., 2001; De Jong et al., 2008; Muthama et al. 2013). However, companies operate in particular industries and countries and, thus, understanding the external determinants is important. It is these factors that will be change in the long term but cannot be influenced by the companies themselves (Kayo & Kimura, 2011). It is only governments and central banks that are able to use monetary and fiscal policies to influence macroeconomic conditions with the ultimate long-term goal of financial and economic stability, or even an increase in economic wealth (Karadagli, 2012).

The goal of this paper is to contribute to the subject of macroeconomic variables and capital structure by providing up-to-date empirical findings and an answer to the research question:

'W*hat is the relationship between macroeconomic variables and the capital structure choice of publicly traded non-financial companies in E7 and G7 countries?'*

In order to answer this question, this study examines different countries (14 in total) over the period 2005-2014. More specifically, the sample size is 3.426 companies, which were incorporated into a database for the bivariate and multivariate analyses. Moreover, the 10 examined macroeconomic variables are represented through the real GDP growth rate, the inflation rate, the corporate tax rate, stock market development, bond market development, bank concentration, financial freedom, creditor protection, law enforcement and perceived level of corruption represent the macroeconomic variables in this study. Overall, the findings indicate that in E7 as well as G7 countries some of the country specific variables, such as the real GDP growth rate, the corporate tax rate, bond market developments, financial freedom and law enforcement are similarly correlated to capital structure. By contrast, there are variations in the impact from the impact of inflation rate, stock market developments, bank concentration, creditor protection and perceived level of corruption. Furthermore, almost all the macroeconomic variables showed a significant relationship in the applied Ordinary least Squares (OLS) and General linear Model (GLM) methods. However, the inflation rate and bank concentration in E7 countries and the real GDP growth rate and the stock market development in the G7 countries were partly insignificant. Concerning the model fit, the long-term debt ratio was similar for both the E7 and the G7 countries, which was in contrast to the long-term market debt ratio.

The remainder of this paper is organised as follows: *Section 2* summarises the past research on capital structure. *Section 3* discusses relevant theories. *Section 4* explains how the variables as well as the hypotheses were determined. *Sections 5* and *6* describe the methodology and the data collection. *Section 7* consists of a discussion of descriptive statistics, bivariate and multivariate analyses. Section 8 sums up the main findings of this research, finally, *Section 9* discusses the limitations

2. LITERATURE REVIEW

Much research has been published on the determinants of capital structure (De Jong et al., 2008; Jõeveer, 2013; Kayo & Kimura, 2011). As depicted in *Table 1*, the research differs in terms of emerging and developed countries, the size of samples and the periods that were reviewed.

Table 1. Prior literature

Overview					
Authors	Year	Countries	Number of countries	Sample	Study period
Rajan, R. G., & Zingales, L.	1995	Developed	7	4557	1987-1991
Giannetti, M.	2003	Developed	8	1151	1993-1997
Jõeveer, K.	2013	Emerging	9	2909	1995-2002
Schmukler, S., & Vesperoni, E.	2001	Emerging	7	800	1980-1999
Booth, L. et al.	2001	Emerging & Developed	10	1000	1980-1991-
Cho, S. S., et al.	2014	Emerging & Developed	48	7593	1991-2010
De Jong.A., et al.	2008	Emerging & Developed	42	11849	1997-2001
Gungoraydinoglu & Öztekin	2011	Emerging & Developed	37	15177	1991-2006
Kayo, E.L., & Kimura, H.	2011	Emerging & Developed	40	12734	1997-2007

This table presents published papers which examined the relationship of firm specific and macroeconomic variables in regard to capital structure. The depicted literature is sorted by the examined country classifications.

Up to now, the main focus of mot papers concerning has been the internal determinants of capital structure, namely firm-specific variables (Deesomsak et al., 2004). Thus, this aspect has been thoroughly researched and includes: tangibility, business risk, size, tax, growth opportunities, profitability and liquidity. For example, the Rajan & Zingales study (1995) had the primary objective of determining whether or not the observed relationships between firm-specific determinants and capital structure in the USA could also be seen in other G7 countries. Indeed, the academic found that the effect of internal factors on a firm's leverage is quite similar across the G7 countries. De Jong et al. (2008) extended this study by examining a total of 42 countries split evenly between emerging and developed economics. This study did not found that the relationship of firm-specific determinants and capital structure was the same across all the countries in the sample. Besides firm-specifc variables, macroeconomic variables and their impact on capital structure have also been the focus of numerous research papers. Furthermore Daskalakis & Psillaki, (2008) and Kayo & Kimura (2011) argued, that firm-specific variables were relatively better explanatory determinants of the variance in capital structure because they were more dynamic and volatile. In addition, they are more likely to change in the short-term whereas macroeconomic factors tend to change in the long run. The academics concluded that managers therefore focus more on a firm's intrinsic characteristics when making financing decisions.

With regard to differences between emerging and developed economics, the Booth et al. study (2001) is deemed to be important since the purpose of this research was to compare 10 emerging countries with developed countries (represented by the G7). The academics found that, despite institutional and cultural differences among countries, the relationship between external determinants and capital structure seen in developed countries could also be observed in emerging, too. There were robust and significant findings showing that macroeconomic factors, such as the economic growth rate, the inflation rate, financial market development and government policies, did indeed influence the capital structure in developed as well as emerging countries (Booth et al., 2001).

Research carried out by De Jong et al. (2008) found additionally that macroeconomic variables have a direct and indirect impact. The indirect impact is characterised by the changed effect of firm-specific variables on capital structure due to macroeconomic variables. Hence the influence of firm-specifc factors tends to change when companies are operating within a particular country. In particular, countries might also be allocated into bank or market-based financial systems (De Jong et al., 2008). According to Sett & Sarkhel (2010), financially constrained companies operating in a bank-market are more likely to rely on funds provided by banks than companies operating in market-based systems. But Schmukler & Vesperoni (2001) asserted, that the difference between developed and emerging countries is more important than the distinction between bank-based and market-based countries.

Furthermore, (Kayo & Kimura, 2011; Talberg et al., 2008) claimed that most papers have only focused on firms and countries rather than sectors or industries. Talberg et al. 2008 found significant differences in the capital structure of companies which were dependent on the type of industry. For example, the authors found that the independent variables tend to have the same impact across the examined industries. In addition, Kayo & Kimura (2011) argued that there are direct and indirect impacts on firm-specific variables not only from macroeconomic variables but also from industry variables, such as industry dynamism, industry concentration and industry munificence. According to them, the latter was deemed to be a significant direct driver of growth opportunities in emerging countries and not significant in developed ones while the effect of industry munificence on a firm's profitability is indirect and also classified as a significant determinant of capital structure.

Besides industry-specific variables Akhtar (2012) and Hackbarth et al. (2006) noted, that the four different stages of the business cycle, namely peak, contraction, trough and expansion had a significant role in explaining the error terms of capital structure studies. In this regard, Cook & Tang (2010) claimed that the impact of macroeconomic variables on the adjustment speed of capital structure was largely ignored. They asserted, that when macroeconomic conditions are favourable companies tend to adjust their capital structure more quickly, with a view to achieving their target leverage ratios, than under adverse conditions. For example, companies operating in France, adjusted their capital structure relatively more quickly than companies in Japan (Antoniou et al., 2008). Moreover, in terms of adjustment speed a distinction is made between companies that are 'financially constrained' and companies that are 'unconstrained' (Cook & Tang, 2010). According to Levy & Hennessey (2007), financially unconstrained companies have a free cash flow to total debt ratio of more than 1. Hanousek & Shamshur (2011) found that the capital structure of companies which are financially constrained, due to credits, is not affected by economic transformations and macroeconomic shocks. Therefore, supporting Levy & Hennessey (2007), they concluded that financially constrained companies are more focused on firm-specific variables, while financial unconstrained companies are more responsive to macroeconomic variables.

However, a common feature of most of the research is the restricted database. Small companies tend to provide less financial information than larger ones (Beck et al., 2008). Consequently, very often it is only large companies that are included – for example, the constituents of major indices. Jõeveer (2013) examined the impact of including either small or large companies in the sample. In a study of 9 Eastern European countries he argued, that macroeconomic variables were the main determinants of capital structure for small unlisted companies while firm-specific variables mostly explain the variation in the leverage of large unlisted and listed companies. These findings thus explain the relatively weak model fits of macroeconomic variables compared with firm- specific variables. (Kayo & Kimura, 2011). In addition, Daskalakis & Psillaki (2008) and Katagiri (2014) argued that larger firms tend to rely more on debt compared to smaller companies. In this respect, Kayo & Kimura (2011) found evidence that larger companies are more transparent and are able to spread the cost of debt by taking higher volumes. Finally, Camara (2012) stressed, that there are significant differences between multinational and domestic companies in regard to the impact of macroeconomic variables on capital structure.

All in all, latest research findings appear to confirm that macroeconomic variables do influence capital structure. However, are that still not enough studies that solely focus on the direct impact of macroeconomic variables. In addition, the literature has focused on study periods from 1980-2010, which means that there is lack of up-to-date findings. Furthermore, although there are already many comparisons between emerging and developed countries, it is assumed that there is still a research gap in terms comparisons of the E7 with the G7.

3. RELEVANT THEORIES

This section discusses the main theories in the subject of capital structure. In particular, the trade-off theory, the pecking-order theory, the agency theory and the market timing theory are introduced and explained.

3.1 Trade-Off Theory

The Kraus & Litzenberger (1973) theory resulted from the debate about of the debate about the Modigliani and Miller propositions. It is called the trade-off theory and can be divided into static and dynamic. The static trade-off theory is one of the most used theories in explaining the determinants of capital structure (Kraus & Litzenberger, 1973). It argues that a company will use debt instead of equity to a certain extent to maximise its enterprise value. Particular consideration is given to, the tax-shield which can be used to reduce taxable income for a given year, or delay income taxes into subsequent years. In this respect, the trade-off theory stresses a target leverage ratio. Antoniou et al. (2008) claimed that the impact of a one-period lagged leverage ratio on the current leverage ratio is supposed to show whether or not a company has a target capital structure.

However the tax shield has a drawback since too much leverage would give rise to a proportional increase in the financial distress costs. Thus, the trade-off theory assumes that companies always have to make a trade-off between financial distress costs and the benefits of a tax shield. Furthermore, the financial distress costs can be divided into direct and indirect ones. Direct costs are, for example, legal fees connected with bankruptcy, while indirect costs could include a potential decrease in the number of customers, employees and business opportunities.

Besides the static trade-off theory, there is also the dynamic trade-off theory that is concerned with the adjustment speed of the capital structure. Camara (2012) claimed that, in particular, for equity investors the adjustment speed to a target leverage ratio denotes lower recapitalisation costs, financial flexibility and stable cost of capital. It is assumed that companies that deviate to a far extent from the target leverage ratio, or ones that are overleveraged, will adjust at a faster speed in order to achieve their target leverage ratio when compared with companies that are closer to their target, are deemed to be underleveraged (Camara, 2012; Chipeta & Mbululu, 2013). In addition, Hackbarth et al. (2006) and Cook & Tang (2010) stated that the size and speed of the adjustment depends on the economic conditions, where more often but smaller adjustments were observed in booms compared to recessions. However Camara (2012) found evidence, that multinational corporations adjust faster to their target leverage ratio in good macroeconomic conditions compared to domestic companies.

3.2 Pecking-Order Theory

The pecking-order theory was expounded by Myers & Majluf (1984) and differs from the 'trade-off theory' that it does not imply that there is a target capital structure that has to be attained and maintained. According to the theory, companies are supposed to follow a predefined financial hierarchy to finance investments, starting off with the use of internal resources then debt and subsequently convertible bonds then finally equity. This order was selected on account of asymmetric information, which is the main reason for conflicts between agents and principals (Jensen & Meckling, 1976). Moreover, issuing more debt or equity signifies a willingness to share information with the outside world, although this could lead to a loss of competitive advantage (Myers & Majluf, 1984). Furthermore, the pecking order theory states certain relationships between firm-specific variables with respect to capital structure. According to the pecking-order theory, larger companies have more opportunities to use internal funds to finance themselves since their revenues are relatively higher than those of small firms. Nevertheless, Beck et al. (2008) claimed that the 'traditional pecking order theory' did not consider that investors would like to acquire additional 'proprietary' information. Thus, the 'reverse pecking order' coexisted where companies tend to issue equity before debt increase the incentives for investors to invest in information.

3.3 Agency Cost Theory

Jensen & Meckling (1976) claimed that the agency cost deals with the problems that can emerge because of a separation of control and ownership theory. There are several types of agency problems that can result in agency costs. Firstly, there is the 'type one' agency problem which mainly consists of conflicts between executives and shareholders. It is assumed that, in reality agents and principals have varying amounts of information and different targets with respect to the assets and the company's on-going day-to-day operations. This can potentially result in costs when the agents are not acting in the interest of shareholders. Jensen & Meckling (1976) stated that additional leverage can be an effective method against moral hazard of managers. Shareholders may grant the use of additional debt since this would limit the funds available to executives that allow them to pursue personal agendas and, moreover, ties them to a repayment obligation. (Kayo & Kimura, 2011). In this mean it is possible to stop the empire building ambitions of managers since high-risk investments are not possible. Secondly, the 'type two' agency problem concerns tensions between majority and minority shareholders that can lead to abuses of power and free riding problems which lead an increase in agency costs. Finally, the 'type three' agency problem is characterised as the conflict between bondholders and shareholders and specifically situations where creditors and owners pursue different goals in order to maximise their own value. In contrast to shareholders, bondholders do not wish to invest in risky investments since this would imply a value transfer to shareholders as they benefit from capital gains and dividends whereas bondholders only receive the interests.

3.4 Market Timing Theory

Baker & Wurgler (2002) expounded the market timing theory. It states that companies decide to change or adjust their capital structure according to market timing and market valuations. This explains changes to capital structure during market fluctuations more appropriately than the trade-off, pecking-order and agency-theory. Baker & Wurgler (2002) explained, that for companies, it is not important whether they issue more debt or equity but only which one is more highly valued on the market at a particular point in time. For example when companies go public, generally, they issue more equity compared with the phase afterwards, as IPOs are usually carried out when markets are buoyant and the intention is to benefit from the high valuation and favourable forecast for the company's performance. Additionally, in their market timing theory Baker & Wurgler (2002) maintain that, similar to the pecking order theory, there is no target capital structure and that capital structure can be seen as a cumulative result of past attempts to time the equity. They concluded, that companies with low levels of leverage tend to raise equity when their market valuations are high, while highly leveraged companies seem to do the opposite and issue equity when their market valuations are relatively low.

4. VARIABLES & HYPOTHESES

After all relevant theories were explained, this section provide information about the variable and hypotheses determination.

4.1 Dependent Variables

Rajan & Zingales (1995) asserted that the total debt ratio is deemed as the broadest definition of leverage. According to them, this ratio is inappropriate for measuring leverage as there is a lack of indication of future financial distress. Moreover, they claimed that total liabilities include other means such as account payables and/or pension liabilities, which are not interest-bearing. De Jong et al. (2008) argued that the total debt ratio is not appropriate to measure leverage due to trade credits. In this respect, trade credits are deemed to have other determinants leading to a bias interpretation at the end of the analysis. Consequently, total debt is not taken as a financial ratio to measure leverage.

In the literature, academics use the book value or market value of equity as well as total liabilities (Booth et al., 2001; Kayo & Kimura, 2011). Frank & Goyal (2009) claimed that book based leverage ratios are backward looking, whereas market based ratios are forward looking. Indeed, Chipeta & Mbululu (2013) stated that, instead of the book value, the market value should be used as it fallows market valuation to be taken into account. It has also been argued that book values reflect distortions of accounting rules (Kayo & Kimura, 2011). In addition, Kayo & Kimura (2011) stated that market value provides a more realistic view since it is closer to a firm's intrinsic firm value. The importance of considering market value was stated by Giannetti (2003), who claimed, that a major limitation of his study was the database, as no data on market capitalisation was included and thus the explanatory power of the results was restricted.

Nevertheless, there have been studies that have used book based ratios. It has been argued that the market value of the debt ratio can be determined by other factors that are not controlled by a company (Booth et al., 2001). In this regard, Booth et al. (2001) claimed that the market value should not be used on its own since it implies actions that are not fully related to managers' actions and could be the result of market fluctuations. Moreover, book leverage captures the value of assets in place and not growth options reflected in the current market values (Kayo & Kimura, 2011). In other words, book value has the potential to identify the negative marginal debt capacity of growth options, too. Thus it does not distort future investment decisions as market value does.

This paper uses the long-term book debt ratio and the long-term market debt ratio as proxies for leverage, following Akhtar (2012), Booth et al. (2001), Cho et al. (2014) and Frank & Goyal, (2009). The leverage ratios are calculated as follows:

$$\text{Long term book debt ratio: } \frac{\text{Total liabilites } - \text{current liabilites}}{\text{Total liabilities} + \text{Book equity value}}$$

$$\text{Long term market debt ratio: } \frac{\text{Total liabilites } - \text{current liabilites}}{\text{Total liabilities} + \text{Market equity value}}$$

4.2 Independent variables

4.2.1 Real Gross Domestic Product Growth Rate

Beck et al. (2008), De Jong et al. (2008), Chipeta & Mbululu (2013) and Muthama et al. (2013) found that companies operating in a country with increased real GDP, have a higher level of economic wealth and thus tend to issue more debt than equity. However, Kayo & Kimura (2011) found a negative relationship and argued, that companies tend to generate greater profits during periods of peak economic activity, in particular, higher net income. This provides the opportunity to finance further investments internally and not by issuing debt or equity.

Hypothesis 1: Real GDP growth rate is negatively related to leverage

4.2.2 Inflation Rate

Frank & Goyal (2009) and Jõeveer (2013) argued that the inflation rate is positively related to leverage since, during periods of inflation, companies can repay debt more easily because of their greater pricing power and higher earnings. However, Beck et al. (2008) and Muthama et al. (2013) stated that inflation is negatively related to leverage as it harms companies' profitability through the influence on consumer demand. While pricing power increases during periods of inflation, the earnings can become very volatile and this can entail greater business risk and financial distress (Chipeta & Mbululu, 2013). Inspired by Beck et al. (2008), Camara (2012), Muthama et al. (2013) and Chipeta & Mbululu (2013) this paper used the annual percentage change of the consumer price

Hypothesis 2: Inflation is negatively related to leverage

4.2.3 Tax Rate

De Jong et al. (2008) classified the tax rate as being a firm-specifc determinant of capital structure calculated as total income taxes divided by pre-tax income. However Gungoraydinogluc & Öztekin (2011) asserted that, in particular, institutional factors influencing taxes drive most of the country heterogeneity in capital structure. In this concern, Fan & Twite (2012) found that taxes are significant determinants of capital structure in developed countries. Furthermore according to the trade-off theory, large companies are more able to use the tax-shield as their costs of financial distress and bankruptcy are lower and thus have more incentives to issue debt. Given that the sample in this study comprises mostly large companies, including this variable is justified. Inspired by Fan & Twite (2012), Jõeveer (2013) and Sett & Sarkhel (2010) this study used the corporate tax rates.

Hypothesis 3: The corporate tax rate is positively related to leverage

4.2.4 Stock Market Development

De Jong et al. (2008), Kayo & Kimura (2011) and Sett & Sarkhel (2010) found that stock market development is an important variable for the evaluation of the impact of macroeconomic variables on capital structure, as it influences the tendency to issue equity rather than debt. This influence is justified by the market timing theory but is not in accordance with the pecking-order theory and trade-off theory. As mentioned earlier, the market timing theory states that the decision to issue either debt or equity is related to the question of whether the stock market is undervalued or overvalued. It is assumed that if the stock market is undervalued a company would be more willing to issue equity rather than debt, as the cost of equity would be relatively low. According to Antoniou et al. (2008), De Jong et al. (2008), Delcoure (2007) and Kayo & Kimura (2011) stock market development can be gauged by looking at the ratio of stock market capitalisation to GDP.

Hypothesis 4: Stock market development is negatively related to leverage

4.2.5 Bond Market Development

Schmukler & Vesperoni (2001) research how sources of financing are related to internal determinants and how those change when companies operate in world markets. There were no significant results that an evolving banking sector does guarantee more external financing opportunities in emerging countries. However, De Jong et al. (2008) and Sett & Sarkhel (2010) asserted that a more developed bond market, also known as debt or credit markets, in a country facilitates access to debt. This is justified by the argument that developed bond markets lead to robust legal systems that protect debt holders and mitigate agency problems. In this respect, Beck et al. (2008) found evidence that bond market development is positively related to bank and development finance, in particular, for large companies. Furthermore, Giannetti (2003) stated that some countries provide better surveillance opportunities for debt holders by adjusting the law appropriately. For example, in Germany if banks wish to represent their interest there is the possibility to have seats on corporate boards. Therefore, it has been assumed that this increased level of security for the banks has tended to decrease their costs of debt, which ultimately makes it more attractive for companies. Following Beck et al. (2008), bond market development is represented as the amount of domestic credit provided by the financial sector in regard to GDP.

Hypothesis 5: Bond market development is positively related to leverage

4.2.6 Bank Concentration

Jõeveer (2013) claimed that the higher the degree of bank concentration within a country the lower the level of competition. This leads to an increase in the cost of debt as the competitive pressure in the market is lower. However, Jõeveer (2013) was not able to verify the established expectations and found a positive relationship. Therefore, this study uses this variable to verify whether or not different countries and sample sizes lead to the same outcomes. Jõeveer (2013) defined bank concentration as a percentage of the three biggest banks' assets in relation to the total banking sector' assets. In other words, an evaluation of the level of bank sector competition in a country.

Hypothesis 6: Bank concentration is negatively related to leverage

4.2.7 Financial Freedom

Delcoure (2007) claimed, that the financial constraints of banking systems are a crucial factor that influence capital structure. In this respect, it is assumed that without additional control of banks, in particular, are more able to decrease their cost of debt. Consequently, companies have greater incentives to borrow more. The 'Financial Freedom Index' is used to measure efficiency as well as independence of the financial sector from the government control and inferences. The scale is 0 to 100 - the higher the score the more independent the financial system.

Hypothesis 7: Financial Freedom is positively related to leverage

4.2.8 Creditor Protection

Creditor protection describes the degree to which tangible collateral and bankruptcy laws protect the rights of debt holders. De Jong et al. (2008) claimed, that heightened creditor protection in a country increases the propensity to issue more debt than equity. It has been argued better creditor protection decreases the 'type two' agency cost problem where bondholders defend their interests' vis-à-vis managers and shareholders by means such as higher interest rates or additional debt covenants. The intention is to reduce the likelihood of a value shift from bondholders to shareholders. The assumption is that if the debt holders' interests are protected and misconduct is punished then there will be more incentives to lower the cost of debt or make debt covenants less strict. In order to measure the level of creditor protection in a country, the 'Depth of Credit Information Index' is used. It is has a scale of 0-8 where 0 indicates a low amount of information available to the lender and 10 states a large amount of information is available like additional accounting information.

Hypothesis 8: Creditor protection is positively related to leverage

4.2.9 Law Enforcement

On the one hand, Beck et al. (2008) claimed that better protection of property rights is correlated with higher use of external funding, especially for small companies. However, they claimed that this positive relationship decreases proportionally with size. On the other hand, Gungoraydinoglu & Öztekin (2011) and Antoniou et al. (2008) claimed that a higher level of enforcement of both the law generally and contracts specifically leads to a greater risk of bankruptcy and thus to lower agency costs of equity and less debt. It has therefore been assumed that higher levels of enforcement are associated with lower leverage ratios. In addition, De Jong et al. (2008) observed that better law enforcement in a country facilitated the health of the economy and thus reduced the borrowing of companies. Still, they claimed the importance of this variable as a mean for measuring the indirect impact of macroeconomic variables. In this respect, it is assumed that higher law enforcement further increases the influence of the firm-specific variable namely profitability on capital structure. This study uses the 'Strength of Legal Rights Index', which measures the degree to which collateral and bankruptcy law protect the rights of creditors. A scale of 0 to 12 is used and 0 represents non-enforcement law protection by the government while higher scores imply greater levels of enforcement.

Hypothesis 9: Law enforcement is negatively related to leverage

4.2.10 Perceived Level of Corruption

Hanousek & Shamshur (2011) argued that lower corruption is correlated to higher debt levels. Still, their findings classified corruption as an insignificant determinants of capital structure for listed companies. However, Jõeveer (2013) found significant evidence that corruption is negatively related to leverage. In this concern, it was expected that less corruption within a country lead to a lower level of asymmetric information. This is supported by the pecking-order theory and the agency theory, which state that greater levels of asymmetric information lead to increased use of internal funds instead of external financing. In addition, Fan & Twite (2012) argued that in more corrupt countries total debt increase while long-term debt is negatively correlated. Following Jõeveer (2013), Fan & Twite (2012) and Hanousek & Shamshur (2011) the 'Corruption Perceptions Index' is used in order to identify to what extent corruption is present in a country. A score of 0 is correlated with a highly corrupt environment in a country while a higher score indicates lower levels of corruption.

Hypothesis 10: The perceived level of corruption is negatively related to leverage

5. METHODOLOGY

This paper describes a time series study, where data was examined over a period of 10 years, namely *2005-2014*. This duration is justified since other academics, such as Booth et al. (2001), Frank & Goyal (2009), Gungoraydinoglu & Öztekin (2011), Kayo & Kimura (2011) and Schmukler & Vesperoni (2001) took similar periods for their studies and stated significant and robust findings. The units of analysis are the E7 and G7 countries and the units of observation as non-financial publicly listed companies operating within these countries. Long term book and long-term market ratios are regressed against 10 macroeconomic variables using the 'Ordinary Least Squares' (OLS) method. Furthermore, 'z-scores' are used to standardise the independent variables since there different measurement scales are applied (De Jong et al., 2008).

Table 2. Dependent and Independent Variables

Variable	Abbreviation	Source
Long-term book debt ratio	LDB	ORBIS
Long-term market debt ratio	LDM	ORBIS
Real Gross Domestic - Product Growth Rate	GDP	World Bank, IMF
Inflation rate	INF	World Bank
Corporate Tax Rate	T	World Bank
Stock market - Development	SM	World Bank
Bond market - Development	BM	World Bank
Bank Concentration	B	World Bank
Financial Freedom	FF	Heritage Foundation, IMF
Creditor protection	CP	World Bank
Law enforcement	L	World Bank
Perceived level of corruption	C	Transperancy International

This table shows the abbreviations and the sources of the dependent and independent variables.

Inspired by Daskalakis & Psillaki (2008), Cho et al. (2014), Giannetti (2003), Karadagli (2012), Rajan & Zingales (1995), Sett & Sarkhel (2010) and Talberg et al. (2009) the multivariate regression equation is stated as follows:

$$LDB_{ict} = \beta_0 + \beta_1 zGDP_{ct} + \beta_2 zINF_{ct} + \beta_3 zT_{ct} + \beta_4 zSM_{ct} + \beta_5 zBM_{ct} + \beta_6 zB_{ct} + \beta_7 zBE_{ct} + \beta_8 zCP_{ct} + \beta_9 zL_{ct} + \beta_{10} zC_{ct} + \varepsilon_{ct} \quad \textbf{[1]}$$

$$LDB_{ict} = \beta_0 + \beta_1 zGDP_{ct} + \beta_2 zINF_{ct} + \beta_3 zT_{ct} + \beta_4 zSM_{ct} + \beta_5 zBM_{ct} + \beta_6 zB_{ct} + \beta_7 zBE_{ct} + \beta_8 zCP_{ct} + \beta_9 zL_{ct} + \beta_{10} zC_{ct} + \varepsilon_{ct} \quad \textbf{[2]}$$

Where

β_0 = intercept of the econometric model
$\beta_{1\text{-}10}$ = regression coefficients of the econometric model
ε = error term (also known as disturbance term)
i = company (1,….,3426)
c = country (1,…,14)
t = year (2005,…, 2014)
z = standardisation by using z-scores
LDB_{ict} = long term book debt ratio of company i in country c at time t
LDM_{ict} = long term market debt ratio of company i in country c at time t
$\beta_1 zGDP_{ct}$ = standardised real GDP growth rate of country c at time i
$\beta_2 zINF_{ct}$ =standardised inflation rate of country c at time i

Nevertheless Verbeek (2012) and Wooldridge (2014) explained, that in order to use the OLS method several requirements have to be fulfilled.

Firstly, it was presumed that heteroscedasticity could occur when examining macroeconomic variables and capital structure (Hanousek & Shamshur, 2011). This is when the standard deviations of a variable are non-constant – this results in biased F-statistics, standards errors and coefficients (Hayes & Cai, 2010; Wooldridge, 2014). Therefore, in order to find this out, unstandardised predicted values and unstandardised residuals were depicted on a scatterplot. This provided a small indication of heteroscedasticity. Therefore subsequently, further statistical tests called 'Breusch-Pagan test' and 'White test' were performed (Verbeek, 2012). The hypotheses were tested with the assumption that H_0 equals homoscedasticity and H_1 equals heteroscedasticity. Unfortunately, the H_0 was rejected meaning that heteroscedasticity was present. For this reason the 'General Linear Model' (GLM) was applied, to verify the extent to which heteroscedasticity influenced the F statistics, parameters and standards errors in the OLS method. Wooldridge (2014) claimed that GLM is not susceptible to heteroscedasticity and is thus suitable for a multivariate analysis if there is considerable heteroscedasticity. Fortunately, the GLM analysis produced the same findings as the OLS model leading to the assumption that only a small degree of heteroscedasticity existed. Nevertheless, in order to exclude heteroscedasticity, the syntax provided by Hayes & Cai (2010) was used to establish heteroscedasticity adjusted standard errors.

Secondly, *autocorrelation* or *lagged correlation* has been considered and tested. This is used, in particular, when examining historical time series data implying residuals which can be segregated by a time lag (Verbeek, 2012). Kayo & Kimura (2011) encountered this type of problem and argued that it occurs when data is extracted from companies nested in the same kind of industry and country. In this study the 'Durbin-Watson Statistic' was used to detect autocorrelation where the outcome of this statistic varies between 0 and 4. Verbeek (2012) stated that a value that is near to 0 implies a positive autocorrelation and means that the hypothesis H_0 with no autocorrelation is rejected. Furthermore, a value approaching 4 indicates that negative autocorrelation prevails. Consequently, a Durbin-Watson value of 2 would indicate almost no autocorrelation. In this regard, the OLS outcomes have shown a value of 1.7-1.9, hence it is assumed that the requirement is fulfilled and the outcomes are unbiased.

Thirdly, there is the requirement that there should be a normal distribution of the residuals. Long-term book and market debt ratios that are regressed against ten macroeconomic variables in G7 countries produce normal distributed residuals. However, in E7 countries slightly positively skewed data have been observed Moreover, Wooldridge (2014) stated that although skewed data is present a large sample size provides unbiased results.

Fourthly, multicollinearity has been analysed: It pertains the possible linear relationship between independent variables, which could lead to biased regression estimates (Verbeek, 2004). Prior studies encountered multicollinearity issues while using similar macroeconomic variables (De Jong et al., 2008). Thus, the multicollinearity diagnostic test was performed and consisted of a tolerance value as well as the variation inflation factor (Verbeek, 2012). In this regard, the assumption of multicollinearity was rejected since the examined independent variables in the E7 and G7 exceeded neither the tolerance margin of 1 nor the variation inflation factor margin of 10.

6. DATA

In order to show how the data collection was done in his research this section is divided into the sub-sections countries as well as companies. In the first sub-section, the choice of the appropriate countries to measure the macroeconomic variables is explained. Subsequently, in the second sub-section, there is a brief elaboration with respect to the sample.

6.1 Countries

In keeping with Rajan & Zingales (1995), this study takes the IMF's G7 classification as a representative group for the seven wealthiest developed economies (Canada, France, Germany, Italy, Japan, United Kingdom and the USA). The E7 includes Brazil, China, India, Indonesia, Mexico, Russia and Turkey and represents the wealthiest emerging economies. The E7 acronym is and was first coined in the PricewaterhouseCoopers' report 'The World in 2050'. More specifically, Hawksworth & Chan (2015) classified seven emerging economies whose collective size is still below that of the well-known G7 countries but will overtake them by approximately 2050, leading to a shift in global economic power. The main sources for the macroeconomic data for the period 2005-2014 were: the World Bank[8], Eurostat[9] and the International Monetary Fund[10]. It should be noted that data for the real GDP growth rate is only published at regular intervals of two years, which means that it is only available up to 2014. Thus, in this study estimates for 2014 were provided by the International Monetary Fund. These are considered to be accurate and reliable for 2014. While this approach implies a limitation, it has been assumed that reducing the period for the study by one year would change the explanatory power of the other macroeconomic factor significantly, as the study was not able to increase the sample due to the lack of availability of data in ORBIS[11].

6.2 Companies

As previously stated, this study focuses on publicly listed companies from major stock exchanges. These have been classified by the 'World Federation of Exchanges'. The data for the major stock exchanges in each country was retrieved on the 31st January 2015 and is therefore deemed to appropriate the research. Antoniou et al. (2008) and Rajan & Zingales (1995) also took the major stock exchanges as a benchmark to compare several countries and produced reliable findings for the predetermined groups. The choice to take publicly traded companies is justified by the fact that those companies are obliged to publish additional information, such as annual reports, at regular intervals. Moreover, it was assumed that the financial statements have been checked by independent auditors and that the figures are thus accurate. In addition, selecting publicly listed companies also means that there will be sufficient information about the market capitalisation. In order to obtain the necessary data for the leverage ratios the ORBIS database [4] was used. The database is provided by Bureau van Dijk and access is granted by the University of Twente.

This paper focuses on non-financial companies (based on Standard Industrial Classification (SIC) industry codes) operating in the agriculture, construction, IT, manufacturing, mining, real estate, wholesale and retail as well as transport and warehousing industries. Financial institutions as well as utilities were deliberately excluded from this study as it was assumed that these companies have specific regulations as regards their capital structure (Chipeta & Mbululu, 2013; Cho et al., 2014). Finally, the suitable determination of the sample is important. Booth et al. (2001) stated that there were some insignificant results in their study since the sample size was relatively small, leading to excessively high standard errors. Therefore based on the requirements described earlier in this sub-section two selection criteria were used (See *Table 3*) to select suitable companies. Overall, there is a sample size of 1482 in the E7 and 1944 in the G7 countries. However, considering how many non-financial companies are operating in each country acronym, these numbers represent 25.01% of the population. In this study the sample size is seen as reasonable as it is in line with other researchers, such as, Booth et al. (2001), Jõeveer (2013), Rajan & Zingales (1995) and Schmukler & Vesperoni (2001). However, for example, the studies conducted by De Jong et al. (2008), Cho et al. (2014) and Kayo & Kimura (2011) implied more countries and hence exhibit considerably more companies.

Table 3. Sample

E7 Countries				
Country	Major Stock Exchange	Total	Available	Selected
Brazil	BM&F Bovespa	416	276 (66.35%)	40 (14.49%)
China	Shanghai Stock Exchange	979	854 (87.23%)	425 (49.77%)
India	Bombay Stock Exchange	4921	3837 (77.97%)	768 (20.02%)
Indonesia	Indonesia Stock Exchange	509	371 (72.89%)	122 (32.88%)
Mexico	Bolsa Mexicana de Valores	136	113 (83.09%)	41 (36.28%)
Russia	Moscow Exchange	271	168 (62.00%)	51 (30.36%)
Turkey	Instanbul Stock Exchange	429	307 (71.56%)	35 (11.40%)
	Overall	**7661**	**5926 (77.35%)**	**1482 (25.01%)**
G7 Countries				
Country	Major Stock Exchange	Total	Available	Selected
Canada	Toronto Stock Exchange	1165	678 (58.20%)	153 (22.57%)
France	Euronext Paris	887	707 (79.71%)	143 (20.23%)
Germany	Boerse Frankfurt	764	580 (75.92%)	130 (22.41%)
Italy	Borsa Italiana	296	212 (71.62%)	102 (48.11%)
Japan	Toyko Stock Exchange	3493	3086 (88.35%)	618 (20.03%)
United Kingdom	London Stock Exchange	2033	1242 (61.09%)	249 (20.05%)
United States	New York Stock Exchange	2354	1268 (53.87%)	549 43.30%)
	Overall	**10992**	**7773 (70.72%)**	**1944 (25.01%)**

These tables present the chosen sample for the E7 and G7 countries. The first selection criterion ('available') was that the available companies had to operate in one of the following sectors: agriculture, construction, IT, manufacturing, mining, retail trade, wholesale trade, transport or warehousing. Companies in the financial or utilities industries were excluded. The second criterion ('selected') was that companies had to provide full financial data for the required period 2005-2014.

[8] World Bank - http://www.worldbank.org/
[9] Eurostat - http://ec.europa.eu/eurostat
[10] IMF - http://www.imf.org/external/data.htm
[11] ORBIS - http://www.bvdinfo.com

7. RESULTS

This section includes the discussion of the descriptive, bivariate and multivariate analysis. In this respect, the discussions begin with an evaluation of the E7 countries followed by G7.

7.1 Descriptive Analysis

All the information for the descriptive statistics was extracted from *Table 6,* which can be found in the appendix. According to the findings of this study, companies operating in the G7 countries have relatively more long-term debt in terms of book (0.291) and market value (0.247) than E7 countries do (0.241 as well as 0.218). Brazil and India had the largest long-term debt mean in the E7, while companies operating in China surprisingly, had the lowest mean during the period 2005-2014. The United States had the highest percent of long-term debt in G7 countries although being a market-based economy. Nevertheless Italy, Germany and France are characterised as bank based economies and indeed provide indication that these have especially more long-term debt in terms of book and market value compared to Canada. These findings are in line with those of Kayo & Kimura (2011). However, De Jong et al. (2008) found considerably lower means in terms of long-term market debt ratio. This might be explained by the fact that the number of countries and the sample size is higher in their study, which was conducted for the period 1997-2001 and, therefore, did not cover the periods of the most recent financial crises.

As regards the real GDP growth rate, the E7 countries exhibited a higher rate (0.079) than the G7 countries (0.010). As claimed by Hawksworth & Chan (2015), among the E7 countries China possesses the highest real GDP growth rate (0.102). By contrast, in the G7, the development in Italy was even slightly negative (-0.004). Another expected result was that companies in the G7 countries (0.36) have higher corporate tax rates compared with the E7 countries (0.31). Moreover, the stock and bond markets are significantly more developed in the G7 countries. It is notable that the United States has a more highly developed bond market (2.282) than stock market (1.153). Furthermore, Japan has an even more developed bond market than the USA (3.267). This is in line with the classification of Japan to be bank based economy.

On the subject of financial systems, the degree of bank concentration was slightly higher in the G7 than in the E7 countries, which is in accordance with Jõeveer (2013). As regards financial freedom, the findings showed that financial institutions in the G7 countries (68.80) were more independent from government control compared with the E7 countries (36.11). This can be explained by the assumption that, for example, the Chinese government wants to keep control of the markets as much as possible. In this respect, the fiscal and monetary policies of a country are deemed to be the primary means for regulating the market. However, there still exist other limitations on banks, such as the minimum amount of reserves, which are set by the government.

Finally, the descriptive statistics show that, the G7 countries provide higher levels of creditor protection through the obligation to publish additional credit and financial information in accordance with generally accepted international accounting standards, such as IFRS and GAAP. Moreover, in the G7 countries, creditors seem to have greater legal rights in situations of financial distress and bankruptcy. Consequently, the corruption perceptions index states similar results. In the G7 countries (73.34) was higher than in the E7 countries (33.76), which implies that there is less corruption in the G7 compared with the E7 countries.

7.2 Bivariate analysis

In E7 countries, law enforcement (0.38) and corporate tax rates (0.31) are most closely correlated to the long-term book debt (LDB) ratio. In the G7 countries, credit protection (0.37) and law enforcement (0.35) have the greatest positive influence on long-term book debt ratio (LDM). Furthermore, in the E7 countries the real GDP growth rate (-0.71) and bond market concentration (-0.41) are mostly negative related to LDB, while in the G7 countries the Financial Freedom Index (-0.24) and the bond market development (-0.19) are mostly negative related to LDB. With respect to the bond market development, the findings were not in accordance with Hypothesis 5 and the outcomes of De Jong et al. (2008). However, there is positive impact on LDM from law enforcement (0.40) and inflation (0.37) in the E7 countries. By contrast, in the G7 countries, law enforcement (0.23) and creditor protection (0.23) did not have the highest positive correlation to LDM. Finally, in this respect, bank concentration (-0.44) and bond market development (-0.33) were mostly negatively correlated. All the findings discussed were significant - at the level of 1% - except for the relationship between creditor protection and corporate taxes in the E7 countries as well as financial freedom and the real GDP growth rate in the G7 countries.

Furthermore, the correlation among independent variables were tested, too. In the E7 countries most notably, there is a very significant positive correlation between stock market development and GDP (0.56), law enforcement and inflation (0.64) as well as bank concentration and bond market development (0.73). While in the G7 countries bond market development and corporate taxes (0.59), creditor protection and stock market development (0.64) and law enforcement and creditor protection (0.65) are significantly positively related to each other. Finally, in E7 countries, bank concentration and inflation (-0.71) have the highest negative relationship with each other. All in all, there is the conclusion that both long term ratios have significant relationships with macroeconomic variables with differing the coefficient sign in the E7 and G7.

Table 4. Bivariate correlation analysis results

E7 Countries												
	LTB	LTM	GDP	INF	T	SM	BM	B	FF	CP	CP	C
LTB	1											
LTM	**0.89***	1										
GDP	**-0.71***	**-0.11***	1									
INF	**0.26***	**0.37***	**-0.31***	1								
T	**0.31***	**0.32***	**0.13***	**0.42***	1							
SM	**0.12***	**0.10***	**0.56***	**-0.03***	**0.29***	1						
BM	**-0.34***	**-0.33***	**0.45***	**-0.59***	**-0.43***	**0.09***	1					
B	**-0.41***	**-0.44***	**0.18***	**-0.71***	**-0.56***	**-0.13***	**0.73***	1				
FF	**0.05***	**0.14***	**-0.53***	**0.31***	**0.13***	**-0.28***	**-0.42***	**-0.62***	1			
CP	**-0.02***	**0.12***	**-0.35***	**0.25***	0.00	**0.15***	**-0.04***	**-0.08***	**0.46***	1		
L	**0.38***	**0.40***	**-0.17***	**0.64***	**0.46***	**0.17***	**-0.49***	**-0.76***	**0.05***	**0.19***	1	
C	**-0.09***	**-0.05***	**0.12***	**-0.23***	**-0.07***	**0.25***	**0.61***	**0.34***	**0.05***	**0.51***	**-0.04***	1
G7 Countries												
	LTB	LTM	GDP	INF	T	SM	BM	B	FF	CP	CP	C
LTB	1											
LTM	**0.87***	1										
GDP	**0.05***	**-0.04***	1									
INF	**0.27***	**0.18***	**0.29***	1								
T	**0.16***	**0.13***	**0.02***	**-0.32***	1							
SM	**0.21***	**0.06***	**0.33***	**0.28***	**0.06***	1						
BM	**-0.19***	**-0.13***	**-0.07***	**-0.59***	**0.59***	**0.04***	1					
B	**0.15***	**0.14***	**-0.11***	**-0.08***	**0.25***	**-0.09***	**0.23***	1				
FF	**-0.24***	**-0.18***	0.00	**0.06***	**-0.65***	**-0.28***	**-0.54***	**-0.24***	1			
CP	**0.37***	**0.23***	**0.16***	**0.39***	**0.06***	**0.64***	**-0.11***	**0.04***	**-0.22***	1		
L	**0.35***	**0.23***	**0.08***	**0.64***	**-0.26***	**0.52***	**-0.51***	**-0.15***	**-0.03***	**0.65***	1	
C	**-0.10***	**-0.12***	**0.18***	**-0.06***	**-0.04***	**0.43***	**0.14***	**-0.14***	**0.28***	**0.41***	**0.16***	1

*These tables present the bivariate results of the E7 and G7 countries with respect to the dependent and independent variables. *, **, *** denote statistical significance at the 1%, 5% and 10% levels, respectively.*

7.3 Multivariate analysis

In this sub-section there is a discussion of the multivariate regression results in regard to the E7 and G7 countries.

Table 5. Multivariate regression results of OLS and GLM

E7 Countries			
Independent variables	Expected relationship	Long term book debt	Long term market debt
Intercept	/	**0.256***	**0.231***
		(0.002)	(0.003)
Real GDP Growth rate	negative	**-0.014***	**-0.013***
		(0.003)	(0.003)
Inflation Rate	negative	0.002	**0.031***
		(0.003)	(0.003)
Corporate Tax Rate	positive	**0.028***	**0.027***
		(0.003)	(0.003)
Stock market Development	negative	**0.011***	**0.009***
		(0.002)	(0.003)
Bond market Development	positive	**-0.060***	**-0.036***
		(0.004)	(0.005)
Bank Concentration	negative	0.004	0.003
		(0.005)	(0.005)
Financial Freedom	positive	0.001	**0.012***
		(0.003)	(0.003)
Creditor protection	positive	**-0.036***	**-0.024***
		(0.003)	(0.004)
Law enforcement	negative	**0.049***	**0.042***
		(0.003)	(0.004)
Perceived level of corruption	negative	**0.048***	**0.042***
		(0.004)	(0.004)
Observations		14820	14820
R^2		0.269	0.277
Adjusted R^2		0.268	0.276
G7 Countries			
Independent variables	Expected relationship	Long term book debt	Long term market debt
Intercept	/	**0.287***	**0.246***
		(0.002)	(0.001)
Real GDP Growth rate	negative	-0.001	**-0.006***
		(0.001)	(0.001)
Inflation Rate	negative	**-0.009***	**-0.007***
		(0.002)	(0.002)
Corporate Tax Rate	positive	**0.036***	**0.024***
		(0.002)	(0.002)
Stock market Development	negative	0.002	**-0.020***
		(0.002)	(0.002)
Bond market Development	positive	**-0.075***	**-0.050***
		(0.003)	(0.003)
Bank Concentration	negative	**-0.036***	**-0.027***
		(0.003)	(0.003)
Financial Freedom	positive	**0.017***	**0.021***
		(0.003)	(0.003)
Creditor protection	positive	**0.027***	**0.026***
		(0.002)	(0.002)
Law enforcement	negative	**0.056***	**0.040***
		(0.003)	(0.003)
Perceived level of corruption	negative	**-0.020***	**-0.011***
		(0.003)	(0.003)
Observations		19440	19440
R^2		0.275	0.177
Adjusted R^2		0.274	0.177

*These tables present the regression results of the E7 and G7 countries. Bold highlighting and the superscripts *, **, *** indicate statistical significance of the unstandardised coefficients at the 1%, 5% and 10% levels, respectively. Inspired by Hanousek & Shamshur (2011), Hayes & Cai (2010) and Wooldridge (2014) heteroscedasticity adjusted standard errors are reported in parentheses. With respect to multicollinearity, VIF is under 10.*

First of all, the results of the E7 countries are evaluated. As shown in *Table 5*, the so-called model fit, expressed as the adjusted-$R^{2,}$ shows a relatively moderate degree of explanatory power for the E7 countries. In more detail, the regression of the long-term book debt ratio (0.268) has a slightly lower explanatory value compared to the long-term market debt ratio (0.276). Nevertheless, these figures are in accordance with Gungoraydinoglu & Öztekin (2011) who claimed that macroeconomic variables only explain about 1/3 of the variance within leverage ratios. Thus, the remaining 2/3 is represented by unobserved variables that are firm-specific or industry-specific variables. In addition the 'model significance', also known as F-test, is 453.72 for the long-term book debt and 385.48 for the long term market debt ratios, respectively with 1% ANOVA significance satisfying the statistical 'goodness of fit' requirement.

Turning now to the 'economic significance', the real GDP growth rate showed significantly negative coefficients for both ratios (-0.014; -0.013) which is in accordance with Hypothesis 1 and the pecking-order theory. Furthermore, inflation shows an insignificant positive relationship with the LDB but a significant positive relationship with LDM which makes it hard to verify whether the Hypothesis 2 should be rejected or not. The corporate tax rate shows the strongest positive relationship in both leverage ratios and thus confirms Hypothesis 3. In this respect LDB is (0.028) while LDM (0.027).

The, subsequent ratios concern the degree of development of the financial system as reflected in stock market development, bond market development, bank concentration and financial freedom. Stock market development showed a significant positive relationship with LDB and LDM. Moreover, bond market development showed twice a significant negative relationship with both ratios implying the strongest negative t-value. In general these findings lead to a rejection of Hypotheses 4 and 5 and are not in accordance with De Jong et al. (2008). However, Kayo & Kimura (2011) also expected a positive relationship to bond market development and found a negative one. As regards bank concentration, in the E7 countries there was a slight but insignficant negative impact on both leverage ratios so that Hypothesis 6 cannot be rejected completely. In addition, creditor protection showed a significantly negative influence on LDB (-0.036) as well as LDM (-0.024). Furthermore, law enforcement twice showed a significant positive relationship to leverage, which was in contrast to the Hypothesis 9 and the findings of Antoniou et al. (2008). Last but not least, there is the perceived level of corruption, which twice showed a significant positive relationship, in particular, for the LDB ratio (0.048) and the LDM ratio (0.042) and thus rejected the Hypothesis 10.

Turning now to the evaluation of the multivariate results for the G7 countries, which are depicted in *Table 5*. In this regard, the adjusted-R^2 represents (0.274) for the long-term book debt ratio and (0.177) for the long-term market debt ratio, respectively. The ANOVA analysis shows again 1% significance which implies that the independent variables do not explain the dependent variables randomly but there is a model significance prevailing for both ratios. This assumption is supported by the F-statistic for the LDB (503.77) and for the LDM (273.02). With respect to the economic significance of the unstandardised coefficients and their correlated signs, first of all, the real GDP growth rate is insignificantly negatively related to the LDB ratio (-0.001) and significantly negatively related to the LDM (-0.006). Furthermore, in contrast to E7 countries, inflation twice showed significant negative findings, which is in accordance

with Hypothesis 2. Nevertheless, similar to the situation in E7 countries, in G7 countries the corporate tax rate is significantly positively related to the LDB ratio (0.676) and the LDM ratio (0.622), which thus confirm Hypothesis 3. Especially, the marginal impact is the highest in the entire regression of G7 countries and the relationship can be explained by the static trade-off theory.

With respect to the relationship between the degree of development of the financial system and leverage, in E7 countries a negative relation was observed in two instances. As regards, the stock market development, the findings were inconsistent: there was an insignificant positive relationship for the LDB ratio (0.002), while for the LDM ratio this positive relationship was significantly negative (-0.020). Thus, only the results for the LDM ratio are consistent with the findings of De Jong et al. (2008) and the established Hypothesis 5. Moreover, in terms of bond market development, similarly to the E7 countries, there is a significantly negative relationship with the LDB ratio (-0.075) and the LDM ratio (-0.050). Therefore, Hypothesis 6 was rejected and the unexpected findings of Kayo & Kimura (2011) were confirmed. Furthermore, in contrast to the situation in the E7 countries and in accordance with Hypothesis 6, increased bank concentration within a country does have a significant negative relationship with the LDB ratio (-0.036) and the LDM ratio (-0.027). Jõeveer (2013) observed the same results and argued that less competition in the financial sectors puts more pressure on debtors since the market leaders control the market. A monopolistic banking sector is deemed to imply increased cost of debt since there is no competition to lower the premium.

The significant positive relationship between financial freedom from government control and the LDB ratio (0.017) as well as the LDM ratio (0.021) is similar to the situation in the E7 countries and confirms the Hypothesis 7 that less control by government promotes debt instead of equity. Finally, as regards, corporate governance mechanisms, increased creditor protection, by providing e.g. more credit information, is significantly positively related to the LDB ratio (0.027) and the LDM ratio (0.026). Again, the findings for the G7 are in contrast those for the E7 countries, where there is a negative relationship. Nevertheless, the results are in line with De Jong et al. (2008) and also consistent with Hypothesis 8. Thus, there is positive relationship between law enforcement and the LDB ratio (0.056) as well as the LDM ratio (0.040). Unfortunately, this does not support Hypothesis 9, which anticipated a negative relationship. The assumption was that debtors might be afraid of stricter bankruptcy laws in the case of financial distress and would thus borrow less. However, the observations could be justified by the argument that banks or other creditors would like to lower their costs since they are protected by the law, which in turn makes borrowing more attractive. Finally, the higher level of the corruption perceptions index, which indicates low levels of corruption in a country, is negatively correlated to the LDB ratio (-0.020) and the LDM ratio (-0.010) and thus confirmed Hypothesis 10.

8. CONCLUSION

The multivariate regression, performed as part of this study showed that there are significant relationships between macroeconomic variables and capital structure. However, the inflation rate, bank concentration, financial freedom in the E7 as well as the real GDP growth rate and stock market development in the G7 countries showed insignificant relationships with capital structure, which is in line with Beck et al. (2008). Nevertheless, as claimed by Jõeveer (2013) and Kayo & Kimura (2011) there is evidence that macroeconomic variables can be seen as determinants of capital structure. In general, the findings for the E7 as well as for the G7 countries were similar with respect to the impact on leverage – characterised as long-term book and market debt ratios – from the real GDP growth rate, corporate tax rates, bond market development, financial freedom and law enforcement. However, the correlation coefficients differed as regards inflation, stock market development, creditor protection and perceived level of corruption. In more detail, law enforcement had the largest positive coefficients in the E7 and G7 countries while bond market development reported the largest negative coefficients related to long-term book and market debt. Concerning the model fit, the E7 countries showed similar adjusted-R^2 in contrast to the G7 countries. In this case, the long-term market debt ratio only showed an adjusted-R^2 of 0.177 in the G7 countries which is assumed to be justified by the bigger sample size. The differences in the model fits still have shown, that the debate about whether market or book value should be used for calculating the leverage ratio is justified. Nevertheless, the relatively low model fits for the E7 and G7 are in line with findings of Kayo & Kimura (2011) and hence are evaluated as reasonable. Wooldridge (2014) stated that low model fits could occur if a large sample size is taken.

Ultimately, the question arises, for whom will the findings of this study prove to be particularly useful? First of all, they could be of interest to other researchers. For example, there might be other researchers who would like to conduct a similar study on macroeconomic variables and capital structure where the focus is on emerging and developed countries. The outcomes of this study could be used as a starting point or as a comparison. Furthermore, subsequently, papers such as 'The World in 2050' (Hawksworth & Chan, 2015) could be published and the findings could be used to support the assumptions about the E7 and G7. In particular, the descriptive statistics could be of particular interest, as there are observations, such as, that the G7 countries lead in terms of real GDP growth rates but they are not all that far ahead of the E7. Moreover, the results of this study could be of interest to companies operating in the non-financial industries as they would be able to compare their own behaviour with the findings in this study. As Kayo & Kimura (2011) stated, large companies appear to ignore macroeconomic variables as they tend to determine their capital structures on the basis of firm-specific variables. However, as Jõeveer (2013) argued - macroeconomic variables are important for small unlisted companies since they are not able to make such use of tax shields or other firm-specific means to adjust their capital structure in comparison to large companies. Therefore, they might be uncertain as to how they are supposed to cope with macroeconomic changes that occur suddenly.

9. LIMITATIONS

As indicated earlier in this paper, the number of companies operating in the E7 is a major limitation of this study. The ORBIS database did not provide sufficient accounting data for the period 2005-2014 in terms of market capitalization, especially for countries such as Brazil, Mexico, Russia or Turkey. Therefore, further research should be done, in particular for the E7 countries with a bigger sample size and including both large and small companies. Another limitation is that the indirect impact of macroeconomic variables was not considered. Cho et al. (2014), De Jong et al. (2008) and Kayo & Kimura (2011) claimed that the consideration of this indirect impact would entail the inclusion of additional firm-specific variables. This would have led to an unmanageable number of hypotheses and for this reason, was deliberately not done.

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11. APPENDIX

Table 6. Descriptive Statistics – E7 countries

Country	Stats	LDB	LDM	GDP	INF	T	SM	BM	B	FF	CP	L	C
Brazil	Mean	0.308	0.270	0.035	0.055	0.330	0.629	0.957	0.555	51.00	5.400	2.800	37.50
	Median	0.306	0.228	0.032	0.055	0.340	0.600	0.963	0.526	50.00	5.000	3.000	37.00
	SD	0.188	0.199	0.023	0.010	0.027	0.182	0.106	0.074	7.009	0.801	0.401	3.806
	Min	0.003	0.002	-0.003	0.036	0.250	0.356	0.745	0.461	40.00	5.000	2.000	32.00
	Max	0.777	0.776	0.075	0.069	0.340	1.003	1.108	0.663	60.00	7.000	3.000	43.00
China	Mean	0.132	0.103	0.102	0.029	0.274	0.795	1.412	0.564	30.00	4.000	4.300	35.80
	Median	0.099	0.067	0.096	0.026	0.250	0.710	1.451	0.526	30.00	4.000	4.500	36.00
	SD	0.113	0.106	0.021	0.019	0.037	0.432	0.126	0.065	0.000	1.549	0.781	2.272
	Min	0.001	0.001	0.077	-0.007	0.250	0.346	1.208	0.479	30.00	0.000	3.000	32.00
	Max	0.636	0.637	0.142	0.059	0.330	1.782	1.630	0.663	30.00	6.000	5.000	40.00
India	Mean	0.309	0.294	0.077	0.083	0.335	0.821	0.688	0.315	36.00	4.800	7.300	33.90
	Median	0.296	0.261	0.085	0.086	0.340	0.775	0.701	0.321	40.00	5.000	8.000	34.00
	SD	0.183	0.199	0.021	0.024	0.008	0.283	0.069	0.018	4.899	1.833	0.900	2.468
	Min	0.010	0.011	0.039	0.042	0.320	0.527	0.584	0.289	30.00	0.000	6.000	29.00
	Max	0.899	0.911	0.103	0.120	0.340	1.469	0.772	0.339	40.00	7.000	8.000	38.00
Indonesia	Mean	0.176	0.167	0.059	0.072	0.306	0.388	0.406	0.444	41.00	4.200	4.800	27.90
	Median	0.114	0.099	0.060	0.064	0.313	0.417	0.406	0.443	40.00	5.000	5.000	28.00
	SD	0.165	0.174	0.005	0.028	0.012	0.104	0.035	0.014	8.310	1.834	0.400	3.912
	Min	0.002	0.002	0.046	0.043	0.287	0.194	0.364	0.425	30.00	0.000	4.000	22.00
	Max	0.758	0.800	0.065	0.131	0.318	0.508	0.462	0.473	60.00	6.000	5.000	34.00
Mexico	Mean	0.270	0.232	0.025	0.042	0.296	0.354	0.409	0.560	62.00	6.400	5.700	33.60
	Median	0.243	0.181	0.031	0.040	0.300	0.370	0.431	0.577	60.00	6.000	5.000	34.00
	SD	0.177	0.174	0.029	0.006	0.014	0.072	0.058	0.055	4.005	0.801	1.006	1.802
	Min	0.002	0.004	-0.047	0.034	0.280	0.212	0.314	0.440	60.00	6.000	5.000	30.00
	Max	0.885	0.858	0.051	0.053	0.330	0.443	0.495	0.604	70.00	8.000	8.000	36.00
Russia	Mean	0.221	0.232	0.038	0.092	0.225	0.675	0.328	0.269	36.00	3.800	4.800	24.30
	Median	0.199	0.201	0.045	0.087	0.200	0.682	0.341	0.276	40.00	5.000	5.000	24.00
	SD	0.158	0.176	0.046	0.027	0.039	0.297	0.094	0.033	4.904	2.641	0.400	2.534
	Min	0.001	0.001	-0.078	0.051	0.200	0.239	0.208	0.222	30.00	0.000	4.000	21.00
	Max	0.767	0.758	0.085	0.141	0.330	1.156	0.483	0.317	40.00	7.000	5.000	28.00
Turkey	Mean	0.174	0.185	0.044	0.085	0.200	0.335	0.625	0.423	51.00	5.100	4.600	43.40
	Median	0.050	0.089	0.047	0.088	0.200	0.351	0.647	0.462	50.00	5.000	5.000	44.00
	SD	0.199	0.204	0.044	0.014	0.000	0.087	0.134	0.135	8.353	0.542	0.804	4.411
	Min	0.001	0.001	-0.048	0.063	0.200	0.161	0.456	0.100	30.00	4.000	3.000	35.00
	Max	0.637	0.667	0.092	0.104	0.200	0.443	0.843	0.531	60.00	6.000	5.000	50.00
Total	Mean	0.241	0.218	0.079	0.065	0.309	0.751	0.862	0.411	35.90	4.545	5.942	33.76
	Median	0.202	0.160	0.085	0.064	0.330	0.688	0.719	0.339	30.00	5.000	6.000	34.00
	SD	0.182	0.192	0.030	0.033	0.040	0.349	0.382	0.125	7.792	1.818	1.691	3.877
	Min	0.001	0.001	-0.078	-0.007	0.200	0.161	0.208	0.100	30.00	0.000	2.000	21.00
	Max	0.899	0.911	0.142	0.141	0.340	1.782	1.630	0.663	70.00	8.000	8.000	50.00

This table presents the descriptive statistics for the E7 countries. Especially the means, medians, standard deviations, minimums and maximums are stated for the dependent variables as well as dependent variables.

Table 6. (Continued) Descriptive Statistics – G7 **countries**

Country	Stats	LDB	LDM	GDP	INF	T	SM	BM	B	CP	L	C	BE
Canada	Mean	0.257	0.224	0.018	0.018	0.313	1.183	1.775	6.400	0.758	7.400	77.00	85.30
	Median	0.243	0.192	0.020	0.020	0.320	1.249	1.731	6.000	0.812	7.000	80.00	86.50
	SD	0.167	0.163	0.017	0.007	0.040	0.237	0.171	0.800	0.107	0.800	4.584	2.572
	Min	0.006	0.002	-0.027	0.003	0.260	0.650	1.506	6.000	0.594	7.000	70.00	81.00
	Max	0.757	0.775	0.034	0.029	0.360	1.500	2.142	8.000	0.869	9.000	80.00	89.00
France	Mean	0.272	0.240	0.009	0.015	0.330	0.760	1.225	4.400	0.643	4.500	65.00	70.69
	Median	0.251	0.217	0.016	0.016	0.330	0.730	1.252	4.000	0.650	5.000	70.00	70.00
	SD	0.128	0.121	0.016	0.008	0.000	0.186	0.087	0.800	0.018	0.671	8.065	2.383
	Min	0.044	0.025	-0.029	0.001	0.330	0.510	1.057	4.000	0.620	3.000	50.00	67.88
	Max	0.780	0.738	0.024	0.028	0.330	1.045	1.325	6.000	0.666	5.000	70.00	75.00
Germany	Mean	0.267	0.236	0.013	0.016	0.318	0.427	1.235	6.200	0.740	7.100	59.00	79.40
	Median	0.262	0.226	0.011	0.016	0.300	0.420	1.225	6.000	0.722	7.000	60.00	79.00
	SD	0.131	0.135	0.029	0.007	0.034	0.100	0.056	0.980	0.027	0.700	7.003	1.114
	Min	0.016	0.010	-0.056	0.003	0.290	0.296	1.135	5.000	0.712	6.000	50.00	78.00
	Max	0.708	0.699	0.041	0.026	0.380	0.613	1.328	8.000	0.781	8.000	70.00	82.00
Italy	Mean	0.281	0.260	-0.004	0.019	0.326	0.297	1.360	5.500	0.499	2.800	60.00	44.80
	Median	0.248	0.228	0.006	0.019	0.310	0.224	1.367	5.000	0.523	3.000	60.00	43.00
	SD	0.157	0.162	0.023	0.009	0.023	0.148	0.207	0.807	0.103	0.400	4.474	4.379
	Min	0.016	0.007	-0.055	0.002	0.310	0.145	1.035	5.000	0.350	2.000	50.00	39.00
	Max	0.768	0.711	0.020	0.034	0.370	0.528	1.618	7.000	0.631	3.000	70.00	52.00
Japan	Mean	0.188	0.182	0.007	0.002	0.388	0.805	3.267	5.700	0.428	5.600	48.00	75.60
	Median	0.163	0.159	0.016	0.000	0.410	0.708	3.285	6.000	0.439	6.000	50.00	75.50
	SD	0.125	0.121	0.027	0.011	0.031	0.193	0.209	0.458	0.024	0.800	6.000	2.154
	Min	0.011	0.010	-0.055	-0.013	0.330	0.600	2.991	5.000	0.383	4.000	30.00	73.00
	Max	0.720	0.651	0.047	0.027	0.410	1.085	3.665	6.000	0.450	6.000	50.00	80.00
United Kingdom	Mean	0.257	0.199	0.011	0.027	0.285	1.185	1.887	3.800	0.564	9.400	85.00	79.20
	Median	0.235	0.174	0.017	0.024	0.290	1.239	1.956	5.000	0.567	10.00	85.00	77.50
	SD	0.158	0.136	0.022	0.008	0.032	0.221	0.199	2.562	0.041	1.200	5.001	4.191
	Min	0.016	0.004	-0.043	0.015	0.230	0.663	1.530	0.000	0.501	7.000	80.00	74.00
	Max	0.770	0.703	0.030	0.045	0.330	1.469	2.156	7.000	0.632	10.00	90.00	86.00
United States	Mean	0.444	0.349	0.015	0.023	0.400	1.153	2.282	6.400	0.330	9.400	77.00	72.90
	Median	0.435	0.321	0.022	0.025	0.400	1.150	2.272	6.000	0.327	9.000	75.00	73.00
	SD	0.163	0.167	0.018	0.012	0.000	0.191	0.076	0.800	0.019	0.800	7.811	1.375
	Min	0.030	0.031	-0.028	-0.004	0.400	0.797	2.163	6.000	0.299	9.000	70.00	71.00
	Max	0.962	0.965	0.033	0.038	0.400	1.402	2.405	8.000	0.354	11.00	90.00	76.00
Total	Mean	0.291	0.247	0.010	0.015	0.360	0.927	2.309	5.637	0.484	7.174	65.83	74.34
	Median	0.264	0.218	0.017	0.016	0.380	1.022	2.271	6.000	0.442	7.000	70.00	74.00
	SD	0.178	0.159	0.023	0.014	0.050	0.331	0.758	1.436	0.151	2.247	15.52	8.267
	Min	0.006	0.002	-0.056	-0.013	0.230	0.145	1.035	0.000	0.299	2.000	30.00	39.00
	Max	0.962	0.965	0.047	0.045	0.410	1.500	3.665	8.000	0.869	11.00	90.00	89.00

This table presents the descriptive statistics for the E7 countries. Especially the means, medians, standard deviations, minimums and maximums are stated for the dependent variables as well as dependent variables.

EU-US trade deal: Value relevance and conservatism in converging accounting standards

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ABSTRACT

This thesis examines the differences regarding the relation between conditional conservatism and price value relevance in the EU and US. In particular, it investigates whether the relation differs in context of different accounting standards. This paper further investigates how the presence of accruals is related to conservatism and value relevance. In total, 985 firms are extracted from the ORBIS database, 616 firms from the EU complying IFRS and 369 firms from the US complying GAAP. Consequently, 985 firms over a period of 5 years, from 2009 to 2013, results in a total of 4925 firm-year-observations. OLS regressions are carried out to measure conditional conservatism, price value relevance and accrual intensity. Results show that US based firms are more conservative in their accounting practice and therefore have lower value-relevant financial information. European firms, on the other hand, appear to have low levels of conservatism and high value relevance. The presence of accruals and the relation between conservatism and price value relevance did not appear to have a positive relation. However, the regression did show another relation. Interestingly, the presence of accruals is negatively related to conservatism and positive to value relevance. In conclusion, IFRS and US GAAP compliance do not appear to have relational differences regarding conservatism and value relevance. Even more so, results show equal relational directions in the presence of accruals.

Keywords

Standard setters, accounting standards, value relevance, conservatism, income statement approach, valuation, accounting information.

5th IBA Bachelor Thesis Conference, July 2nd, 2015, Enschede, The Netherlands.

1. INTRODUCTION

Anno 2015, the European Union (EU) and the United States (US) are talking terms over the creation of a Transatlantic Trade and Investment Partnership (TTIP). The aim of the TTIP is to establish a partnership which, by breaking down economic barriers (e.g.: tariffs, restrictions, quotas), should improve the current trade situation between the EU and US. Eventually, the TTIP will lead to more welfare and higher utility through the establishment of new jobs, economic growth, lower prices and a higher variety of products (European Commission, 2015).

Before the TTIP will be established, both parties have to discuss political, economic, social, environmental and legal differences. One of these discussions is the accounting practice that will be used in the TTIP for financial reporting. The purpose of good financial reporting is to provide investors and other stakeholders with relevant and reliable information. The mandatory accounting practice in the EU is the International Financial Reporting Standard (IFRS), whilst the US uses the Generally Accepted Accounting Principles (GAAP). These two are worldwide the two dominant accounting practices and it is likely that the new accounting standard, after converging, will become the universally used practice. Hence, convergence of EU's and US' accounting standards will probably be key for the establishment of a uniform 'international accounting language'.

According to the Financial Accounting Standard Board (FASB), the most important characteristics of good financial reporting are 'reliability' and 'relevancy'. As well as the FASB, the American Institute of Certified Public Accountants' (AICPA) Jenkins Committee (1991) found the same results with regard to the most important financial reporting characteristics. Even more so, also academics came to the conclusion that relevancy and reliability are the most important properties of financial information (Barth, et al. 2001; Jonas & Blanchet, 2000). In addition, Barth, et al. (2001) combined the two properties and used it to describe the concepts of 'value relevance'. Financial information is said to be value relevant if it is associated with market values (Barth, Beaver, & Landsman, 2001). There is much literature about value relevance under different accounting standards. One of main causes, explaining differences in value relevance, is related to the level of conservatism in accounting. Different accounting standards tend to favor, or cause more, conservative behavior than others (Barth et al. 2001; Basu 1997; Penman and Zhang 2002; Van Tendeloo & Vanstraelen, 2005). For example Pham (2009) found that firms complying IFRS appear to be more conservative, whereas Gordon, Jorgensen and Linthicum (2008) found the opposite to be true.

Both conservatism and value relevance have been core subjects in the accounting literature. One of the trends that researchers are particularly interested in is the decline in value relevance. Some argue that value relevance is declining because: "accounting is broken", and is no longer representing what is important (Dontoh, Radhakrishnan & Ronen, 2004). Others argue that the decline in value relevance is caused by increased conservatism in accounting (Francis & Schipper, 1999). There are even researchers who argue that there is no significant relation between increased conservatism and declined value relevance (Balachandran & Mohanram, 2011). Hence, conservatism in accounting might only be partly explaining the decline in value relevance.

To sum up, literature states that different types of accounting standard result in different levels of conservatism and that increased conservatism might be the reason for declined value relevance. This thesis combines both subjects and focuses on the relational difference between value relevance and conservatism under different accounting standards. So, in view of the TTIP, this paper will answer the following research question: "to what extent is the relation between conservatism and value relevance different under US' GAAP and EU's IFRS?"

The answer to this question may be of potential interest to a broad diversity of people. Aside from firms operating in the TTIP, the answer might also be relevant for auditors, private and institutional investors, governmental agencies, and politicians that are currently negotiating the TTIP. In addition, this research will add to the already existing pool of literature examining value relevance, conservatism and differences in accounting standards.

2. LITERATURE REVIEW

2.1 Conservatism

2.1.1 Concept and theory

Traditionally, conservative accounting has been described by the following expression: "anticipate no profits, but anticipate all losses" (Bliss, 1924). Nowadays, the literature is split into two types of conservatism. On one hand, conservatism is the decision of writing down in response to 'bad' news while not writing up in response to 'good' news (Basu, 1997), also known as 'conditional conservatism' (Beaver & Ryan, 2005) and the 'income statement approach' (Zhang, 2000). On the other hand, conservatism is the undervaluation of net assets by pre-determined accounting practices (Kieso et al., 2004), also known as unconditional conservatism (Beaver & Ryan, 2005) and the 'balance sheet approach' (Zhang, 2000).

There is a clear gap in the literature lacking an explanation of why firms want to be conservative. Hence, a theory solely for conservative behavior is missing. Nevertheless, there are broader theories that can help to understand why regulators, standard setters and firms tend to be conservative. Some argue that conservative behavior is determined by the socio-cultural background of an individual and the intention to avoid risk by being conservative (Hofstede & McCrae, 2004). Others argue that firms want to be conservative because "conservatism benefits users of the firm's accounting reports" (Watts 2003a, p209). According to Watts (2003a) conservatism in firms exist because of contracts between different stakeholders and because it is part of the organization. Conservative accounting is a way to deal with 'moral hazards' which arise due to 'asymmetric information', 'asymmetric payoffs', a 'limited horizon' and 'limited liability' (Watts, 2003a). The idea that asymmetric information is a reason for conservative behavior was already suggested by Lambert (2001) in his paper: "Contracting Theory and Accounting". Lambert (2001) states that contracting theory is a theory that focuses on the behavior of people, when both parties tend to have different incentives to perform due to asymmetry. This idea of 'moral hazards' and information asymmetry amongst various parties is also used by Morris (1987) in his theory about the agency problem. Second, 'asymmetric payoffs' are related to litigation costs (e.g.: prosecution costs) which tend to be higher when assets are overstated relative to when assets are understated (Watts, 2003a). Third, a 'limited horizon' is related to the taxation and reporting of profits and losses, "asymmetric recognition of gains and losses enables managers of profitable firms to reduce the present value of taxes and increase the value of the firm" (Watts 2003a, p209). Hence, there is an incentive for earnings management. Lastly, 'limited liability' is, like the shareholder litigation costs, related to the cost of being wrong. There is asymmetry in standard setters and regulators' costs because they are more likely to face criticism when firms overstate relative to when firms understate (Watts, 2003a). This

asymmetry between standard setters, regulators and firms is also consistent with the opportunistic behavior assumption in Agency Theory (Morris, 1987).

2.1.2 How is conservatism examined?

Literature shows various ways in which conservatism can be examined and measured. All types of measurement can be put into either one of these two groups, the 'balance sheet approach' or the 'income statement approach'. The former is a measure of unconditional conservatism, which focuses on pre-determined accounting policies, and the latter is a measure of conditional conservatism, which is situational and event-driven (e.g.: 'what to do in a given situation'?) (Beaver and Ryan, 2005).

The most often used measurement models for the balance sheet approach, examining unconditional conservatism, are those of Beaver and Ryan (2001), the model of Penman and Zhang (2002), the Feltham-Ohlson valuation model and the accrual measurement model of Givoly and Hayn (2002). Beaver and Ryan's (2001) method, also called BR-CONS, uses book-to-market ratios and returns taking into account fixed time effects. The model is used to measure the downward bias in book values relative to market values, indicating conservative accounting. Penman and Zhang's (2002) method, also called C-SCORE, uses R&D and advertisement expenses capitalized for a specific year, and LIFO reserves scaled by net operating assets. This method is used to uncover 'hidden reserves' which are indications of conservative accounting (Penman & Zhang, 2002). The Feltham-Ohlson valuation model examines the degree of net asset undervaluation, by regressing the market value of abnormal earnings, assets and investments (Watts, 2003b). Lastly, the Givoly and Hayn (2000) approach uses accrual intensity as an indicator of conservatism.

The most often used measurement models for the income statement approach, examining conditional conservatism, are the model of Basu (1997), the model of Khan and Watts (2009) and the Asymmetrical Accrual to Cash-Flow (AACF) model of Ball and Shivakumar (2005). The Basu model examines the relation between earnings and stock returns. In this model, returns are used as a dummy variable for news. When returns are negative the dummy variable takes the value 1 indicating 'bad' news and when returns are positive the dummy variable takes the value of 0 indicating 'good' news. There has been some criticism on the Basu model as it does not consider or take any firm-specific factors into account (Khan & Watts, 2009). In addition, the model appears to be biased as Dietrich et al. (2007) found that results showed firms were conservative while they were not in reality. Furthermore, one of the parameters in the Basu model is 'return' which, if mispriced, will not give a good proxy for 'bad' or 'good' news (French, Schwert, & Stambaugh, 1987). Khan and Watts (2009) tried to improve the Basu model by adding firm-specific factors such as size, market-to-book and leverage. The firm specific factors are used to determine firm's investment opportunities which, according to them, have effect on the level of conservatism (Khan and Watts, 2009). Downside of this model is the fact that it can only be used in countries which share the same institutional framework as the US (Watts, 2003b). The AACF-model of Ball and Shivakumar (2005) can, in contrast to Basu based models, be used for non-listed firms. The AACF-model does not proxy for 'good' or 'bad' news. Instead, it proxies for negative cash-flows scaled by total assets, which indicate conservative accounting. Furthermore, the model uses accruals scaled by total assets as dependent variable and cash flows scaled by total assets as independent variable.

2.1.3 Findings in conservatism literature

The main indication of conditional conservatism is the timelier loss recognition in response to 'bad' news (e.g.: Basu, 1997; Watts, 2003a; Givoly, 2000). This means that 'bad' news would present itself timelier than 'good' news, indicating conservatism.

The conservatism literature shows context dependent research where conservatism has been examined under different accounting standards. Andre and Filip (2012) examined the level of conservatism after the mandatory adoption of IFRS in the EU and found that conservatism had declined. They analyzed 7378 firm-year-observations over a period of 5 years from 2003 to 2007 and used the Basu model to do so. In addition, Andre and Filip (2012) also analyzed country specific factors that could lead to a decline in conservatism. These country specific factors include: code versus common law, level of perceived governance, shareholder protection and enforcement, countries with important debt markets and countries with less developed equity markets. Pham (2009) on the other hand, examined the difference in conservatism complying IFRS or US GAAP. His results show that firms complying IFRS tend to have smaller book-to-market ratios and therefore tend to be more conservative than firms complying US GAAP.

Other parts in the conservatism literature focus on unconditional conservatism which is the downward bias in book values. Balachandran and Mohanram (2011) focused on unconditional conservatism as prior research had identified it as the main driving force for the decline in value relevance (Lev and Zarowin, 1999). Their research analyzed 100984 firm-year-observations over a period of 30 years from 1975 to 2004. Consistent with prior findings they found that conservatism had increased. Correspondingly, they identified two possible causes for the increased conservatism. First, there has been an increase in accounting assets that are, in general, more subjective to conservative behavior (e.g.: intangible assets). Second, financial reporting simply has become more conservative due to timelier loss recognition.

In conclusion, current trends and findings in conservatism are sometimes contradicting, making it difficult to draw a single conclusion. Watts (2003b) found that these contradicting results are caused by the effect of time-series in research, variations across firms, variations across countries (e.g.: institutional differences), contractual variations and discrimination among conservatism explanations.

2.2 Value relevance

2.2.1 Concept and theory

Value relevance is the combination of 'reliability' and 'relevancy' which are the most important characteristics of financial data (Barth et al., 2001). Financial information is said to be value relevant if it is associated with market values (Barth et al., 2001; Lev and Zarowin, 1999; Francis and Schipper, 1999). Most studies that examine value relevance do not offer any underlying explanation of their methodology which leads to lack of understanding in the underlying logic (Holthausen & Watts, 2001). Nonetheless, the two most used theories explaining, and related to, financial reporting are 'direct valuation theory' and 'inputs to equity valuation theory' (Holthausen & Watts, 2001; Balachandran & Mohanram, 2011).

Direct valuation theory states that accounting earnings should be associated with market values. In addition, according to the direct valuation theory, standard setters and regulators want to know which book values are associated with which market

values. Hence, the theory assumes that standard setters and regulators are interested in which variable is more, or most, associated with market value changes (Dhaliwal et al., 1999). However, the FASB refutes this assumption and fully contradicts direct valuation theory as an explanation of value relevance. "Financial accounting is not designed to measure directly the value of a business enterprise, but the information it provides may be helpful to those who wish to estimate its value" (FASB 1978, viii). In addition, the International Accounting Standards Boards (IASB), whom is responsible for the IFRS, also does not support the direct valuation assumption (IASB, Conceptual Framework for Financial Reporting, section: 1.35(a)-(e)). The inputs to equity valuation theory on the other hand, state that the role of accounting data is to provide information for valuation model inputs (Holthausen & Watts, 2001). This, according to the FASB, is only partly true as financial reporting has a multitude of functions and objectives (Financial Accounting Standard Board, 2010). According to Barth (1994), incremental association studies provide the best explanation for value relevance theory as these studies use 'standard-setting theory' as underlying explanation. This theory suggests that the statements made by accounting regulators should determine whether accounting practices are value relevant or not (Barth, 1994; Holthausen & Watts, 2001). Instead of focusing on shareholders and investors this theory revolves around standard setters to determine whether financial information is value relevant.

2.2.2 How is value relevance examined?

The value relevance literature distinguishes between price value relevance, return value relevance and value relevance from perfect foresight. Price value relevance measures the adjusted R^2 of regression with stock price as dependent variable and book value per share and earnings per share as independent variables (e.g.: Francis and Schipper (1990), Lev and Zarowin (1999)). Return value relevance also measures the adjusted R^2 of regressions but takes returns as dependent variable and earnings and level of earnings as independent variables, also known as the Easton and Harris model (1991). Lastly, the perfect foresight measure examines the stock returns that could have been earned when investors would have had perfect foresight and thus determines the accuracy of book values.

There are a few known problems with the before mentioned measurement models. First, Kothari and Zimmerman (1995) concluded that price models, in general, have a less biased earnings response coefficient compared to return models. Therein against, return models face less econometric problems in comparison with price models (Kothari and Zimmerman, 1995). Hence, depending on the research context both price and return models may be effective (Kothari & Zimmerman, 1995). Furthermore, Balachandran and Mohanram (2011) also found downsides to the value relevance measures. First, most measures of value relevance focus on bottom-line accounting numbers instead of line accounting numbers. Second, there has been an increase in financial disclosures making it more difficult to get a full image of a firm's assets and liabilities. Third, current value relevance measures may also capture other value, value of non-financial information, which disrupts the value relevance as it might deviate from the true value.

Other methods used to measure value relevance are the balance sheet model, the earnings model and the Ohlson model. The balance sheet model is used on the premise that market value of equity is equal to the market value of all assets minus the market value of all liabilities (Schiebel, 2007). The earnings measure is particularly useful for listed firms because it regresses the market capitalization on earning variables. Lastly, the Ohlson model states that the stock price of a firm can be written as a linear function of its earnings and book values. This model offers a benchmark when examining the relation between financial data and other information (Harris, Lang, & Mőller, 1994).

2.2.3 Findings in value relevance literature

Most research examined the difference in value relevance after adoption or between different accounting standards. Devalle (2010) researched whether value relevance improved after the mandatory adoption of IFRS in the EU. They used the Ohlson model to measure value relevance on a sample of 3721 firms listed on five European stock markets. Their results indicate that value relevance has improved after the mandatory adoption. This is in line with the findings of Morias and Curto (2009) who used the earnings model on a sample of 6977 listed European firms, over a period of 6 years from 2000 to 2005. These results are in line with the findings of Kargin (2013) who analyzed listed firms in Turkey from 1998 to 2011. In addition, Morias and Curto (2009) concluded that there are additional differences in value relevance caused by country specific factors such as the tax system and the level of legal enforcement. Soderstorm and Sun (2007) share this idea and argue that, even after the mandatory adoption of IFRS, differences between countries exist because of country specific institutional factors.

Lin, Riccardi and Wang (2012) did not examine value relevance after the adoption of a new accounting standard. Instead, they analyzed a sample of high-tech German firms and researched the differences in value relevance between two accounting standards, German GAAP and IFRS. Their results show that IFRS leads to more earnings management and less timely loss recognition. However, the main and somewhat contradicting finding was higher value relevance for firms complying GAAP. These results contradict previous findings as previous findings found that value relevance had increased after adoption of IFRS from GAAP. Atwood et al. (2011) also examined the differences in value relevance between two different accounting standards. They analyzed 8405 firms spread over 33 countries over a period of 7 years, from 2002 to 2008, and looked at the association between current accounting earnings and future cash flows. Their results show that earnings reported complying US GAAP are more associated with future cash flows than those under IFRS.

Some researchers did not find any significant difference in value relevance among US GAAP or IFRS (Van der Meulen et al., 2007). Van der Meulen et al. (2007) examined 128 firms and only found differences regarding the predictability, which was superior for firms complying US GAAP. Likewise, Dontoh, Radhakrishnan and Ronen (2004) came to the conclusion that value relevance was not increasing or decreasing because of conservatism. Instead, their results indicate that value relevance had declined because of an increase in non-information based trading.

2.3 Relationship between conservatism and value relevance

This part of the literature review will focus on research done on the relationship between conservatism and value relevance. Balachandran and Mohanram (2011), who studied the assertion of increasing conservatism being the driving force of declining value relevance, focused on firms in the US. Their results were unexpected as they did not find statistical evidence that unconditional conservatism was the main driving force for declining value relevance. This contradicts the results of Lev and Zarowin (1999) who found unconditional conservatism to be the main driving force for decreased value relevance. Even more unexpected, firms with increasing unconditional

conservatism showed a smaller decline in value relevance than firms with steady unconditional conservatism.

Others focused on conditional conservatism instead of unconditional conservatism in relation to value relevance. Kousenidis, Ladas and Negakis (2009) researched the relationship between conditional conservatism and return value relevance in a European context. They analyzed a sample of 127 listed firms and looked at the relationship before the mandatory adoption of IFRS. They divided the time period in two phases, before and after the crisis. Their results show that conditional conservatism increased after the crisis as regulations on accounting policies were sharpened. Furthermore, they found that value relevance had declined from 1989 to 2003. Almost like the results of Balachandran and Mohanram (2011), Kousenidis, Ladas and Negakis (2009) found that firms with higher levels of conservatism tend to have higher value relevance, whereas firms with lower levels of conservatism tend to show lower value relevance.

Brown et al. (2006) did not focus on the EU or US but examined the relation on an international scale. Moreover, Brown et al. (2006) also included country specific factors when examining the relationship between conservatism and value relevance. Their research included 20 countries from 1993 to 2004. Brown et al. (2006) used the Basu model and the AACF-model to measure conditional conservatism. After finding a positive relation, between conditional conservatism and value relevance in countries with high accrual intensity, they investigated the effect of accruals on the relationship between value relevance and conservatism. They concluded that the relationship between conservatism and value relevance depends on the accrual intensity. This might be a reason of why Balachandran and Mohanram (2011) did not find a significant relationship between declining value relevance and increasing conservatism as they did not focus on the accrual intensity.

Maganaris (2011) also looked at the relationship between conservatism and value relevance, taken into account, the effects that IFRS had on this relationship. They examined a period from 1999 to 2008 which was divided into two sub-periods; 1999 to 2004 and 2005 to 2008. By subdividing the period of analysis they got a clear idea of what happened after the mandatory adoption of IFRS in 2004. Their measurement model for value relevance was based on the Easton and Harris model of earnings. For measuring conditional conservatism they used the Basu measure. In conclusion, they found that more conditional conservatism is related to less value relevance of earnings after the adoption of IFRS, indicating a negative relationship. However, these results were not applicable for Germany.

2.4 Conclusion

Most literature shows that value relevance has increased after the adoption of IFRS. However, differences amongst countries still exist due to institutional factors (Soderstorm & Sun, 2007). The conservatism literature is indifferent, in the sense that, results vary a lot depending on the research carried out. Literature on the relationship between conservatism and value relevance also report different results but most studies found evidence of a negative relation between conservatism and value relevance. This literature review formed the basis for developing the hypotheses which will be explained in the next section. The next part will also elaborate on how each hypothesis will be tested and the regression models used to determine the level of conservatism, value relevance and accrual intensity. In addition, regression models will be based on models used in the literature.

3. METHOD

3.1 Accounting standard, conditional conservatism and price value relevance

This thesis investigates whether there is a difference between price value relevance and conditional conservatism complying different accounting standards, i.e.: IFRS and US GAAP. Accountants are more likely to be conservative in situations facing 'bad' news than situations of 'good' news. Immediate transparency in accounting numbers facing 'bad' news leads to maximization of personal utility for the accountant. Firstly because the transparency of 'bad' news creates a situation in which it only can get better. Secondly, by not acting in response to 'good' news, the current situation remains unchanged while the future situation becomes more promising. Hence, due to opportunistic behavior and timelier loss recognition, I expect that there will be a negative relation between conditional conservatism and price value relevance. This is in line with the results of Kousenidis, Ladas and Negakis (2009) and Maganaris (2011). Eq. (1)[1] is used to investigate the level of conditional conservatism. In addition, eq. (2) [2] is used to examine conditional conservatism by controlling for growth options and leverage. Lastly, eq. (3)[3] examines the level of price value relevance. In order to test these hypotheses a sample of 616 EU firms and 369 US firms over a period of 5 years from 2009 to 2013 will be analyzed. The hypotheses are as follows:

Hypothesis 1. Firms complying US GAAP are likely to exhibit a negative relation between conditional conservatism and price value relevance.

Hypothesis 2. Firms complying IFRS are likely to exhibit a negative relation between conditional conservatism and price value relevance.

$$E_{i,t} = \alpha_0 + \beta_1 NW_{i,t} + \beta_2 R_{i,t} + \beta_3 NW_{i,t} * R_{i,t} + \varepsilon_{i,t} \quad \textbf{(1)}.$$

Where

$E_{i,t}$ Is earnings measured as net income of firm 'i' in year 't' scaled by beginning of the period market value,

$R_{i,t}$ Is return for firm 'i' in year 't', measured by subtracting the initial stock price from the ending stock price (period 1), adding dividends for the period and dividing this by the initial stock price,

$NW_{i,t}$ Is a dummy variable for news that takes 1 if $R_{i,t} < 0$, indicating 'bad' news, and takes 0 otherwise,

$\varepsilon_{i,t}$ Is the error term.

To control for leverage and growth options modifications were made in eq. (1) resulting in eq. (2). Controlling for growth options is important as it tends to be associated with information asymmetry and "conservatism increases following increases in information asymmetries" (LaFond and Watts, 2008, p.476). In addition, LaFond and Watts (2008) also control for leverage measured as total liabilities scaled by shareholders' funds. The presence of debt makes managers act more conservative as debt repayments have to be made which leads to lower tolerance for risk.

$$E_{i,t} = \alpha_0 + \beta_1 NW_{i,t} + \beta_2 R_{i,t} + \beta_3 NW_{i,t} * R_{i,t} + \beta_4 G_{i,t} + \beta_5 G_{i,t} * NW_{i,t} + \beta_6 G_{i,t} * R_{i,t} + \beta_7 G_{i,t} * R_{i,t} * NW_{i,t} + \beta_8 LV_{i,t} + \beta_9 LV_{i,t} * NW_{i,t} + \beta_{10} LV_{i,t} * R_{i,t} + \beta_{11} LV_{i,t} * R_{i,t} * NW_{i,t} + \varepsilon_{i,t}$$ **(2).**

[1] Eq. (1) is based on Givoly and Hayn (2000, p.292) and Basu (1997, p.13).
[2] Eq. (2) is based on Latridis (2011, p. 95)
[3] Eq. (3) is based on Balachandram & Mohanram (2011, p. 276)

Where

$E_{i,t}$ Is earnings measured as net income of firm 'i' in year 't' scaled by beginning of the period market value,

$R_{i,t}$ Is return for firm 'i' in year 't', measured by subtracting the initial stock price from the ending stock price (period 1), adding dividends for the period and dividing this by the initial stock price

$NW_{i,t}$ Is a dummy variable for news that takes 1 if $R_{i,t} < 0$, indicating 'bad' news, and takes 0 otherwise,

$G_{i,t}$ Is total market value scaled by total book value of firm 'i' in year 't',

$LV_{i,t}$ Is total liabilities scaled by shareholders' funds of firm 'i' in year 't',

$\varepsilon_{i,t}$ Is the error term.

The most important coefficients in eq. (2) are $\beta_3 (R * NW)$, $\beta_7 (G * R * NW)$ and $\beta_{11} (LV * R * NW)$. The β_3 gives an indication of the incremental increase in the relationship between earnings and return when return is negative. Hence, when β_3 is positive and significant it means that 'bad' news is reflected timelier in earnings than otherwise, indicating conditional conservatism. Furthermore, a positive and significant β_7 means that firms have information asymmetry caused by growth options. Growth options are unidentifiable for outsiders so the information asymmetry between managers and outsiders is expected to be larger when more growth options are present. Thus, more information asymmetry means higher levels of conditional conservatism. Lastly, a significant β_{11} measures the "contracting demand" for conservative investments as leverage measures the relative non-growth option investments (LaFond and Watts, 2008). A larger amount of liabilities disciplines managers to be more careful as investments are made with someone else's capital, which has to be paid back. In addition, leverage tends to decline in the presence of growth options because leverage measures the relative non-growth options (LaFond and Watts, 2008).

$$\ln SP_{i,t} = \alpha_0 + \beta_1 \ln EPS_{i,t} + \beta_2 \ln BVPS_{i,t} + \varepsilon_{i,t} \quad (\mathbf{3}).$$

Where

$\ln SP_{i,t}$ Is the natural log of stock price for firm 'i' in year 't',

$\ln EPS_{i,t}$ Is the natural log of earnings per share for firm 'i' in year 't',

$\ln BVPS_{i,t}$ Is the natural log of book value per share for firm 'i' in year 't',

$\varepsilon_{i,t}$ Is the error term.

Eq. (3) is used to determine price value relevance. The most important statistic is the adjusted R^2 of regressions because a high and significant R^2 is indicating high price value relevance and a low R^2 is indicating low price value relevance. There are two known problems with eq. (3). First, the regression constrains the coefficients of earnings per share (ln EPS) and book value per share (ln BVPS) to represent one coefficient for all industries. Since industries can differ a lot in the variables used, Balachandram and Mohanram (2011) suggest to control for industries. However, Balachandram and Mohanram (2011) found, after they controlled for industries, that there was no significant difference on the adjusted R^2 so it will not be implemented in the regression model. Second, Givoly and Hayn (2002) found that the incidence of loses has increased over time. Balachandran and Mohanram (2011) solved this problem by controlling for losses. Results showed a significant impact when losses were controlled for. Hence, it will be implemented in the regression model. This thesis will control for losses by creating a dummy variable that takes 1 when earnings per share (ln EPS) are negative and 0 otherwise. Eq. (4)[4] displays the new regression model including the dummy variable.

$$\ln SP_{i,t} = \alpha_0 + \beta_1 \ln EPS_{i,t} + \beta_2 \ln EPS_{i,t} * L_{i,t} + \beta_3 \ln BVPS_{i,t} + \beta_4 \ln BVPS_{i,t} * L_{i,t} + \varepsilon_{i,t} \quad (\mathbf{4}).$$

Where

$\ln SP_{i,t}$ Is the natural log of stock price for firm 'i' in year 't',

$\ln EPS_{i,t}$ Is the natural log of earnings per share for firm 'i' in year 't',

$\ln BVPS_{i,t}$ Is the natural log of book value per share for firm 'i' in year 't',

$L_{i,t}$ Is a dummy variable that takes 1 if $\ln EPS_{i,t} < 0$, and 0 otherwise.

$\varepsilon_{i,t}$ Is the error term.

3.1.1 Robustness test hypothesis 1 and 2

Another way to examine conservatism is by focusing on earnings changes. Eq. (5)[5] is used to measure earnings changes in conservatism. Following Basu's (1997) findings it becomes apparent that, in contrast to 'good' news, earnings changes from 'bad' news are more likely to reverse in the future. The reversal of negative earnings changes might be an indication of earnings conservatism. Hence, eq. (5) will be used to test the robustness of conditional conservatism following eq. (2).

$$\Delta E_{i,t} = \alpha_0 + \beta_1 D\Delta E_{i,t-1} + \beta_2 \Delta E_{i,t-1} + \beta_3 \Delta E_{i,t-1} * D\Delta E_{i,t-1} + \varepsilon_{i,t} \quad \mathbf{(5).}$$

Where

$\Delta E_{i,t}$ Is change in net income of firm 'i' in year 't' scaled by market value,

$D\Delta E_{i,t-1}$ Is a dummy variable that takes 1 if $\Delta E_{i,t-1} < 0$ in year 't-1' and 0 otherwise,

$\Delta E_{i,t-1}$ Is change in net income of firm 'i' in year 't-1', scaled by market value,

$\varepsilon_{i,t}$ Is the error term.

A significant negative $\boldsymbol{\beta_3}$ $(\Delta \mathbf{E} * \mathbf{D}\Delta \mathbf{E})$ would give evidence of earnings conservatism through reverse of negative earnings changes. However, it is important to note that this robustness test does not take into account the growth options and leverage as did eq. (2).

3.2 Conditional conservatism, price value relevance and accrual intensity

Conditional conservatism can be measured in a multitude of ways but the two most often used models either based on accruals or the Basu measure. Concerning accruals, Givoly and Hayn (2000) suggest that accruals, over time, are an indication of conservatism. Moreover, Brown et al. (2006) found that there is a positive relationship between conditional conservatism and price value relevance in countries where there is high accrual intensity. This paper will also examine the accrual intensity of firms in the US and the EU. Watts (2003a) states that in the presence of accruals, conservatism decreases the opportunistic behavior of managers. In addition, accruals provide managers with more choices in how to act in a given situation providing better value-relevant accounting information (Brown 2006; Ball

[4] Eq. (4) is based on Balachandran & Mohanram (2011, p.277)
[5] Eq. (5) is based on Latridis (2012, p. 106).

and Shivakumar 2006). Hence, in the presence of accruals, conservatism decreases the opportunistic behavior of managers more, than in firms where presence of accruals is less (Brown et al., 2006). Therefore, I expect that conservatism and value relevance will be higher in presence of accruals as there is less opportunistic behavior and more choices in how to act in a given situation. Moreover, the expectation of higher value relevance is also in line with prior hypotheses 1 and 2 as these are also built on the assumption that the presence of opportunistic behavior leads to a negative relation. Furthermore, another reason is that accrual accounting should provide better value-relevant financial information, based on results of prior research (Brown 2006; Ball and Shivakumar 2006). Eq. (6)[6] is used to measure accruals. To test these hypotheses a sample of 616 European firms and 369 US firms over a period of 5 years from 2009 to 2013 will be analyzed. The hypotheses are as follows:

Hypothesis 3. The relation between conditional conservatism and price value relevance is positively related to the presence of accruals for US GAAP complying firms.

Hypothesis 4. The relation between conditional conservatism and price value relevance is positively related to the presence of accruals for IFRS complying firms.

$$ACC_{i,t} = \alpha_0 + \beta_1 DCF_{i,t} + \beta_2 CF_{i,t} + \beta_3 DCF_{i,t} * CF_{i,t} + \varepsilon_{i,t} \quad (\mathbf{6}).$$

Where

$ACC_{i,t}$ Is accruals scaled by total assets for firm 'i' in year 't', accruals measured as: $\Delta Inventory + \Delta debtors + \Delta other\ current\ assets - \Delta creditors - \Delta other\ current\ liabilities - depreciation$,

$CF_{i,t}$ Is operating cash-flow scaled by total assets for firm 'i' in year 't',

$DCF_{i,t}$ Is a dummy variable that takes 1 if $CF_{i,t} < 0$ and takes 0 otherwise,

$\varepsilon_{i,t}$ Is the error term.

The $\beta_3(DCF * CF)$ is the coefficient that determines conservatism. It shows that accruals are more likely when operating cash-flows scaled by total assets are below zero. Hence, when β_3 is positive and significant it means that there is a high accrual intensity and when β_3 is low it means low accrual intensity.

4. DATA

For testing the hypotheses, this study extracted a sample of firms originating from two geographical locations, i.e. the European Union (28) and the United States. The sample only consists of listed firms that practice either IFRS or US GAAP (Local) as these are the units of analysis. Financial data was collected from the ORBIS database. The search provided data for 985 listed firms, 616 firms from the EU complying IFRS and 369 firms from the US complying US GAAP. 985 listed firms over a period of 5 years, from 2009 to 2013, leads to a total of 4925 firm-year-observations. The most recent year 2014 is excluded as not all firms have data for this year available. After accounting for missing values and outliers the total amount of firm-year-observations for the IFRS group is 2834 and for the US GAAP group is 1759. Furthermore, the hypotheses will be tested using OLS regression analysis.

This thesis accounts for residuals that are not normally distributed by drawing a histogram of residuals (Appendix A). It will account for heteroscadesticity by plotting residuals and predicted Y-values. This showed a normal distribution, ruling out the problem of heteroscadesticity (Appendix B). Lastly, multicollinearity was examined by looking at the correlation of the independent variables (Appendix C). Both the VIF and tolerance levels show multicollinearity but there are some situations in which, the problem of multicollinearity, safely can be ignored (Statistical Horizon, 2012). First, when variables with high VIFs are control variables and the variables of interest do not have high VIF scores. Second, when high VIF scores are caused by products of other variables. Third, when variables with high VIF scores are indicator, or dummy variables, which represent categorical variables. In conclusion, there is no multicollinearity that effects the data in a way which makes the numbers difficult to interpret. Lastly, this thesis uses interaction variables in its regression models. The interaction variables were created by the product of two centered variables. The centered variables were created by subtracting the mean of a variable from its original value.

5. RESULTS

5.1 Descriptive statistics

Table 1 presents the descriptive statistics for the firm samples analyzed. The IFRS group displays the mean and standard deviation (SD) for firms complying IFRS and the US GAAP group displays the mean and SD for firms that comply US GAAP.

Table 1

Descriptive statistics.

	IFRS group		US GAAP group	
Variables	Mean	SD	Mean	SD
E	79.789	49.752	63.137	28.223
G	0.002	0.002	0.003	0.006
R	0.267	0.381	0.231	0.309
LV	1.388	0.903	1.592	1.334
ln SP	3.190	1.379	3.581	0.640
ln EPS	0.494	1.487	1.277	1.238
ln BVPS	-0.295	1.408	2.682	0.693
ACC	0.043	0.056	0.039	0.066
CF	0.107	0.069	0.118	0.066
Sample size	N=2834		N=1759	

The IFRS sample consists of 2834 firm-year-observations whilst the US GAAP sample consist of 1759 firm-year-observations. E is net income scaled by market value. G is market value scaled by book value of a firm. LV is total liabilities scaled by shareholders' funds. Ln SP is natural log of stock price at the end of the year. Ln EPS is the natural log of earnings per share. Ln BVPS is the natural log of book value per share. ACC is accruals measured as Δinventory + Δdebtors + Δother current assets - Δcreditors - Δother current liabilities - depreciation. CF is cash flow scaled by total assets. R is return measured as $(P_1 - P_0) + D/P_0$ where P_1 is the ending stock price, P_0 is initial stock price and D is dividends.

The descriptive statistics show that firms complying IFRS have higher earnings (E) but also more variety in earnings than firms complying US GAAP. Furthermore, US GAAP compliance tends to have more growth options (G) than IFRS compliance. Also the ratio between liabilities and shareholders' funds (LV) appears to be higher, on average, for firms who comply US GAAP. All stock related variables, stock price (ln SP), earnings per share (ln EPS) and book value per share (ln BVPS) show a higher mean for firms complying US GAAP with the exception of returns (R) which are higher in the EU. Furthermore,

[6] Eq. (6) is based on Brown (2006, p. 615).

accruals (ACC) tend to be higher for IFRS compliance whereas operating cash flows (CF) appear to be higher for US GAAP compliance. Lastly, descriptive statistics are gathered from a sample of 2834 firm-year-observations for the IFRS group and 1759 firm-year-observations for the US GAAP group. The following sections will elaborate on the results starting with hypothesis 1 and 2 followed by hypothesis 3 and 4.

5.2 Accounting standard, conditional conservatism and price value relevance

Panel A and B of table 2 show that hypothesis 1 holds with an adjusted R^2 of 0.036 statistical significant at $F < 0.01$. Firms complying US GAAP are likely to exhibit a negative relation between conditional conservatism and price value relevance. The first statistic of importance shows a negative coefficient of -0.074 for the interaction variable news and returns ($NW * R$). This negative coefficient is an indication of 'bad' news not being reflected timelier than otherwise. Hence, conditional conservatism is not present through timelier loss recognition. However, this coefficient is neither statistical nor economical significant, questioning the reliability. Nevertheless, results contradict the findings of Basu (1997) who concluded that timelier loss recognition was present and therefore also conservative behavior. The second statistic is growth options (G). The US GAAP group shows a positive economic and statistical significant coefficient of 0.155 for growth options ($G * R * NW$) statistical significant at $p < 0.05$. Growth options are unidentifiable for outsiders, so the information asymmetry between managers and outsiders is expected to be larger when growth options (G) are present. More information asymmetry indicates more conditional conservatism as conservatism is a response to information asymmetry (Khan and Watts, 2009). The general idea is that conservatism leads to higher quality of earnings because conservatism yields lower earnings and therefore should have higher earnings quality (Penman & Zhang, 2002). In addition, the combination of conservative accounting and growth options suppresses the earnings and returns leading to reserves. Consequently, as soon as these reserves are used to make investments higher rates of return and earnings are the result. When these changes in investments are merely temporary the real quality of earnings and return could be questionable (Penman & Zhang, 2002). The last statistic of importance is the leverage coefficient ($LV * R * NW$) which is negative and both statistical and economic significant with a coefficient of -0.293, significant at $p < 0.01$. A negative significant coefficient is measuring the "contracting demand" which means that firms with more leverage do not necessary report earnings in a more conservative manner (LaFond & Watts, 2008). When firms take additional funds in the form of liabilities, a situation is created in which conservatism will likely be more present as managers are constrained and more conscious about not being conservative as they have to pay back debt. Findings were expected because leverage tends to decline in the presence of growth options as leverage is the demand for non-growth options (LaFond & Watts, 2008). Hence, the negative coefficient can be explained through the positive coefficient of the interaction variable of growth options ($G * R * NW$). In conclusion, conservative accounting appears to be present for US GAAP complying firms as most of the relevant variables are statistical and economical significant. This supports the findings of Pham (2009); US GAAP compliance leads to less conservative accounting.

Second, table 2 panel B also shows that firms complying US GAAP have a significant adjusted R^2 of 0.348, statistical significant at $F < 0.01$. A significant value of 0.348 implies that price value relevance is low for US GAAP complying firms. The R^2 is low because Balachandran and Mohanram (2011) found on average an adjusted R^2 of 0.700 in price value relevance for US firms in the period of 1975 to 2004. However, due to economic downturns (e.g.: great recession of 2007 to 2009) there is a possibility that conservatism has increased more, (e.g.: stricter governance mechanism) and therefore price value relevance decreased more. This supports the conclusion of LaFond and Watts (2008) who argue that governance mechanism create demand for conservatism which is an efficient mechanisms to mitigate information asymmetry, benefiting shareholders. In conclusion, firms complying US GAAP appear to have high levels of conditional conservatism and low price value relevance indicating a negative relationship. Hence, hypothesis 1 holds.

Table 2

Accounting standard, conditional conservatism and price value relevance.

US GAAP group		IFRS group	
Variables	Coefficients	Variables	Coefficients
Panel A conditional conservatism			
NW	0.032 *(0.351)*	NW	0.056 *(0.831)*
R	-0.070* *(-1.607)*	R	0.030 *(0.781)*
NW * R	-0.074 *(-0.955)*	NW * R	0.028 *(0.497)*
G	-0.106*** *(-2.892)*	G	-0.252*** *(-5.094)*
G * NW	0.085 *(1.158)*	G * NW	0.121* *(1.772)*
G * R	-0.152*** *(-3.490)*	G * R	0.098* *(2.094)*
G * NW * R	0.155** *(2.013)*	G * NW * R	0.122* *(1.729)*
LV	-0.110* *(-1.869)*	LV	0.084* *(1.764)*
LV * NW	-0.277*** *(-2.901)*	LV * NW	0.033 *(0.494)*
LV * R	-0.113** *(-2.314)*	LV * R	0.002 *(0.058)*
LV * NW * R	-0.293*** *(-3.343)*	LV * NW * R	0.018 *(0.322)*
Constant	62.727*** *(44.702)*	Constant	80.373*** *(38.285)*
R^2 adjusted	0.036*** *(7.029)*	R^2 adjusted	0.107*** *(31.857)*
Sample size	N=1759	Sample size	N=2834

***, ** and * point to statistical significance at the 1%, 5% and 10% level (two-tailed). The t-statistic is in parentheses under the coefficients. The F-statistic is in parentheses under the adjusted R^2. The interaction variables were created by the product of two centered variables. The coefficients represent the standardized coefficients. The regression analyzed 985 firms, 369 in the US GAAP group and 616 in the IFRS group. This led to 1759 and 2834 firm-year-observations respectively. The dependent variable (E) is net income scaled by market value, whereas the explanatory variables are return (ln SP), growth options (G) measured as market value scaled by book value and leverage (LV) which are total liabilities scaled by shareholders' funds. NW is a dummy variable that takes 1 when returns are negative, indicating 'bad' news and 0 otherwise.

Panel B price value relevance

ln EPS	-0.061*** *(-2.944)*	ln EPS	0.640*** *(43.988)*
ln EPS ∗ L	0.055*** *(2.686)*	ln EPS ∗ L	-0.122*** *(-10.520)*
ln BVPS	0.586*** *(30.358)*	ln BVPS	0.327*** *(23.012)*
ln BVPS ∗ L	-0.006 *(-0.313)*	ln BVPS ∗ L	0.110*** *(9.755)*
Constant	3.579*** *(270.054)*	Constant	3.111*** *(219.733)*
R^2 adjusted	0.348*** *(235.958)*	R^2 adjusted	0.862*** *(4420.593)*
Sample size	N=1759	Sample size	N=2834

***, ** and * point to statistical significance at the 1%, 5% and 10% level (two-tailed). The t-statistic is in parentheses under the coefficients. The F-statistic is in parentheses under the adjusted R^2. The interaction variables were created by the product of two centered variables. The centered variables were created by subtracting the mean variable from the original variable. The regression analyzed 985 firms, 369 in the US GAAP group and 616 in the IFRS group. This led to 2834 and 1759 firm-year-observations respectively. The dependent variable (ln SP) in panel B is natural logarithm of stock prices, whereas the explanatory variables are earnings per share (ln EPS) and book value per share (ln BVPS). The control variable are losses (L) which is a dummy variable that takes 1 when earnings per share are negative and 0 otherwise.

Panel A and B of table 2 show that hypothesis 2 holds with a significant model of 0.107, significant at $F < 0.01$. Firms complying IFRS are likely to exhibit low conditional conservatism and high price value relevance. The first statistic of importance shows there is a positive coefficient of 0.028 for the interaction variable news and returns (NW ∗ R). This means conservatism is present as "conservatism results in losses being anticipated in earnings but gains being postponed pending realization" (Basu, 1997, p34). However, the coefficient is not economic nor statistical significant at $p > 0.1$, reducing the reliability of the coefficient. The second statistic is the interaction variable of growth, returns and news (G ∗ R ∗ NW). The coefficient of this interaction variable is 0.122 and is statistical significant at $p < 0.1$. This is an indication of information asymmetry between managers and outsiders due to growth options and therefore conditional conservatism. This also supports the results of Khan and Watts (2009) who found that growth options lead to information asymmetry indicating more conditional conservatism as conservatism is a response to information asymmetry. However, this is a sign of conditional conservatism through asymmetry not through earnings. The last statistic of importance is the interaction variable for leverage, return and news (LV ∗ R ∗ NW). This variable shows a positive coefficient of 0.018 insignificant at $p > 0.1$, nor is the coefficient economical significant. This indicates that the demand for non-growth options for IFRS complying firms is low. Overall, compared to the US, there does not appear to be much conservative accounting for European firms as two out of three statistics show very insignificant economic and statistical coefficients. Hence, conservative accounting in the EU is low. This conclusion supports the results of Gordon, Jorgensen and Linthicum (2008) who found that IFRS compliance leads to less conservative accounting. However, it contradicts the results of Pham (2009) who found that the opposite to be true.

Second, regarding price value relevance, table 2 panel B shows that firms complying IFRS show high price value relevance with a significant adjusted R^2 of 0.862 which is statistical significant at $F < 0.01$. These results show that accounting numbers under IFRS are closer associated with market values increasing predictability. This results contradict the work of Atwood (2011) who also controlled for losses and found that US GAAP was superior regarding predictability. Differences may be accounted for as Atwood (2011) did not focus on the EU as such but on IFRS compliance worldwide. In conclusion, firms complying IFRS show low conditional conservatism and high price value relevance indicating a negative relationship between conditional conservatism and price value relevance. Hence, hypothesis 2 holds.

5.2.1 Robustness test hypothesis 1 and 2

Table 3 shows the results of the robustness check with regard to conditional conservatism.

Table 3

Robustness test conditional conservatism

US GAAP group		IFRS group	
Variables	Coefficients	Variables	Coefficients
DΔE	-0.022 *(-1.188)*	DΔE	0.024 *(1.109)*
ΔE	0.794*** *(42.165)*	ΔE	0.951*** *(28.740)*
DΔE ∗ ΔE	-0.018 *(1.149)*	DΔE ∗ ΔE	0.857*** *(26.150)*
Constant	5.809*** *(9.945)*	Constant	15.944*** *(16.836)*
R^2 adjusted	0.654*** *(926.388)*	R^2 adjusted	0.352*** *(446.554)*
Sample size	N=1472	Sample size	N=2457

***, ** and * point to statistical significance at 1%, 5% and 10% level (two-tailed). The t-statistic is in parentheses under the coefficients. The F-statistic is in parentheses under the adjusted R^2. The interaction variables were created by the product of two centered variables. The centered variables were created by subtracting the mean variable from the original variable. The parentheses underneath the constant represent the standard error of the constant. The regression analyzed 985 firms, 369 in the US GAAP group and 616 in the IFRS group. This led to 1472 and 2457 firm-year-observations. This is less than previous analyses because not all firms had data available for the year 2008 (lagged year). The dependent variable is change in earnings (ΔE) and the independent variables are change in net income in year t-1 scaled by market value (ΔE_{t-1}), and a dummy variable that takes the value 1 if $\Delta E_{i,t-1} < 0$ and 0 otherwise.

The US GAAP group has a significant model with an adjusted R^2 of 0.654, statistical significant at $F < 0.01$. The robustness test for the US GAAP group shows a negative coefficient for the interaction variable which is an indication that earnings conservatism, or conditional conservatism, is present through negative earnings changes. However, the coefficient does not appear to be economic or statistical significant as $p > 0.1$, reducing the reliability of the coefficient. The IFRS group also has a statistical significant model with an adjusted R^2 of 0.352, statistical significant at $F < 0.01$. Furthermore, the IFRS group shows a positive coefficient for the interaction variable. This is an indication that earnings conservatism is not present for firms complying IFRS. In addition, the interaction coefficient for the IFRS group is both statistical and economical significant at $p < 0.01$.

In conclusion, the US GAAP group shows a negative coefficient indicating the presence of conservatism. This finding is not in line with the previous findings regarding hypothesis 1. Previous findings showed a negative insignificant coefficient of -0.074, implying no conservatism. Whereas the

robustness test of conservatism found a negative insignificant coefficient of -0.018 indicating earnings conservatism. However, both coefficients are statistical insignificant lowering the reliability of the robustness test with respect to US GAAP and questioning the usefulness. The IFRS group shows a positive coefficient which indicates that conservatism through negative earnings is not present. This finding is also not in line with previous findings regarding hypothesis 2. Previous findings showed a positive insignificant coefficient of 0.028, implying conservatism. Whereas the robustness test found a positive significant coefficient of 0.857, significant at $p < 0.01$, indicating earnings conservatism. In conclusion, there is stronger statistical evidence to believe that conservatism in the IFRS group is not present.

5.3 Conditional conservatism, price value relevance and accrual intensity

Table 4 shows the accrual intensity for US GAAP and IFRS compliance. The most important coefficient is the coefficient of the interaction variable between operating cash flow scaled by total assets and the dummy variable that takes 1 if $CF_{i,t} < 0$ ($DCF * CF$). This coefficient indicates that accruals are more likely when operating cash flows scaled by total assets are below zero. Hence, accrual presence and magnitude.

Table 4

Accrual intensity.

US GAAP group		IFRS group	
Variables	Coefficients	Variables	Coefficients
DCF	-0.226* *(-1.721)*	DCF	0.388*** *(4.522)*
CF	0.183*** *(7.337)*	CF	0.130*** *(6.242)*
$DCF * CF$	-0.278** *(-2.142)*	$DCF * CF$	0.312*** *(3.729)*
Constant	0.037*** *(19.855)*	Constant	0.046*** *(33.904)*
R^2 adjusted	0.036*** *(22.846)*	R^2 adjusted	0.015*** *(15.802)*
Sample size	N=1759	Sample size	N=2834

***, ** and * point to statistical significance at the 1%, 5% and 10% level (two-tailed). The t-statistic is in parentheses under the coefficients. The F-statistic is in parentheses under the adjusted R^2. The interaction variables were created by the product of two centered variables. The centered variables were created by subtracting the mean variable from the original variable. The parentheses underneath the constant represent the standard error of the constant. The regression analyzed 985 firms, 369 in the US GAAP group and 616 in the IFRS group. This led to 2834 and 1759 firm-year-observations respectively. The dependent variable (ACC) is accruals, accruals measured as ΔInventory+Δdebtors+Δother current assets-Δcreditors-Δother current liabilities-depreciation, scaled by total assets. The explanatory variables are operating cash-flow scaled by total assets (CF) and a dummy variable (DCF) that takes 1 when CF is negative and 0 otherwise.

The US GAAP group has a significant model with an adjusted R^2 of 0.036, significant at $F < 0.01$. Results show a negative economic and statistical significant coefficient for the interaction variable of -0.278, statistical significant at $p > 0.05$. So, the negative relationship is an indication that accruals are less likely when operating cash flows scaled by total assets are below zero. This means that accrual intensity is low for firms complying US GAAP.

The IFRS group also has a significant model with an adjusted R^2 of 0.015, significant at $F < 0.01$. Furthermore, there appears to be a positive economic and statistical significant coefficient for the interaction variable of 0.312, statistical significant at $p > 0.01$. Hence, accrual intensity is high for firms complying IFRS.

Table 5

Summary of results.

	US GAAP group	IFRS group
Statistics	Coefficients	Coefficients
CC1	-0.074	0.028
CC2	0.155***	0.122*
CC3	-0.299***	0.018
RCC	-0.018	0.857***
VR	0.348***	0.862***
ACC	-0.278**	0.312***

***, ** and * point to statistical significance at the 1%, 5% and 10% level (two-tailed). This table presents a summary of the most important statistics regarding conditional conservatism (CC), robustness check for conservatism (RCC), price value relevance (VR) and accrual intensity (ACC). Conditional conservatism is subdivided into the three statistics of importance: the interaction variable between return and news (CC1), the interaction variable between return, news and growth options (CC2) and the interaction variable between return, news and leverage (CC3).

Table 5 shows that hypothesis 3 is rejected. Hence, the hypothesis that the relation between conditional conservatism and price value relevance would be positively related to the presence of accruals for US GAAP complying firms is rejected. Instead, accruals appear to be positively related to value relevance as US GAAP compliance shows low value relevance and low accrual intensity. In addition, accruals appear to be negatively related to conservatism as there is high conservatism and low accrual intensity. Hence, hypothesis 3 is rejected contradicting the results of Brown et al. (2006). However, "a consistent predominance of negative accruals across firms over a long period is, ceteris paribus, an indication of conservatism" (Givoly and Hayn 2000, p292). Thus, it might be that the firms in the US GAAP group show a predominance of negative earnings indicating conservatism. This thesis did not investigate this further but it might be interesting for future research to investigate the predominance of negative earnings for US GAAP complying firms.

Table 5 also shows that hypothesis 4 is rejected. So, the hypothesis explaining that the relation between conditional conservatism and price value relevance would be positively related to the presence of accruals for IFRS complying firms is rejected. Instead, accruals are, also for the IFRS group, positively related to value relevance and negatively to accrual intensity. Hence, hypothesis 4 is rejected, again contradicting Brown et al. (2006). Differences may be accounted for as Brown et al. (2006) had an international scope whereas this thesis only focuses on the US and EU. Furthermore, Brown et al. (2006) analyzed the period before the global financial crisis in 2008. Crises as severe as those might influence the accrual intensity leading to different results.

The similar results regarding the relation between accrual intensity and value relevance, and accrual intensity and conservatism, for both US GAAP and IFRS, might be an interesting topic for further research. As prior research determined the presence of accruals to be positively related to the relation between value relevance and conservatism (Brown, 2006).

6. CONCLUSION

This paper focuses on listed firms in the EU and US and investigates whether there is a difference in the relationship between conditional conservatism and price value relevance complying different accounting standards. In addition, this paper analyzed accrual intensity for both IFRS and US GAAP.

The purpose of this paper was to give answer to the following research question: "to what extent is the relation between conservatism and value relevance different under US' GAAP and EU's IFRS?" Results show a negative relation between price value relevance and conditional conservatism for both US GAAP and IFRS. These are interesting findings as it confirms expectations for rule-based and principle-based accounting. US GAAP accounting is rule-based, hence there are strict rules and regulations on how to proceed in a given situation. This raises the inability or handicap of not being able to reevaluate or change accounting numbers when additional information becomes available. This, in combination with the conclusion of Watts (2003a) which tells us that overstatement is more expensive than understatement, explains why firms complying US GAAP show high conservatism. IFRS accounting on the other hand is principle-based, hence there are merely principles on how to act in a given situation. There is more way to maneuver or revaluate when additional information is available. Hence, the likelihood of capturing the real market value, through situational changes in book values, is higher. This reasoning is confirmed as IFRS complying firms have higher price value relevance.

This paper contributes to the literature by offering evidence that firms complying US GAAP use a conservative approach in their income statement accounting, decreasing the reliability, as book values are less likely to represent market values. In addition, this thesis also provides evidence that firms complying IFRS have more reliable financial information, book values offer a good representation of market values, strengthening the predictability of European firms. Furthermore, due to principle-based accounting changes can be made fairly easy. Hence, there is less need to be conservative as values can be revaluated as soon as additional information presents itself. This research also contributes to the accounting standard literature by explaining the differences that results from principle-based versus rule-based accounting regarding the IFRS and US GAAP. This paper further offers evidence that the presence of accruals is not influencing the relation between conservatism and value relevance but is influencing them independently, positively for value relevance and negatively for conservatism. This implies that accruals do give managers more choices in how to act in a given situation which provides better value-relevant financial information, consisted with Brown et al. (2006) and Ball and Shivakumar (2006). The most interesting implication is the fact that, in the presence of accruals, conservatism does not decrease the opportunistic behavior of managers. On the contrary, in the presence of accruals there is less conservative behavior whereas a more conservative approach is visible when there is low accrual intensity. Hence, reducing the amount of accruals might increase the conservative behavior of firms which might be of potential interest to managers and outside investors analyzing a firms prospects. Lastly, some practical contributions regarding the TTIP negotiations. Currently, politicians, standard setters and regulators are negotiating the establishment of a uniform accounting language through convergence of IFRS and US GAAP. The knowledge of principle-based accounting, creating more reliable financial statements, and rule-based accounting, leading to a conservative approach with respect to the income statement, is crucial information when considering the convergence of both accounting standards.

Theoretical implications of this thesis are the negative relationship between conditional conservatism and price value relevance. This reconfirms the findings of Kousenidis, Ladas and Negakis (2009) and Maganaris (2011). On one hand, US GAAP compliance shows higher levels of conservative accounting in comparison with IFRS compliance, reconfirming results of Pham (2009). On the other hand, IFRS complying firms show higher price value relevance in comparison with US GAAP compliance. Other theoretical implications are related to accrual intensity in relation to conservatism and value relevance. Existing literature showed that accrual intensity is related to the relation between conservatism and value relevance. This thesis implies that this does not appears to be true. Instead, there appears to be an independent relation between accrual intensity and conservatism and accrual intensity and value relevance. Furthermore, practical implications are related to the convergence negotiations of the FASB and IASB to establish a uniform accounting language for the TTIP. Concerning the negotiations, this paper can be used to identify differences in European and US accounting behavior.

There are several limitations regarding this bachelor thesis. First, the sample consists of 985 firms which is, compared to other studies, rather small. A small sample size limits the generalizability of the result with respect to the EU and US. Second, only listed firms are analyzed in both the US and EU. Analyzing non-listed firms might lead to different results. Third, this thesis only looks at conditional conservatism and its relation to price value relevance. It is therefore impossible to conclude that conditional conservatism is causing declining value relevance. The only concluding remark that can be made regarding the relation is that conditional conservatism is part of the explanation of price value relevance. Lastly, conditional conservatism is only part of conservatism, hence this paper did not focus on unconditional conservatism. This thesis also only focuses on price value relevance and not on other types such as earnings value relevance or value relevance under perfect foresight. Studying these different forms of value relevance and conservatism might offer a more complete image.

Further research might examine different forms of value relevance and unconditional conservatism so that politicians, negotiating the TTIP, can make better judgements to converge accounting standards in the most optimal way. In addition, it might be interesting to focus on what is most important, conservative behavior or value-relevant financial information. Results could help negotiators with the converging of accounting standards and whether the EU or the US should converge more or less, depending on which of the two is most important. In addition, some theoretical direction for further research might focus on other cultures and levels of conservatism. As some cultures tend to be more conservative and less risk averse than others. Therefore, it might be an interesting topic to link cultural behavior to accounting behavior. Furthermore, if the TTIP will be created, it might be interesting to see what has changed in conservatism and value relevance. By examining the period in the EU and the US before the creation of the TTIP and after the creation of the TTIP. If findings still show the same results regarding differences in conservatism and value relevance than this might be an indication of country-specific, firm-specific or institutional differences. By examining these specific factors it becomes clearer how differences arise value relevance and conservatism. Lastly, it might be interesting to investigate whether there is an optimal amount of value relevance and conservatism. Hence, quantifying the optimal level of value relevance and conservatism in a way which is beneficial for all stakeholders.

7. ACKNOWLEDGEMENTS

I would like to thank my supervisor Dr. G. Latridis for his support and feedback on my bachelor thesis. I would also like to thank H. van Beusichem, X. Huang and R. Kabir for their informative lectures on how to approach and deal with certain aspects of the bachelor thesis. Additionally I would like to thank the rest of the Finance & Accounting bachelor supervisory team for making it possible to write a bachelor thesis in finance and accounting. Finally, I would like to thank my family, friends and colleagues for their support and faith and the University of Twente for facilitating the bachelor in International Business Administration.

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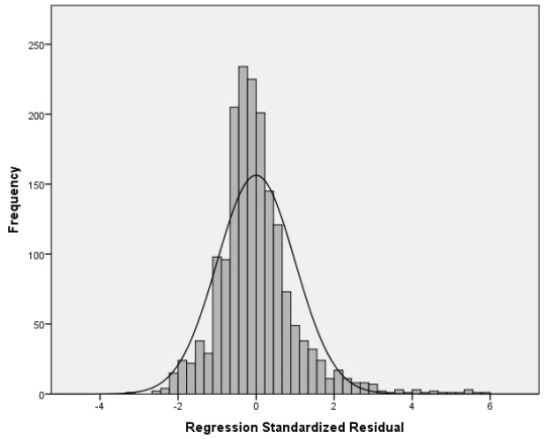
9. APPENDIX

9.1 Appendix A

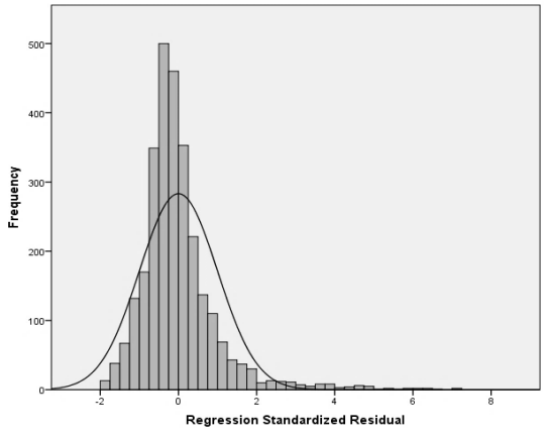
Figure A1. Regression model of conditional conservatism.

Histogram of residuals.

Panel A US GAAP group



Panel B IFRS group

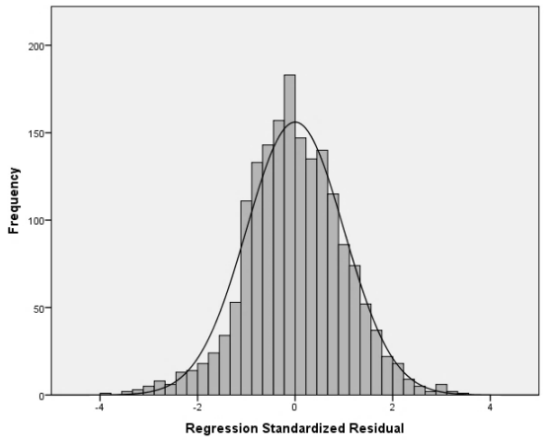


To control for normal distribution both histograms were made. Both the IFRS as the US GAAP group show normal distribution for regression model eq. (2) the conditional conservatism regression.

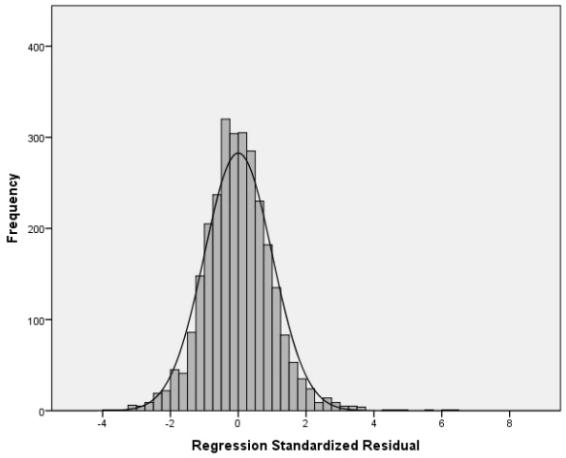
Figure A2. Regression model of price value relevance.

Histogram of residuals.

Panel A US GAAP group



Panel B IFRS group

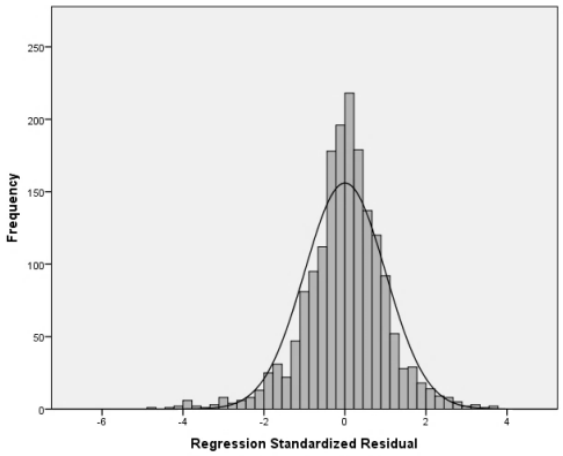


To control for normal distribution both histograms were made. Both the IFRS as the US GAAP group show normal distribution for regression model eq. (4) the price value relevance regression.

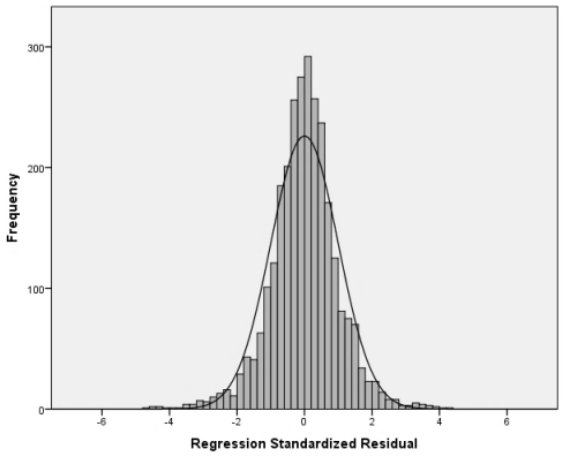
Figure A3. Regression model of accrual intensity.

Histogram of residuals.

Panel A US GAAP group



Panel B IFRS group



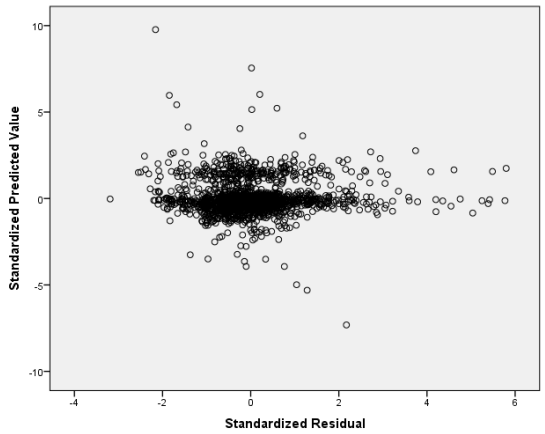
To control for normal distribution both histograms were made. Both the IFRS as the US GAAP group show normal distribution for regression model eq. (6) the accruals intensity regression.

9.2 Appendix B

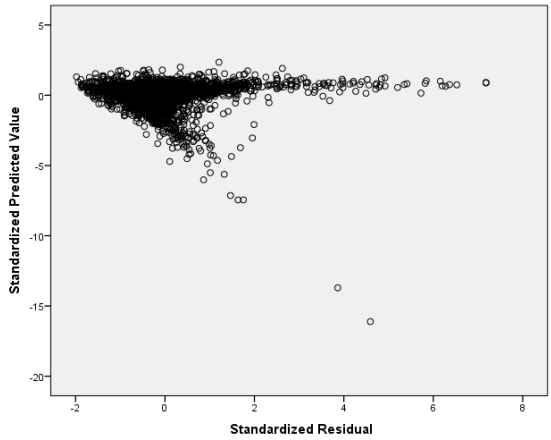
Figure B1. Regression model of conditional conservatism.

Plot of residuals versus predicted Y-values.

Panel A US GAAP group



Panel B IFRS group

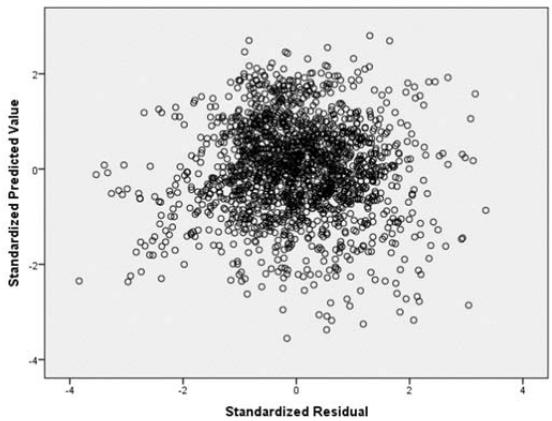


The conditional conservatism regression shows that if variance of residuals (errors) are not constant there is a heteroscadesticity problem. Hence, by examining the curvature of the plots in panel A and B we can conclude that heteroscadesticity is not present.

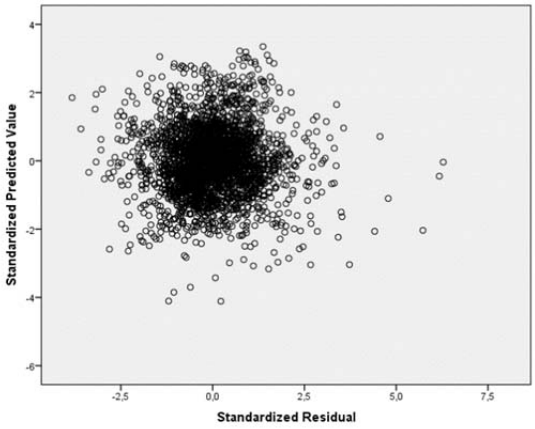
Figure B2. Regression model of conditional conservatism.

Plot of residuals versus predicted Y-values.

Panel A US GAAP group



Panel B IFRS group

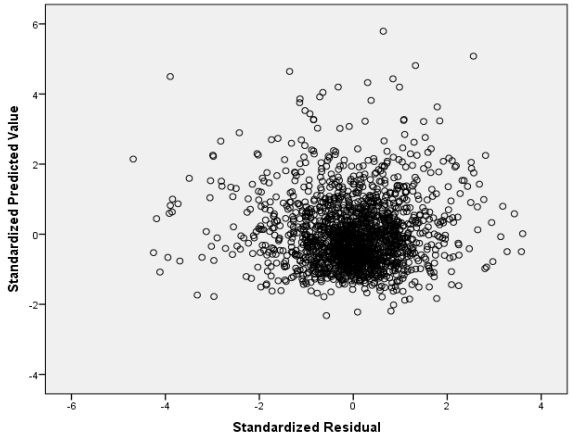


The price value relevance regression shows that if variance of residuals (errors) are not constant there is a heteroscadesticity problem. Hence, by examining the curvature of the plots in panel A and B we can conclude that heteroscadesticity is not present.

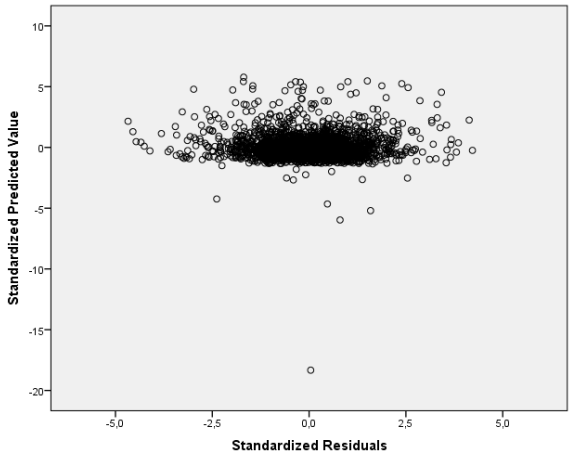
Figure B3. Regression model of conditional conservatism.

Plot of residuals versus predicted Y-values.

Panel A US GAAP group



Panel B IFRS group



The accrual intensity regression shows that if variance of residuals (errors) are not constant there is a heteroscadesticity problem. Hence, by examining the curvature of the plots in panel A and B we can conclude that heteroscadesticity is not present.

9.3 Appendix C

Table C1.

Multicollinearity statistics.

US GAAP group			IFRS group		
Variables	T	VIF	Variables	T	VIF
Panel A Regression model eq. (2) conditional conservatism					
NW	0.067	14.984	NW	0.070	14.326
R	0.289	3.460	R	0.217	4.618
NW ∗ R	0.090	11.063	NW ∗ R	0.098	10.246
G	0.410	2.439	G	0.128	7.790
G ∗ NW	0.102	9.764	G ∗ NW	0.068	14.783
G ∗ R	0.288	3.475	G ∗ R	0.143	7.002
G ∗ NW ∗ R	0.093	10.795	G ∗ NW ∗ R	0.064	15.662
LV	0.159	6.293	LV	0.138	7.238
LV ∗ NW	0.060	16.638	LV ∗ NW	0.069	14.392
LV ∗ R	0.229	4.362	LV ∗ R	0.253	3.959
LV ∗ R ∗ NW	0.071	14.036	LV ∗ R ∗ NW	0.097	10.314
Panel B Regression model eq. (4) price value relevance					
ln EPS	0.855	1.169	ln EPS	0.230	4.348
ln EPS ∗ L	0.850	1.176	ln EPS ∗ L	0.363	2.754
ln BVPS	0.995	1.005	ln BVPS	0.242	4.135
ln BVPS ∗ L	0.987	1.013	ln BVPS ∗ L	0.387	2.585
Panel C Regression model eq. (6) Accrual intensity					
DCF	0.032	31.514	DCF	0.047	21.216
CF	0.885	1.130	CF	0.803	1.245
DCF ∗ CF	0.032	30.812	DCF ∗ CF	0.050	20.165

Table 7 checked for multicollinearity between independent variables. Panel A shows the multicollinearity for regression eq. (2), panel B for regression eq. (5) and panel C for regression eq. (6). A high VIF score and low T (for tolerance) is an indication for multicollinearity. However, there are some situations in which, this problem of multicollinearity, safely can be ignored. First, when variables with high VIFs are control variables and the variables of interest do not have high VIF scores. Second, the high VIF scores are caused by products of other variables. Third, variables with high VIF scores are indicator, or dummy variables, that represent categorical variables (Statistical Horizon, 2012). Hence, there is no multicollinearity that effects the data in a way which makes the numbers difficult to interpret.

The impact of gender diverse boards on firm financial performance in Norway

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Abstract

The gender-diversity of corporate boards is a frequently debated topic in both management practice and academic discourse. In this paper, it is intended to examine the effect of gender diverse boards of directors on firm financial performance in Norway. Norway is a useful sample for this type of study, as the country was one of the first ones to introduce a mandatory gender quota law for female board of director representation in 2008. Using a dataset of 55 Norwegian public limited liability companies listed on Oslo Stock Exchange from 2006 to 2013, a time-series study is employed to analyze the relationship and to further examine if the relation is positively moderated by the number of independent directors, the number of directors holding multiple board seats and the education level of directors. The analysis reveals no significant evidence that firm financial performance is positively impacted by gender diverse boards of directors. For Tobin´s Q, there even is a negative relationship of gender diversity of boards of directors and firm financial performance. Neither is the relationship significantly moderated by independent directors, multiple directorships or education. The results of this paper therefore support the findings of a number of other studies which did not find any significant link between gender diversity of corporate boards and firm performance neither. Practical implications derived from these results are that decision-makers in society and politics need to be aware of the empirical evidence suggesting a non-existing or even negative impact of quota laws for gender diversity of boards of directors on firm financial performance.

Key words

Gender diversity, boards of directors, gender quota laws, firm financial performance

5th IBA Bachelor Thesis Conference, July 2nd, 2015, Enschede, The Netherlands.

1. INTRODUCTION

The gender diversity of corporate boards is a highly discussed topic all over Europe. As of May 2011, Spain, Norway, Iceland and France have passed laws for quotas regarding female representation on the board of directors; Belgium, the Netherlands and Italy have pending quota laws and in other countries gender quotas for boards are seriously discussed (Ahern & Dittmar, 2012). As recently as March 2015, Germany passed a quota law requiring 30 % of board of directors' seats to be female (Smale & Miller, 2015). While some of the quotas were justified with the purpose of increasing gender equality and developing a "fairer society" (Oie, 2007), it is not clear if the larger proportion of women on corporate boards resulting out of the quotas also leads to better economic results for the companies in those countries. Norway is at the forefront of the quota, as it was the first country to introduce a minimum requirement for female board of director representation in 2003 (Bohren & Staubo, 2014).

The topic of gender diversity on corporate boards is also discussed to a considerable amount in academic literature. A Google Scholar search for "female corporate board directors" in March 2015 gives approximately 108.000 results. In some of the literature, researchers focus on the effect of gender diversity among corporate boards of directors on firm financial performance. Those works yield mixed results, with some authors finding positive effects of diversity on performance (Isidro & Sobral, 2014; Liu, Wie & Xie, 2014) and others observing negative effects (Ahern & Dittmar, 2012; Bohren & Strom, 2010). Furthermore, some works result in gender diversity of boards having no or ambiguous impacts on firm financial performance (Abdullah, Ismail & Nachum, 2015; Rose, 2007). Especially for Norway, there are few scholars up to now which have empirically examined the impact of the quota and the effect of gender diversity of boards of directors on firm financial performance, with those studies all examining the short-term effects until 2009. As Dale-Olsen, Schone and Verner (2013) note: "Future research should look at potential long-term effects of the reform" (p.129).

The goal of this study is to provide an examination of those longer-term effects, to add to the knowledge about the effects of gender diversity of corporate boards of directors on firm financial performance and to further deepen the insight into this topic by addressing the following research question:

What is the effect of gender-diverse boards of directors on firm financial performance in Norway?

The research question can be further divided into the following sub questions:

What is the effect of gender-diverse boards of directors on accounting performance measures of Norwegian public limited companies?

What is the effect of gender-diverse boards of directors on market performance measures of Norwegian public limited companies?

Because gender is naturally not the only characteristic that distinguishes board members from each other and different boards are not homogenous, it is also useful to consider other variables of board composition when examining the link between board gender diversity and firm financial performance (FFP):

Is the relationship between gender diversity of boards and firm financial performance influenced by the number of outside directors?

Is the relationship between gender diversity of boards and firm financial performance influenced by board members having multiple directorships with other companies?

Is the relationship between gender diversity of boards and firm financial performance influenced by the education of board members?

2. LITERATURE REVIEW

The review of the literature about the impact of gender diverse boards of directors on firm financial performance will be structured as follows: First, theoretical perspectives on the question will be discussed; second, previous empirical evidence about the topic will be reviewed. The section concludes with a short overview about Norway´s quota for female board membership, its current corporate governance systems and the up-to-date empirical observations about the consequences of the quota.

2.1 Theoretical perspectives on the effect of gender diverse boards on firm financial performance

The majority of literature about female corporate board members is descriptive and does not explicitly develop a theoretical framework (Terjesen, Sealy & Singh, 2009). However, two main theories have been commonly used in order to account for the impact of board members on a company´s performance (Johnson, Schnatterly & Hill, 2013). Those theories are agency theory, which was developed by Jensen and Meckling in 1976, and resource dependency theory, which was originally proposed by Pfeffer and Salancik in 1978. Even though not specifically developed for this issue, both theories provide useful perspectives on the impact of gender diverse boards of directors on firm performance.

2.1.1 Agency theory

The most influential theory in corporate governance is agency theory (Daily, Dalton & Canella, 2003). It is furthermore the theoretical framework most commonly used for examining the connection between board characteristics and firm value (Carter, Simkins & Simpson, 2003). According to Jensen and Meckling (1976), an agency relationship involves a person (the principal or owner) to engage another person (the agent or manager) to perform a service or activity on behalf of the principal. In agency theory, both persons are seen as rational and as aiming to maximize their personal benefits. This leads to the agent not acting in the best interest of the principal, or expressed in a business context, the managers not performing in the best interest of shareholders. The principal can limit those agency problems by monitoring the actions of the agent (Jensen & Meckling, 1976). Through the lens of agency theory, the most important and value-enhancing role of the board of directors is to control and monitor managers, thereby reducing agency problems between the two parties (Carter et al., 2003). Even though agency theory does not provide a clear-cut prediction about the influence of board characteristics on firm performance (Smith, Smith & Verner, 2006; Carter et al., 2003), it provides a variety of aspects which help to hypothesize about the impact of gender diverse boards on firm financial performance.

Firstly, empirical evidence suggests that female directors are, on average, better monitors (Carter, D`Souza, Simkins & Simpson, 2010; Adams & Ferreira, 2009). Dang, Bender and Scotto (2015) found that female directors are likely to put more effort into monitoring duties than male directors. They furthermore bring a new perspective into complicated issues (Francoeur, Labelle, Sinclair-Desgagne 2008), ask questions more frequently, provide higher levels of board accountability and are better prepared for meetings (Terjesen et al., 2009). This in turn can help to reduce informational bias in formulating strategies and making decisions (Westphal & Milton, 2000), thereby limiting the risks of moral hazard and adverse selection, two important risks considered in agency theory (Lambert, 2001). Additionally, in firms that have more gender diverse boards, managers are more likely to receive equity-based compensation (Dang et al., 2015), which leads to a better alignment of manager-shareholder interests.

Secondly, in the agency theoretical perspective, board independency is an important characteristic for the board to function in the best interest of the shareholders (Carter et al., 2003). Outside directors who have no business or family relationships with management or important shareholders are seen as behaving more independently than inside directors (Terjesen et al., 2009). When examining female directors in Norway, Nygaard (2011) found that an increase in female directorships equalled an increase in the number of outside directors. This indicates that women board of director members are more likely to be outside directors and therefore more independent, a circumstance partially supported by Terjesen, Couto and Francisco´s (2015) finding that more gender diverse boards are enhancing the board of director´s independence. Singh, Terjesen and Vinnicombe (2008) assess that women inhibit relatively fewer insider director seats, relative to their overall representation on boards of directors.

So, taking an agency theoretical perspective in trying to analyse the link between the gender diversity of boards of directors and firm performance reveals the following outcome: Because women directors are more independent and more active monitors, they will enhance the monitoring and controlling of management activities, which in turn improves the financial performance of the firm.

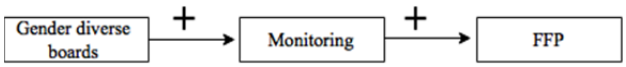

Figure 1. Impact of female directors on FFP in agency theoretical view

2.1.2 Resource dependency theory

Another often used theoretical perspective when examining the impact of gender diverse boards on firm financial performance is resource dependency theory. This theory proposes that firms are open systems that have an interdependent relationship with external entities and constituencies (Pfeffer & Salancik, 1978) and that the success of organizations depends on linkages with those resources and entities (Daily et al. 2003). In resource dependency theory, directors are seen as "boundary spanners of the organization and its environment" (Daily et al., 2003, p. 372). In this view, the value that directors bring to the organization comes from their linkages to external parties (Daily et al., 2003). Pfeffer and Salancik (1978) suggest four types of benefits that come from external linkages of the board: 1) directors provide their information and expertise, 2) they offer certain communication channels with external elements that have importance for the firm, 3) they get support commitments for the company from other organizations or groups, 4) they create legitimacy for the firm in its environment. When applying a resource dependency lens to examine the impact of gender diverse boards of directors on firm financial performance, the following aspects come up:

Firstly, in a resource dependence view, female directors bring different valuable resources to the boards. According to Terjesen et al. (2009), women directors insert knowledge, skills and experiences to their boards that differ from those of their male counterparts. Furthermore, women directors have the ability to create linkages to different parties than men, for example to different customers, suppliers, future employees or suppliers (Hillman, Shropshire & Canella, 2007). Hillman, Canella and Paetzold (2000) extended the resource dependence view on the role of directors by combining theory and empirical findings to develop four different types of directors: Insiders, Business experts, support specialists and community influentials. Using this terminology, Hillman et al. (2007) found that women directors are better community influentials than men. Community influentials are considered to provide expertise of and impact on powerful groups in the community surrounding the business (Hillman et al., 2007). The finding that female directors fill this role better than their male counterparts is supported by the conclusions of Brammer, Millington and Pavelin (2007), who observed a positive reputational effect of female board of director members. As mentioned above, one of the benefits of board linkages described by Pfeffer and Salancik (1978) is the creation of legitimacy for the firm. Building on this particular benefit, Dang et al. (2015) discovered that the appointment of women directors can enhance the legitimacy of the firm. The aforementioned points illustrate that in a resource dependence view, female directors will improve firm performance. This prediction is similar to the one derived through an agency theoretical rationale. Therefore,

H1: *Gender diverse boards of directors will improve firm financial performance of Norwegian public limited companies.*

Figure 2. Hypothesis 1

Hypothesis 1 can be further specified into

H1a: *Gender diverse boards of directors will improve market-based financial performance measures of Norwegian public limited companies.*

H1b: *Gender diverse boards of directors will improve accounting-based financial performance measures of Norwegian public limited companies.*

Secondly, the resource dependency perspective underlines the importance of outside or independent directors, as those directors provide access to resources needed by the firm in order to enhance firm performance and organizational effectiveness (Daily et al., 2003). This proposition is in line with the propositions of an agency theoretical perspective. As mentioned above, female directors are likely to enhance board independence (Singh, Terjesen & Vinnicombe, 2008; Nygaard, 2011; Terjesen et al., 2015). Therefore, the hypothesized positive relationship between gender diverse boards of directors and firm performance might be influenced by the number of outside directors on boards. So,

H2: *The relationship between the gender diversity of boards of directors and firm financial performance is positively moderated by the number of outside directors.*

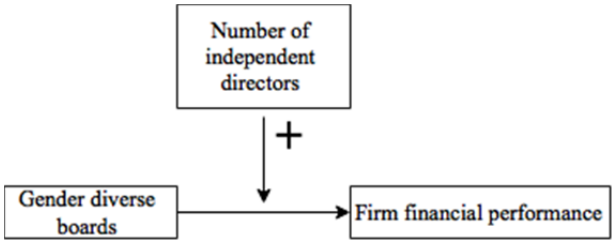

Figure 3. Hypothesis 2

Thirdly, one aspect of the value of directors in a resource dependent view is that they supply the resources of advice, counsel, information and expertise (Pfeffer & Salancik, 1978; Daily et al., 2003). Literature found that female directors are better educated, are more likely to hold advanced degrees (Hillman et al., 2002) and are more likely to hold an MBA degree (Singh et al., 2008). In a study about Canadian female directors, Burke (1997) found that 9 out of 10 were university graduates, indicating a generally high level of education for women directors. Additionally, better educated teams are found to be more innovative (Bantel & Jackson, 1989). Therefore,

H3: *The relationship between the gender diversity of boards of directors and firm financial performance is positively moderated by the level of education.*

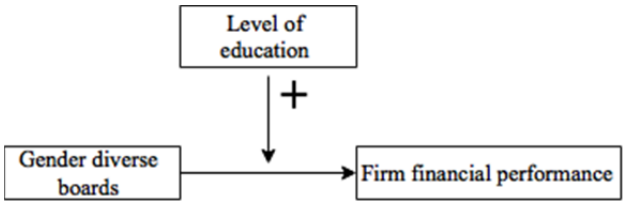

Figure 4. Hypothesis 3

As mentioned above, directors have a boundary-spanning role in the resource dependency perspective (Daily et al., 2003) and two of their most important value-generating functions are to open communication channels to other parties and to get support commitments from important external groups (Pfeffer & Salancik, 1978). Therefore, board interlocks are considered to be valuable to the company by resource dependency theorists. There is empirical support for this assumption (Mizruchi & Stearns, 1988; Pombo & Gutierrez, 2011). Female directors are found to join many boards faster than male directors (Hillman et al., 2002) and were reported to hold relatively more multiple directorships than men (Sealy, Singh & Vinnicombe, 2007). As in the case of Norway some of the existing executives and directors remarked there would not be enough qualified women for the director´s jobs (Criscione, 2002), it might be reasonable to assume that the director seats were distributed among a rather small number of women, creating multiple board interlocks. This "recycling" of a small group of female directors results in them becoming considerably experienced in the role of a director (Terjesen et al., 2009). Therefore,

H4: *The relationship between the gender diversity of boards of directors and firm financial performance is positively moderated by the number of multiple directorships held.*

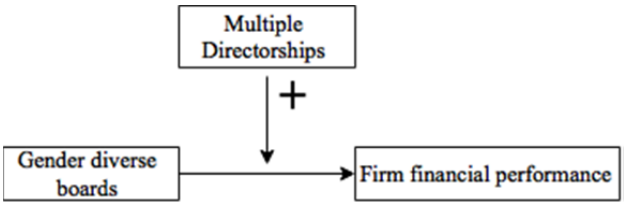

Figure 5. Hypothesis 4

Overall, the different hypothesized relationships about the diversity-performance relationship based on agency theoretical as well as resource dependency theoretical frameworks are the following:

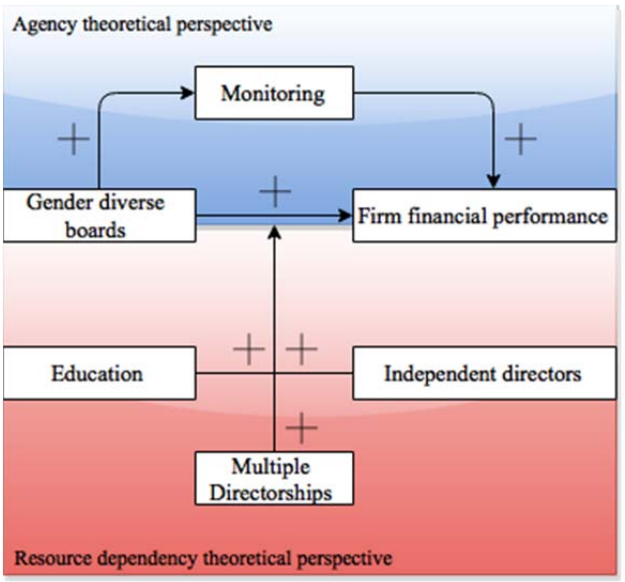

Figure 6. Hypotheses 1-4

2.2 Previous empirical evidence on the effect of gender diverse boards on firm financial performance

Previous attempts to empirically examine the effect of gender diversity of boards of directors on firm performance resulted in mixed conclusions (Simpson, Carter & D´Souza, 2010). Some authors reported a positive effect of diversity of boards of directors on firm performance, others found a negative effect, and further researchers found no relationship or an ambiguous relationship. In the next three sections, each category of results will be further examined.

2.2.1 Positive effects of gender diverse boards on firm financial performance

There is a number of empirical studies examining the effect of gender diverse boards of directors on firm financial performance which result in a positive effect. A noticeable feature about these articles is that they cover different time intervals, performance measures as well as samples or countries.

The earliest studies in consideration are examining samples in the 1990s. Analysing publicly traded Fortune 1000 firms, Carter et. al. (2003) fiound a positive relationship between the proportion of female board directors and firm value measured in Tobin´s Q. This is supported by Erhard, Werbel and Shrader (2003), who observed an increased effectiveness in the

monitoring function of gender diverse boards of US companies as well better firm performance measured in ROA and ROI. Another study drawing on a sample from the 1990s found a positive relation between the percentage of female directors and Tobin´s Q of Spanish firms (Campbell, Minquez-Vera, 2008).

Regarding samples in the 2000s, researchers also examined the board diversity-firm performance link in developing countries. Liu et al. (2014) identified a strong positive effect of female directors on the ROA and ROE of Chinese firms. Mahadeo, Soobaroyen and Hanuman (2012) examined Mauritian companies and discovered a significant positive performance effect of gender diverse boards compared to boards with no female representation. Other works in the 2000s investigating the effect of gender diverse boards on firm performance and finding positive effects include studies in France (Sabatier, 2015) or Spain (Martin-Ugedo & Minquez-Vera, 2014). The study of Martin-Ugedo and Miquez-Vera (2014) additionally examines the aforementioned effect in SMEs, considerably differentiating itself compared to the other studies, whose samples usually include large, publicly traded firms.

Next to single-country studies, literature furthermore entails multi-country studies that result in positive effects of board gender diversity on firm performance, including examinations of a sample of European firms (Isidro & Sobral, 2014) as well as across the world (Terjesen et al., 2015).

2.2.2 Negative effects of gender diverse boards on firm financial performance

Next to results regarding a positive effect, a small part of academic literature on the board gender diversity-firm performance link also reports that increased gender diversity in boards of directors leads to decreases in firm performance. For example Adams and Ferreira (2008) report that even though women directors are found to be more active monitors, in countries with otherwise strong shareholder protection more gender diverse boards may lead to over-monitoring through which firm performance is negatively affected. This finding partially contradicts the agency theoretical perspective on the effect of gender diverse boards on firm performance. The authors go on to propose that in weak shareholder protection circumstances, gender diverse boards might be positive for firm performance (Adams & Ferreira, 2008). However, this proposition is questioned by other studies, which for example found a negative impact of board gender diversity on firm performance in countries with actually weak investor protection (Ujunwa, Okoyeuzu & Nwakoby, 2012; Okike, 2007).

2.2.3 No effects of gender diverse boards on firm financial performance

Besides the clearly positive and clearly negative findings in some studies, a large part of the literature about this topic results in more pronounced effects of gender diversity of boards on firm financial performance. These can be classified into either 1) no effect or relationship at all, or 2) ambiguous effects/effects subject to other factors.

Firstly, there is a variety of studies observing no effect of gender diversity on corporate boards at all. According to Rose (2007) there is no significant link between gender diversity of boards and firm performance measured in Tobin´s Q. This is supported by other studies (Carter et al., 2010). Even though women are more likely to serve on the boards of better-performing companies, studies could not find evidence that gender diverse boards in itself are value-improving (Farrel & Hersch, 2005). Francoeur et al. (2008) examined female participation in both top management and corporate governance of Canadian firms, stating that gender diverse boards create enough value to keep pace with normal stock returns, but not more value than other board forms. Gender diversity of boards furthermore was observed to have no effect on firm financial performance during crisis times (Engelen, van den Berg & van der Laan, 2012).

Secondly, other research about the effect of gender diverse boards of directors on firm performance results in ambiguous effects or relationships. For example in analysing gender diversity of boards in Malaysian companies Abdullah et al. (2015) found that female directors bring economic value, however this is moderated by significant negative market perceptions, leading the market to discount their impact. In examining the relationship between gender diversity of top management boards and the propensity to strategic change, Triana, Miller & Tzrebiatkowski (2013) observed that depending on the situation gender diversity can either impede of propel the company´s ability to react to changes in its environment. The impact of gender diversity on firm financial performance also depends on the measure of firm performance as well as on the measure of the proportion of women on boards (Smith et al., 2006).

So, after summing up the previous empirical evidence about the effect of gender diverse boards on firm financial performance, the question of why different articles come to different results remains. The three most usually reviewed possible reasons for this are time, causality, and critical mass (Lückenrath-Rovers, 2013). According to Lückenrath-Rovers (2013), time refers to the difference between static and dynamic measurements as well as the point in time when the measurements happen. Causality refers to the problem that causality and endogeneity might influence conclusions. Critical mass refers to the problem that a subgroup needs to reach a certain size in order to influence an overall group (Kramer et al., 2006). This paper will confidently circumvent the problems of time and critical mass, as a broader time range will be covered and in the sample the percentage of female board members needs to be at least 40 %, making the number of both genders in the board nearly equal.

2.3 The case of Norway

2.3.1 Norwegian corporate governance and the quota

The Norwegian corporate governance system is characterised by the following aspects: Public limited liability companies in Norway are required to have a board of directors with at least three members, which elects the CEO, who is not allowed to be part of the board of directors (Norwegian Public Limited Liability Companies Act, 2014). The directors should furthermore be elected by the general meeting. Companies with more than 30 employees should also have employee representation on their board of directors (NPLLCA, 2014). A special part of Norwegian corporate governance is that firms with more than 200 employees are required to form a corporate assembly consisting of members voted by shareholders and employees, which shall act as a link between the board of directors and the general meeting. However, the company, employees and unions may agree to relinquish the formation of corporate assembly (NPLLCA, 2014). Additionally, it is recommended in the Norwegian Code of Corporate Governance (2014) that the board of directors should not include executive personnel. Therefore, the Norwegian board structure can be characterized as a two-tier board system even though the separation is not as clear as for example in the German

corporate governance system. It is also recommended that a majority of the members of the board of directors are independent from the company (NCCG, 2014). The legal system in Norway is civil law (Thomsen & Conyon, 2012).

In 2003, the Norwegian Parliament introduced a law which required all public-limited firms to have at least 40 % of female representation on their boards of directors (Ahern & Dittmar, 2012). In 2006 the law changed from voluntary compliance to legal compulsory, and firms that did not comply by January 2008 were threatened with liquidation. In April 2008, all PLCs were complying with the law (Ahern & Dittmar, 2012). According to Ahern & Dittmar (2012), female representation in the boards of directors of Norwegian public limited companies went from 25% in 2006 to slightly more than 40% in 2008.

2.3.2 Empirical evidence on the effect of gender diverse boards of directors on firm financial performance in Norway

The country under consideration in this paper will be Norway. To the best of the author´s knowledge in May 2015, there are only five studies investigating the impact of the quota for greater female board representation directly or indirectly. Of those 5 studies, one is not considering the board gender diversity-firm performance link, but rather evaluating the quota´s impact on board structures of Norwegian PLCs. Herein it is concluded that the quota led to inefficient board structures and that costs of restructuring were high (Bohren & Staubo, 2014). Out of the four further works investigating the link between gender diversity of boards and firm financial performance in Norway, one identified a positive effect, one identified no effect and two observed negative effects.

Nygaard (2011), studying the impact of the mandating of the quota at the end of 2005, found that for firms with low information asymmetry, the quota had beneficial, value-creating effects. Furthermore, firm performance measured in ROA for these companies from 2004 to 2008 improved. Dale-Olsen et al. (2013) compared firm performance measured in ROA from quota-affected Norwegian companies with unaffected Norwegian companies from 2003 to 2007 and derived that the impact of the quota and the board gender diversity-firm performance link is negligible in the short-term. In contrast to the aforementioned studies, Ahern & Dittmar (2012) observed a large decline in Tobin´s Q of Norwegian PLCs from the introduction of the quota until 2009. Another study with a sample of Norwegian firms found a negative relationship between gender diversity of boards and firm performance measured in ROA and Tobin´s Q (Bohren & Strom, 2010). The dataset of this study however only covered the period from 1989-2002, which was before the introduction of the quota and the subsequent increase in female directorships.

The most recent sample time from the aforementioned works is 2009, only three years after mandating of the quota and only one year after 40 % female board of director representation was achieved. As Dale-Olsen et al. (2013) note, “Future research should look at potential long-term effects of the reform” (p.129). In this paper, it is intended to provide part of this future research, as a dataset ranging until 2013 will provide a medium- to long-term analysis of the quota´s impact and the effect of gender diverse boards of directors on firm financial performance.

3. METHOD

3.1 Variables

3.1.1 Board of director diversity

Board of director information will be collected partially from the company database ORBIS and partially from the companies´ annual reports. If an annual report is not given or particular information for one variable is not included in the annual report, this information is tried to find by other means, for example in annual reports of different companies, from investor services like Bloomberg Business or from news articles using the database LexisNexis. Professional business networks such as Linkedin are furthermore searched for information. Gender diversity of boards of directors will be measured as the aggregate percentage of female board of director members in the sample. For identifying the gender of a director, the rules that Ahern & Dittmar (2012) follow in their research on Norwegian board of director members will be applied as well: First, a photograph from the person out of the annual report is used. If this does not exist, the biographical information will be searched for pronouns like for example his or her. If this does not exist neither, the gender of the director will be derived from the person´s first name. In order to test hypotheses 2-4, additional board of director information will be collected as well. The education level of the directors will be collected making use of the coding scheme developed by Engelen et al. (2012), which divides between five different levels of education: PhD, Master, Bachelor, lower than Bachelor, other. For assessing if a director is an outsider or independent, criteria from the Norwegian Code of Corporate Governance (2014) will be used. Those criteria are 1) the director has not been employed by the company in a senior position any time in the last five years, 2) does not have business relationships with the company 3) is not entitled to any fees dependent on the company´s performance 4) does not have any cross-relationships with executive personnel or other members of the board of directors and 5) has not been a partner or employee of the firm performing the audit of the respective company in the last three years. Independence will then be described as either independent or dependent and coded in those two categories, respectively. Even though the independence of board of director members is hard to judge precisely, it is reasonable to assume that those criteria give a good picture about a director´s relations to the company, their fellow board members and the company´s shareholders. The aspect of multiple directorships will be assessed on if a director is on the boards of directors of other companies as well on at the time in question. This information is usually included in the biographical information about the directors in the annual reports and will be coded as either the director is holding multiple directorships or not. No distinction is made between the numbers of additional director posts.

3.1.2 Firm financial performance

Firm financial performance will be measured using both market-based performance measures and accounting-based performance measures. The market-based measure will be Tobin´s Q, which is furthermore used as the firm performance variable in a considerable number of previous studies about governance and firm financial performance (Ahern & Dittmar, 2012, Carter et al., 2003, Haniffa & Hudaib, 2006). Based on Ahern & Dittmar (2012), “Tobin’s Q is computed as the sum of total assets and market equity less common book equity divided by total assets” (p.148). A high value of Q signals the effectiveness of governance mechanisms and a good market perception for the company (Weir, Laing & McKnigh, 2002). Further advantages of Tobin´s Q as a measure of firm performance are that it accounts for risk (Campbell & Minguez-Vera, 2008) and that it is not sensitive to reporting distortions

arising from accounting conventions and tax laws (Lindenberg & Ross, 1981).

Additionally, two accounting-based measures will be included in the analysis, namely ROA and ROE. A high ROA signals that the company´s assets are effectively used in serving the shareholder´s interests (Haniffa & Hudaib, 2006). All financial performance data will be retrieved from the company database ORBIS.

3.2 Modelling of the relationship between the variables

To measure any linear relationship between the (independent variables) diversity indicators gender, independence, directorships multiplicity, education and the (dependent variables) firm financial performance measures ROA, ROE and Tobin´s Q, the following regression models are constructed:

Equation (1)

$$ROA_i = \alpha_i + \beta_{1j} GENDERDIVERSITY_{ij} + \beta_{2j} INDEPENDENCE_{ij} + \beta_{3j} MULTIPLEDIRECTORSHIPS_{ij} + \beta_{4j} EDUCATION_{ij} + \beta_5 SIZE_i + \beta_6 LEV_i + \beta_7 SALES_i + \beta_8 industry\ dummy_{i,m} + \varepsilon_{ij}$$

Equation (2)

$$ROE_i = \alpha_i + \beta_{1j} GENDERDIVERSITY_{ij} + \beta_{2j} INDEPENDENCE_{ij} + \beta_{3j} MULTIPLEDIRECTORSHIPS_{ij} + \beta_{4j} EDUCATION_{ij} + \beta_5 SIZE_i + \beta_6 LEV_i + \beta_7 SALES_i + \beta_8\ industry\ dummy_{i,m} + \varepsilon_{ij}$$

Equation (3)

$$Q_i = \alpha_i + \beta_{1j} GENDERDIVERSITY_{ij} + \beta_{2j} INDEPENDENCE_{ij} + \beta_{3j} MULTIPLEDIRECTORSHIPS_{ij} + \beta_{4j} EDUCATION_{ij} + \beta_5 SIZE_i + \beta_6 LEV_i + \beta_7 SALES_i + \beta_8\ industry\ dummy_{i,m} + \varepsilon_{ij}$$

where ROA_i, ROE_i and Q_i are the respective financial performance measures for firm i in the sample, $GENDERDIVERSITY_{ij}$ the gender diversity on company i´s board measured as the percentage of female directors on the board, $INDEPENDENCE_{ij}$ measured as the percentage of independent directors on company i´s board, $MULTIPLEDIRECTORSHIPS_{ij}$ measured as the percentage of directors holding additional directorships next to the one on company i, and $EDUCATION_{ij}$ measured as the percentage of directors on company i´s board who hold a Master´s degree or a higher form of education. This classification of the "education" variable is similar to the one used by Ahern and Dittmar in their 2012 study about the impact of the quota. Additionally each regression equation contains four control variables, namely firm size measured as the log-value of total assets, leverage measured as the ratio of total debt to total assets, sales growth measured as the year-wise percentage change in sales and industry dummies to capture any industry specific effects. Each regression equation is used to test hypothesis 1.To test hypotheses 2-4, interaction effects between the variables will be further examined by constructing and testing the following regressions:

Equation (4)

$$ROA_i = \alpha_i + \beta_{1j} DIVERSITY*INDEPENDENCE_{ij} + \beta_{2j} DIVERSITY*MULTIPLEDIRECTORSHIPSij + \beta_{3j} DIVERSITY*EDUCATION_{ij} + \beta_4 SIZE_i + \beta_5 LEV_i + \beta_6 SALES_i \beta_7\ industry\ dummy_{i,m} + \varepsilon_{ij}$$

Equation (5)

$$ROE_i = \alpha_i + \beta_{1j} DIVERSITY*INDEPENDENCE_{ij} + \beta_{2j} DIVERSITY*MULTIPLEDIRECTORSHIPSij + \beta_{3j} DIVERSITY*EDUCATION_{ij} + \beta_4 SIZE_i + \beta_5 LEV_i + \beta_6 SALES_i \beta_7\ industry\ dummy_{i,m} + \varepsilon_{ij}$$

Equation (6)

$$Tobin´s\ Q_i = \alpha_i + \beta_{1j} DIVERSITY*INDEPENDENCE_{ij} + \beta_{2j} DIVERSITY*MULTIPLEDIRECTORSHIPSij + \beta_{3j} DIVERSITY*EDUCATION_{ij} + \beta_4 SIZE_i + \beta_5 LEV_i + \beta_6 SALES_i \beta_7\ industry\ dummy_{i,m} + \varepsilon_{ij}$$

where the multiplications of diversity with the remaining board characteristics represent the interacting effects of those characteristics that influence the impact on firm financial performance as hypothesized in section 2.

Because the observation method was to collect data on the same companies from 2006 until 2013, the regression model will inherit multiple responses from the same subject, which cannot be regarded as independent from each other. Therefore a linear mixed model with parameter estimates will be used as regression analysis, which diminishes the need to average over items or subjects (Baayen, 2008).

After the analysis, the results will be further tested using a series of robustness checks. Firstly, the analysis will be repeated dividing between those companies who already accomplished the quota ratio of 40 % female participation and those who did not. For the ones already accomplishing the required ratio of 40 % in 2006, the mandatory imposition of the quota might not have impacted their board composition as drastically as for those who were not complying before, making the change for them easier. Secondly, board size will be included in the analysis to check the robustness of the findings. Previous research found that smaller boards are more effective and successful (Yermack, 1996; Eisenberg, Sundgren & Wells, 1998). In order to account for the impact of possible outliers, the extreme values below the first and above the 99th percentile for each variable will be left out of the analysis.

4. DATA

4.1 Sample

The sample will consist of the shareholder-elected directors of all non-financial Norwegian public limited companies listed on Oslo Stock Exchange from 2006 to 2013. The quota for female board of director representation applies to those companies and directors, as for employee-elected directors a less strict quota was mandated (Nygaard, 2011). The quota law makes Norwegian PLCs a useful ground for examining the effect of gender diverse boards of directors on firm financial performance. This is because of the remarkable spike in female representation on boards of directors: In 2006, the percentage of female board members in Norwegian PLCs was at 25 %; since 2009, it is steadily at around 40 % (Ahern & Dittmar, 2012). After restricting the search according to the aforementioned criteria, the ORBIS database shows an output of 68 companies. Because of unavailability of more than half of the required observations for 13 companies, those companies had to be dropped from the observation. When comparing the sample with the overall population of Norwegian PLCs listed from 2006 to 2013 however, it can be concluded that after left out cases the sample still covers 80% of the population of Norwegian PLCs listed on OSE from 2006 to 2013.

4.2 Descriptive statistics

Appendix 1 shows the mean, minimum, maximum and standard deviation values for each independent, dependent and control variable. The values are shown for the overall sample including

the range 2006-2013 as well as for the year-to-year developments of the variables.

The mean percentage of female board of director representation in the sample is at 41.4%, while the minimum value for this variable is 0 and the maximum value is 57%. As can be seen from appendix 1, the percentage of women directors on the boards of the sample firms is increasing, from a mean value of 33.48% in 2006 up to a mean value of 42.81% in 2013. So overall, female board of director representation in the sample firms increases by 27.8% over the sample time.

The percentage of independent directors on the boards of the sample firms averages 63.37% over the total sample time. This variable shows a moderately increasing development from 2006 to 2013, rising by approximately 6.5%.

The percentage of directors holding multiple directorships is 82.82% on average. Comparable to the independent director variable, the percentage of directors with multiple directorships increases by 7.1% over the sample period from 2006 to 2013.

Regarding the education variable, 65.11% of the directors in the sample are holding a master´s degree or some higher form of education. This percentage is at 67.02% in 2006 and decreases to 61.8% in 2008, then rises again up to 70.06% in 2013.

The leverage ratio of all firms in the sample is at 57.08%. While the ratio shows small decreases or increases from year to year it is rather constant overall, never increasing above 60 or below 55 %.

The same holds for the firm size measured as log value of total assets, which averages 5,9 over the whole sample period, increases from 5,75 in 2006 to 5,93 in 2007 and then constantly stays at around 5,9, indicating no substantial change in the size of the sample firms over the period.

In contrast to the stable development of the aforementioned variables, sales growth shows large fluctuations from year to year. Over the whole sample period the average sales growth of the companies is 21.35%. This large average mostly comes from high growth rates in 2006 and 2007 with 53% and 57% respectively. After 2007 growth rates do not reach that level again and range from 23% in 2009 to 0.5% in 2013.

The three financial performance measures ROA, ROE and Tobin´s Q each show negative development. Average ROA over the whole sample period is 4.24%. It decreases by 72.2% from 2006 to 2013. Average ROE for the whole sample period is 9.61%. It shows a similar development like ROA, decreasing by 73.4% from 2006 to 2013. The average Tobin´s Q for the sample firms is 1,5. Like the accounting-based performance measures ROA and ROE it develops negatively over the sample period, but not as strong as those. Tobin´s Q decreases by 31.7% from 2006 to 2013.

5. RESULTS

5.1 Empirical results for the effects of gender diversity, independent directors, multiple directorships and education on FFP

The parameter estimates for equations (1), (2), and (3) are shown in appendix 2. In the next sections, the results regarding each measurement of firm financial performance are described separately.

5.1.1 ROA

None of the industry dummies is significant, indicating that there are no industry effects influencing the relationship between the independent variables and ROA. The estimates for the other three control variables leverage, firm size and sales growth are all significant. Leverage shows a negative coefficient, while both firm size and sales growth have positive coefficients describing a positive impact of those two variables on ROA of the sample companies.

The three independent variables of gender diversity, independent directors and education are all not significant. Multiple directorships however shows a significant and negative relationship with ROA (β=-8,839; $p<0,05$), indicating that an increase in the percentage of board members holding multiple directorship will decrease ROA of the sample companies.

5.1.2 ROE

The results for ROE closely resemble those already measured for ROA. None of the industry dummies is significant, indicating no industry effects on the relationship between gender diversity, independent directors, multiple directorships and education on ROE. The control variables of leverage, firm size and sales growth are once again all significant, with leverage showing a negative effect on ROE and both sales growth and firm size showing a positive effect. Like in the case of ROA, the independent variables of gender diversity, independent directors and education do not have significant effects on ROE. Contrary to the findings for ROA, the effect of multiple directorships is not statistically significant anymore ($p>0,05$) but a trend is still observable ($p<0,10$), and this trend is negative (β=-18,26).

5.1.3 Tobin´s Q

The industry dummies are again not significant, so also for Tobin´s Q there are no industry-specific effects influencing the relationship between the independent and control variables and the financial performance measure. Despite this, the results for the market-based financial performance measure Tobin´s Q differ significantly from the impacts found for the accounting-based measures. The impact of leverage on firm financial performance is not significant for the Q-value. Sales growth has a significant and positive impact, as is the case for ROA and ROE. Firm size also has a significant effect, but in contrast to the observed result for the accounting-based measures, this effect is negative. Regarding the independent variables, a negative and significant effect can be observed for gender diversity (β=-1.253; p=.004). The three remaining variables of independent directors, multiple directorships and education do not have a significant impact on Tobin´s Q in the model.

Because of the lack of significant and positive parameter estimates for the relationship between gender diversity and ROA respectively ROE, and due to the observed significant negative impact of this variable on Tobin´s Q, there is no support for hypotheses 1, 1a and 1b; they are rejected each.

5.2 Empirical results for the effects of interactions between gender diversity, independent directors, multiple directorships and education on FFP

In order to test for the hypothesized interactions between gender diversity, independent directors, multiple directorships and education which were formulated in hypotheses 2-4, the three additional terms gender diversity*independent directors, gender diversity*multiple directorships and gender diversity*education

were computed and put into the regression model. The parameter estimates for equations (4), (5) and (6) are shown in appendix 2. In the next sections, the results are described separately for each measurement of firm financial performance.

5.2.1 ROA

Once again, no industry dummy is significant. Furthermore, the three control variables of firm leverage, firm size and sales growth are all significant, with leverage having a negative coefficient and both sales growth and firm size having a positive coefficient. None of the three new interaction terms is significant, indicating that the interactions between gender diversity, independent directors, multiple directorships and education have no meaningful impact on firm performance measured in ROA.

5.2.2 ROE

As is the case for ROA, no industry dummy is significant, so there are no industry effects observable in the model. The coefficient for firm leverage is not significant, while the coefficients for sales growth and firm size are both significant and positive. None of the three interaction terms is showing a significant effect on firm performance measured in ROE. However, the interaction of gender diversity and multiple directorships results in a largely negative coefficient with a p-value of .089. This makes it statistically not significant anymore ($p>.05$), but a trend is observable ($p<.10$) and this trend is negative ($\beta=-187.06$).

5.2.3 Tobin´s Q

No industry dummy is significant, so for this model as well there are no industry-specific effects observable in the sample. Leverage is not significant, while both sales growth and firm size are significant. For the sales growth variable, a moderately positive coefficient can be observed, while for the firm size variable, a moderately negative coefficient is found. This result is similar to the one in equation (4); in both models, firm size is negatively impacting the Tobin´s Q-values of the sample companies. Regarding the interaction terms, once again no significant relationship is found.

As in each of the three constructed models no significant and positive effect of the interaction between gender diversity, independent directors, multiple directorships and education can be found – for equation (5), there even is a negative trend observable between ROE and the interaction of gender diversity with multiple directorships – hypotheses 2-4 do not find support; each of them is to be rejected.

5.3 Robustness

In order to test for the robustness of the findings, two additional variables are included in the regression analysis. The first one is called quota achievement in 2006 and is coded as a dummy variable with two categories, separating those companies who already reached a 40 % ratio of female board of director representation (as mandated by the quota) in 2006 and those who did not do so in the same year. Bohren & Staubo (2014) found that forced gender balance on boards of directors is costly and that a forced gender balance law brings with it a difficulty to design post-law boards of directors that have the same qualities as pre-law boards of directors. Other researchers argue that a mandatory gender balance law represents a large shock to the ability of shareholders to choose the optimal structure for the board of directors (Ahern & Dittmar, 2012). Therefore it is reasonable to assume that the firms which already had 40 % of women directors on their board did not need to considerably change their board structure in the following years, thereby saving the costs of complying to the law and keeping the board of director structure that was considered optimal by their shareholders before the mandatory introduction of the quota.

The second variable inserted into the regression models is the board size of the sample firms in the respective years. Previous research found that smaller boards are more effective (Yermack, 1996; Eisenberg, Sundgren & Wells, 1998) and bring higher focus and participation (Firstenberg & Malkiel, 1994). So if companies would have tried to accomplish the quota-mandated 40 % of women directors by just filling up their boards with women and not by replacing male directors with female directors, board and firm financial performance might have suffered from the increasing board size.

So including the two variables for robustness checks into the model brings:

Equation (7)

$$FFP_i = \alpha_i + \beta_{1j}\,GENDERDIVERSITY_{ij} + \beta_{2j}INDEPENDENCE_{ij} + \beta_{3j}MULTIPLEDIRECTORSHIPS_{ij} + \beta_{4j}EDUCATION_{ij} + \beta_5 SIZE_i + \beta_6 LEV_i + \beta_7 SALES_i + \beta_8 industry\ dummy_{i,m} + \beta_9 BSIZE_i + \beta_{10} achievement\ dummy_{i,m} + \varepsilon_{ij}$$

And for the interaction effects:

Equation (8)

$$FFP_i = \alpha_i + \beta_{1j}DIVERSITY*INDEPENDENCE_{ij} + \beta_{2j}DIVERSITY*MULTIPLEDIRECTORSHIPSij + \beta_{3j}\,DIVERSITY*EDUCATION_{ij} + \beta_4 SIZE_i + \beta_5 LEV_i + \beta_6 SALES_i\ \beta_7\ industry\ dummy_{i,m} + \beta_9 BSIZE_i + \beta_{10} achievement\ dummy_{i,m} + \varepsilon_{ij}$$

Appendix 3 shows the respective parameter estimates for the additionally introduced variables of equations 7 and 8. None of the robustness checks altered the previously observed results.

The last conducted robustness check was to test if problems of multicollinearity were present in the data. This was not the case.

6. DISCUSSION

After reviewing the literature about the effects of gender diversity of boards of directors on firm performance, deriving hypotheses from literature and theory, collecting data and analysing this data it can be stated that none of hypotheses 1-4 finds support; they have to be rejected. There is no conclusive evidence that gender diversity of boards of directors improves firm financial performance measured in ROA, ROE or Tobin´s Q. Regarding Tobin´s Q, a negative and significant effect of gender diversity on this financial performance measure is found. As the Q-ratio is a market-based measure of financial performance, this finding might indicate that increased gender diversity on the boards of directors is not perceived favourable by financial markets, a claim which is also put forward by Abdullah, Ismail & Nachum (2015) in their study about the impact of societal perceptions on corporate governance in emerging markets. Linking this work and a study having a developed country like Norway as sample should be done with caution, especially as the Norwegian society is fairly advanced in gender equality issues, ranking high on gender equality indices and female labour participation rates (Casey, Skibnes & Pringle, 2011). However, the mandating of the quota by the government resulted in angry reactions by corporate leaders and stock prices declined with the first announcement of the quota (Ahern & Dittmar, 2012), so it might be reasonable to suggest

that markets still do not perceive gender equality on boards of directors favourably.

Furthermore, no evidence can be found that the relationship between gender diversity and firm financial performance is positively moderated by the number of independent directors, the number of directors holding multiple directorships or the education level of the board members.

This study´s results support the findings of a number of previous empirical examinations about the impact of gender diversity of boards of directors on firm financial performance. Farrel and Hersch (2005) could not confirm that gender diversity in the board room is value enhancing, Rose (2007) did not find a significant link between board gender diversity and Tobin´s Q of Danish firms. Engelen, van den Berg and van der Laan (2012) examined board diversity during crisis times, identifying gender as having no impact on firm financial performance during crisis times. Other studies did not find a significant relationship between gender diversity and firm performance neither (Francoeur et al., 2008, Carter et al., 2010). Additionally, results of works in which the sample consist of Norwegian companies are also supported by this study. Ahern & Dittmar (2012) state that the gender diversity quota caused a large decline in Tobin´s Q over the following year, consistent with the negative and significant impact of gender diversity on Tobin´s Q in this paper. Bohren and Strom (2010) also used Tobin´s Q as the measure of firm financial performance and found a negative impact.

So, what are possible explanations for the non-existent or even negative effect of gender diverse boards of directors on firm financial performance measures? One point of reference might be the work of Adams & Ferreira (2009). Using a panel of US firms, the authors identify gender diverse boards as being more active monitors. However, an active board can lead to over-monitoring, which might decrease firm value for companies active in an otherwise strong corporate governance system (Adams & Ferreira, 2009). To assess the strength of the Norwegian corporate governance system, two different indices will be used.

The first is the Standard & Poor´s transparency and disclosure rating. This is a corporate governance rating developed for a study by S&P in 2001, and it is used in a number of empirical research (Doidge, Karolyi & Stulz, 2007). The ratings are derived by researching firm´s annual reports and standard regulatory filings for 98 items, which are then scored binary, so one point for a disclosed item and 0 points for an undisclosed item. The scores are then added and translated to a percentage score (Doidge et al., 2007). The second measure used to evaluate the strength of the Norwegian corporate governance system is the methodology developed by La Porta, Lopez-de-Silanes, Shleifer & Vishny (2001), which investigates the laws covering the protection of shareholders and the quality of their enforcement.

The tables for the two measures can be found in appendix 9. Norway is in the 75th percentile or higher in the S&P transparency and disclosure rating as well as in each of the measures used by La Porta et al. (2001). This indicates that the Norwegian corporate governance system is well developed and that the sample firms operate in an environment characterized by strong corporate governance mechanisms. According to Adams and Ferreria (2009), this is an environment in which actively monitoring and tough boards will decrease firm value. This paper is by no means declaring causality and that this is the reason for the non-existent respectively negative effect of gender diverse boards on firm performance, but it might be a starting point for further research.

Another possible explanation point is drawing on critical mass theory (Granovetter, 1978). According to Torchia, Calabro and Huse (2011) women on corporate boards reach a "critical mass" when at least 3 females are on the board. Studying the board of directors´ impact on firm level innovation, they find that innovation is greater when the "critical mass" of at least three women on the board is reached (Torchia et al., 2011). So, the non-significant impact of gender diverse boards on ROA and ROE might be explainable with the non-accomplishment of reaching a "critical mass", for example when the board consists of five members and two of them are female. This is a setting which complies with the quota but does not meet the "at least three women"-threshold formulated by Torchia et al. (2011). Once again this is not implying causality but rather a suggestion for further research

6.1 Future research suggestions

Even though the field of gender diversity on corporate boards of directors already is commonly researched, there are still suggestions for research directions to take in future works. As mentioned before, a possible future research suggestion is to build upon the findings of Adams & Ferreira (2009) by explicitly comparing the impact of gender diverse boards on firm financial performance in environments with weak corporate governance systems to those with strong ones. For both sets of circumstances there are studies (Liu et al., 2014; Ahern & Dittmar, 2012); but comparative research is rare. Another already mentioned suggestion is to apply the critical mass-concept used by Torchia et al. (2011) to firm financial performance measures as dependent variables, as their study examined the impact on company innovativeness. Furthermore, research could focus on the relationship between diversity and market-based financial performance measures such as Tobin´s Q. As this paper as well as other studies found a significant negative impact of gender diversity on Tobin´s, it would be interesting to further explore the reasons for this negative relation. One might even use qualitative research methods in order to more deeply examine the attitudes of investors, brokers and other stock market actors towards gender quotas and gender diversity on corporate boards.

6.2 Limitations

As is the case with other research in the social sciences, this paper is not free of limitations. The first limitation is related to the predictor variable of independent directors. Even though thorough criteria were used in order to differentiate independent from dependent directors, in the data collection it had to be relied on the companies´ annual reports. Therefore some non-observable business relationship or family tie between a director and the respective company might not have been detected. The second limitation refers to the predictor variable of education. The sample included a number of directors whose education took place outside of Norway, and educational degrees from different countries are sometimes difficult to compare and classify together.

7. CONCLUSION

The gender diversity of corporate boards is a frequently discussed topic both in management practice as well as in academic research. Norway was one of the first countries to mandate a quota for gender diversity, requiring 40 % of board of director seats in Norwegian public limited liability companies to be held by women. The quota was fully complied

with in 2008 and makes Norway a useful ground for examining the effect of gender diverse boards of directors on firm financial performance, mainly due to a considerable spike in the number of female directors. In this paper, the research question "What is the effect of gender-diverse boards of directors on firm financial performance in Norway?" is examined. Additionally, possible positively moderating interaction effects of the number of independent directors, the number of directors holding multiple board seats and the education level of directors are investigated as well.

Theoretical perspectives commonly used to explain the impact of gender diversity of corporate boards on firm financial performance are agency theory and resource dependency theory. Both theoretical perspectives suggest a positive effect of gender diverse boards of directors on firm financial performance. In the agency theoretical view, independent directors and active monitoring are most important to reduce agency problems, and those two aspects are found to be increasing with increasing gender diversity. In the resource dependency theoretical perspective, directors are perceived to span the boundary between the organization and its environment, and to supply critical resources such as counsel and advice. Outside directors are also considered to be important in this perspective, as they offer resources the company otherwise does not get. Studies furthermore found that female directors are better educated on average. These factors explain the suggested positive linkage of gender diverse boards and firm performance when using a resource dependency theoretical perspective.

Existing empirical evidence on the gender diversity-firm financial performance link is mixed, with some studies resulting in positive effects of diversity on performance and others finding negative effects. Furthermore some empirical examinations about this topic did not observe a significant link between gender diversity of boards of directors and firm performance.

In this study, board of director and firm financial performance data from 55 Norwegian public limited liability companies, which are listed on Oslo Stock Exchange from 2006 to 2013, is gathered and linear mixed regression models are used to examine the relationship between gender diversity and firm financial performance measured in ROA, ROE and Tobin´s Q. Additionally, possible positively moderating effects from the number of independent directors, the number of multiple directorships and the education level of board members are investigated. The following hypotheses are formulated:

H1: *Gender diverse boards of directors will improve firm financial performance of Norwegian public limited companies.*

H1a: *Gender diverse boards of directors will improve market-based financial performance measures of Norwegian public limited companies.*

H1b: *Gender diverse boards of directors will improve accounting-based financial performance measures of Norwegian public limited companies.*

H2: *The relationship between the gender diversity of boards of directors and firm financial performance is positively moderated by the number of outside directors.*

H3: *The relationship between the gender diversity of boards of directors and firm financial performance is positively moderated by the level of education.*

H4: The relationship between the gender diversity of boards of directors and firm financial performance is positively moderated by the number of multiple directorships held.

The analysis reveals no supporting evidence on the hypothesis that gender diverse boards of directors will improve firm financial performance. For Tobin´s Q, an actually negative relationship is found between gender diversity and firm performance. Furthermore, no significant effects are found for the interactions between gender diversity, independent directors, multiple directorships and education and their impact on firm financial performance, thereby not detecting support for hypotheses 2-4. So each hypotheses is rejected. This paper supports a number of previous empirical examinations which did not find a significant link between gender diverse corporate boards and firm performance.

This paper has important implications for practice. Many countries are currently following Norway´s example and introduce gender diversity quotas for corporate boards, with Germany being the latest of these in March 2015 (Smale & Miller, 2015). While those mandatory quotas might positively affect the status of women in business life as well as provide steps towards a "fairer society", decision-makers need to be aware of the empirical evidence - including this paper - which suggests that those quotas will not improve and possibly even decrease the financial performance of companies.

8. ACKNOWLEDGEMENT

First of all, I would like to thank my primary supervisor Peter-Jan Engelen and the whole supervisory team of the Finance & Accounting Track for the fast and always constructive feedback regarding my thesis. Furthermore, thanks go to my parents for all of their support and trust.

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10. APPENDICES

Appendix 1) Descriptive statistics overall sample and year-to-year

Descriptive statistics overall sample

	N	Minimum	Maximum	Mean	Standard deviation
Gender Diversity	345	0,00	0,57	0,41	0,07
Independent Directors	345	0,00	1,00	0,63	0,23
Multiple Directorships	345	0,29	1,00	0,83	0,17
Education	345	0,25	1,00	0,65	0,19
Firm Leverage	345	0,09	0,88	0,57	0,18
Firm Size	345	4,32	7,99	5,91	0,70
Sales Growth	345	-0,78	4,66	0,21	0,54
Board Size	345	4,00	7,00	5,44	0,88
ROA	345	-59,65	36,73	4,24	12,14
ROE	345	-134,70	82,82	9,62	29,02
Tobin´s Q	345	0,70	6,25	1,51	0,83
valid (listwise)	345				

Descriptive statistics 2006

	N	Minimum	Maximum	Mean	Standard deviation
Gender Diversity	40	0,00	0,50	0,33	0,15
Independent Directors	40	0,00	1,00	0,61	0,28
Multiple Directorships	40	0,40	1,00	0,79	0,18
Education	40	0,25	1,00	0,67	0,21
Firm Leverage	40	0,11	0,88	0,57	0,20
Firm Size	40	4,60	7,38	5,76	0,73
Sales Growth	40	-0,24	3,24	0,53	0,61
Board Size	40	4,00	7,00	5,50	0,85
ROA	40	-13,50	29,13	8,07	9,04
ROE	40	-37,98	80,05	20,28	22,36
Tobin´s Q	40	1,05	6,25	2,12	1,08
valid (listwise)	40				

Descriptive statistics 2007

	N	Minimum	Maximum	Mean	Standard deviation
Gender Diversity	44	0,25	0,57	0,43	0,06
Independent Directors	44	0,00	1,00	0,64	0,23
Multiple Directorships	44	0,29	1,00	0,80	0,20
Education	44	0,29	1,00	0,62	0,17
Firm Leverage	44	0,13	0,82	0,56	0,18
Firm Size	44	4,38	7,95	5,93	0,79
Sales Growth	44	-0,46	4,66	0,57	0,92
Board Size	44	4,00	7,00	5,45	0,90
ROA	44	-34,80	36,73	8,91	12,23
ROE	44	-59,15	82,82	23,83	25,90
Tobin´s Q	44	0,77	3,51	1,80	0,66
valid (listwise)	44				

Descriptive statistics 2008

	N	Minimum	Maximum	Mean	Standard deviation
Gender Diversity	44	0,33	0,57	0,42	0,04
Independent Directors	44	0,00	1,00	0,62	0,22
Multiple Directorships	44	0,40	1,00	0,82	0,16
Education	44	0,33	1,00	0,62	0,19
Firm Leverage	44	0,16	0,85	0,60	0,17
Firm Size	44	4,32	7,18	5,86	0,72
Sales Growth	44	-0,26	2,33	0,06	0,44
Board Size	44	4,00	7,00	5,48	0,82
ROA	44	-49,85	25,89	1,45	13,37
ROE	44	-124,49	45,85	1,31	36,08
Tobin´s Q	44	0,71	2,92	1,16	0,49
valid (listwise)	44				

Descriptive statistics 2009

	N	Minimum	Maximum	Mean	Standard deviation
Gender Diversity	45	0,25	0,50	0,41	0,04
Independent Directors	45	0,00	1,00	0,61	0,22
Multiple Directorships	45	0,40	1,00	0,85	0,16
Education	45	0,40	1,00	0,63	0,17
Firm Leverage	45	0,09	0,81	0,56	0,18
Firm Size	45	4,40	7,99	5,97	0,75
Sales Growth	45	-0,55	2,35	0,24	0,48
Board Size	45	4,00	7,00	5,40	0,92
ROA	45	-46,03	25,55	4,71	12,35
ROE	45	-93,77	57,93	11,34	27,62
Tobin´s Q	45	0,81	5,32	1,45	0,81
valid (listwise)	45				

Descriptive statistics 2010

	N	Minimum	Maximum	Mean	Standard deviation
Gender Diversity	43	0,20	0,57	0,42	0,06
Independent Directors	43	0,00	1,00	0,64	0,24
Multiple Directorships	43	0,40	1,00	0,83	0,16
Education	43	0,40	1,00	0,63	0,18
Firm Leverage	43	0,11	0,85	0,58	0,18
Firm Size	43	4,40	7,05	5,91	0,68
Sales Growth	43	-0,43	0,46	0,02	0,22
Board Size	43	4,00	7,00	5,35	0,87
ROA	43	-59,65	18,72	0,17	14,03
ROE	43	-130,33	43,18	0,66	31,64
Tobin´s Q	43	0,74	3,98	1,45	0,66
valid (listwise)	43				

Descriptive statistics 2011

	N	Minimum	Maximum	Mean	Standard deviation
Gender Diversity	39	0,40	0,57	0,42	0,04
Independent Directors	39	0,00	1,00	0,65	0,23
Multiple Directorships	39	0,40	1,00	0,83	0,16
Education	39	0,40	1,00	0,68	0,19
Firm Leverage	39	0,14	0,87	0,58	0,17
Firm Size	39	4,40	7,09	5,92	0,65
Sales Growth	39	-0,42	1,59	0,13	0,30
Board Size	39	4,00	7,00	5,51	0,85
ROA	39	-43,66	31,55	3,49	11,82
ROE	39	-134,70	48,35	5,72	29,29
Tobin´s Q	39	0,70	5,23	1,31	0,88
valid (listwise)	39				

Descriptive statistics 2012

	N	Minimum	Maximum	Mean	Standard deviation
Gender Diversity	45	0,33	0,50	0,43	0,05
Independent Directors	45	0,20	1,00	0,64	0,21
Multiple Directorships	45	0,40	1,00	0,86	0,15
Education	45	0,33	1,00	0,67	0,20
Firm Leverage	45	0,12	0,88	0,56	0,18
Firm Size	45	4,44	7,16	5,98	0,65
Sales Growth	45	-0,28	2,17	0,18	0,35
Board Size	45	4,00	7,00	5,44	0,89
ROA	45	-17,76	27,43	5,09	9,20
ROE	45	-68,63	36,17	8,80	20,89
Tobin´s Q	45	0,72	4,84	1,35	0,75
valid (listwise)	45				

Descriptive statistics 2013

	N	Minimum	Maximum	Mean	Standard deviation
Gender Diversity	45	0,33	0,57	0,43	0,05
Independent Directors	45	0,20	1,00	0,65	0,21
Multiple Directorships	45	0,40	1,00	0,85	0,17
Education	45	0,33	1,00	0,70	0,20
Firm Leverage	45	0,09	0,85	0,55	0,19
Firm Size	45	4,44	7,16	5,94	0,68
Sales Growth	45	-0,78	1,80	0,01	0,33
Board Size	45	4,00	7,00	5,40	0,96
ROA	45	-43,42	22,26	2,25	12,23
ROE	45	-107,77	43,48	5,38	28,79
Tobin´s Q	45	0,76	4,48	1,45	0,85
valid (listwise)	45				

Values are rounded to two decimals.

Appendix 2: Parameter estimates for equations 1-6

	Equation (1)	Equation (2)	Equation (3)	Equation (4)	Equation (5)	Equation (6)
Constant	-18,933 (98,035)	-28,117 (203,650)	11,164* (5,302)	-30,008 (97,596)	-83,306 (203,442)	10,829 (5,386)
Firm Leverage	-17,235* (5,738)	-37,962* (14,126)	-0,403 (0,332)	-17,200* (5,748)	-36,896 (14,113)	-0,378 (0,333)
Sales Growth	4,811* (0,897)	10,382* (2,358)	0,199* (0,053)	4,790* (0,906)	10,156* (2,374)	0,193* (0,053)
Firm Size	5,650* (1,991)	12,392* (4,506)	-0,399* (0,111)	5,574* (1,987)	12,297* (4,476)	-0,409* (0,112)
Gender Diversity	3,536 (7,293)	5,364 (18,996)	-1,254* (0,430)	40,073 (36,568)	147,905 (95,144)	-0,053 (2,151)
Independent Directors	-0,941 (3,732)	0,131 (9,454)	-0,074 (0,218)	3,723 (13,410)	-21,890 (34,450)	-0,151 (0,786)
Multiple Directorships	-8,839* (3,961)	-18,265** (10,157)	0,056 (0,232)	4,047 (17,451)	57,244 (45,365)	1,091 (1,026)
Education	1,356 (3,782)	4,072 (9,700)	0,093 (0,222)	5,275 (13,574)	22,136 (35,232)	-0,244 (0,798)
Gender Diversity * Independent Directors				-11,406 (30,504)	53,160 (78,834)	0,249 (1,791)
Gender Diversity * Multiple Directorships				-31,970 (42,140)	-187,067** (109,591)	-2,541 (2,478)
Gender Diversity * Education				-10,729 (32,375)	-44,619 (83,969)	0,847 (1,902)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
y	ROA	ROE	Tobin,s Q	ROA	ROE	Tobin´s Q

Standard errors are given in brackets. * represents significance at the 5 % level, ** represents significance at the 10 % level.

Appendix 3: Robustness tests and results

	Robustness Equation 1	Robustness Equation 2	Robustness Equation 3	Robustness Equation 4	Robustness Equation 5	Robustness Equation 6
quota not achieved in 2006	-2,178 (3,524)	-3,597 (7,381)	-0,077 (0,192)	-2,017 (3,469)	-3,147 (7,243)	-0,068 (0,193)
quota achieved in 2006	0	0	0	0	0	0
Board Size	-0,529 (0,825)	-2,561 (2,100)	-0,033 (0,048)	-0,565 (0,847)	-2,737 (2,142)	-0,027 (0,050)
y	ROA	ROE	Tobin´s Q	ROA	ROE	Tobin´s Q

Standard errors are given in brackets. * show significance at the 5 % level. Estimates for quota achievement in 2006 are set to 0 due to redundancy.

Appendix 4: Standard & Poor´s transparency and disclosure rating and La Porta et al.´s (2001) variables

S&P Transparency and Disclosure Rating

Country	Mean
Finland	75,7
Ireland	75,25
UK	71,36
Greece	68,04
France	67,91
Netherlands	63,23
Sweden	61,51
Australia	61,14
Singapore	58,86
Norway	58,83
Italy	58,58
New Zealand	55,91
Germany	55,9
Portugal	55
Switzerland	54,91
Belgium	54,16
Japan	54,15
Spain	52,67
Denmark	52,17
Thailand	51,63
Austria	49,7
China	48,58
Hong Kong	47,47
South Korea	46,65
Malaysia	45,44
Pakistan	39,76
India	38,75
Luxembourg	38,3
Indonesia	36,47
Chile	34,33
Brazil	32,75
Venezuela	30,65
Argentina	28,63
Phillipines	27,21
Mexico	24,77
Peru	23,26
Taiwan	21,63
Colombia	19,15

La Porta et al.: Shareholder Protection and law enforcement around the world

Country	ADR	Efficiency of Judical System	Rule of Law	Corruption	Risk of Expropriation	Risk of Contract Repudiation	Accounting Standards
Australia	4	10	10	8,52	9,27	8,71	75
Canada	4	9,25	10	10	9,67	8,96	74
Hong Kong	4	10	8,22	8,52	8,29	8,82	69
India	2	8	4,17	4,58	7,75	6,11	57
Ireland	3	8,75	7,8	8,52	9,67	8,96	0
Israel	3	10	4,82	8,33	8,25	7,54	64
Kenya	3	5,75	5,42	4,82	5,98	5,66	0
Malaysia	3	9	6,78	7,38	7,95	7,43	76
New Zealand	4	10	10	10	9,69	9,29	70
Nigeria	3	7,25	2,73	3,03	5,33	4,36	59
Pakistan	4	5	3,03	2,98	5,62	4,87	0
Singapore	3	10	8,57	8,22	9,3	8,86	78
South Afric	4	6	4,42	8,92	6,88	7,27	70
Sri Lanka	2	7	1,9	5	6,05	5,25	0
Thailand	3	3,25	6,25	5,18	7,42	7,57	64
Uk	4	10	8,57	9,1	9,71	9,63	78
US	5	10	10	8,63	9,98	9	71
Zimbabwe	3	7,5	3,68	5,42	5,61	5,04	0
Argentina	4	6	5,35	6,02	5,91	4,91	45
Belgium	0	9,5	10	8,82	9,63	9,48	61
Brazil	3	5,75	6,32	6,32	7,62	6,3	54
Chile	3	7,25	7,02	5,3	7,5	6,8	52
Colombia	1	7,25	2,08	5	6,95	7,02	50
Ecuador	2	6,25	6,67	5,18	6,57	5,18	0
Egypt	2	6,5	4,17	3,87	6,3	6,05	24
France	2	8	8,98	9,05	9,65	9,19	69
Greece	1	7	6,18	7,27	7,12	6,62	55
Indonesia	2	2,5	3,98	2,15	7,16	6,09	0
Italy	0	6,75	8,33	6,13	9,35	9,17	62
Jordan	1	8,66	4,35	5,48	6,07	4,86	0
Mexico	0	6	5,35	4,77	7,29	6,55	60
Netherlands	2	10	10	10	9,98	9,35	64
Peru	2	6,75	2,5	4,7	5,54	4,68	38
Philippines	4	4,75	2,73	2,92	5,22	4,8	65
Portugal	2	5,5	8,68	7,38	8,9	8,57	36
Spain	2	6,25	7,8	7,38	9,52	8,4	64
Turkey	2	4	5,18	5,18	7	5,95	51
Uruguay	1	6,5	5	5	6,58	7,29	31
Venezuela	1	6,5	6,37	4,7	6,89	6,3	40
Austria	2	9,5	10	8,57	9,69	9,6	54
Germany	1	9	9,23	8,93	9,9	9,77	62
Japan	3	10	8,98	8,52	9,67	9,69	65
South Korea	2	6	5,35	5,3	8,31	8,59	62
Switzerland	1	10	10	10	9,98	9,98	68
Taiwan	3	6,75	8,52	6,85	9,12	9,16	65
Denmark	3	10	10	10	9,67	9,31	62
Finland	2	10	10	10	9,67	9,15	77
Norway	3	10	10	10	9,88	9,71	74
Sweden	2	10	10	10	9,4	9,58	83