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THE EFFECT OF BUSINESS RISK ON FINANCIAL LEVERAGE

- A Study of Capital Structures of Swedish Listed Firms

Abstract

This thesis aims to investigate the impact of business risk on firm capital structure. Trade-off theory suggest that, all else equal, firms with higher business risk should have lower financial leverage. This study investigates 309 listed Swedish firms over a ten-year period, using both cross-sectional and panel data approaches where business risk is measured as volatility in operating profitability. Our empirical findings suggest a statistically significant negative relationship between business risk and financial leverage. The results are, however, sensitive to the leverage measure used and a statistically significant relationship is found only for leverage based on financial debt but not for total liabilities. This indicates that financial and operating liabilities have different drivers. This study contributes to existing research by confirming the robustness of four other determinants of capital structure – firm size, asset tangibility, firm profitability and investment opportunities. Additionally, this study shows that the determinants of capital structure have different explanatory power for different types of firms, which calls for more qualitative research within the field of capital structure.

Keywords: Capital structure, financial leverage, business risk, operating risk, ROA volatility

Elin Persson, 21982
21982@student.hhs.se

Anders Åqvist, 21984
21984@student.hhs.se

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1. INTRODUCTION

More than half a century ago, Miller and Modigliani (1958) published their famous paper suggesting that in a perfect market with no information asymmetries, taxes or transaction costs, the value of a firm depends solely on the level and risk of its future cash flows. In that case, financing decisions and capital structure are irrelevant. The publication of Miller and Modigliani's seminal paper led to a wide range of theories aiming at explaining the determinants of capital structure, showing that in most cases, the irrelevance proposition does not hold. In a market with imperfections such as taxes and information asymmetries, capital structure is relevant.

If Miller and Modigliani's irrelevance proposition does not hold, one implication is that firms' costs of capital indeed depend on their capital structures. In other words, firms may alter their cost of capital by adjusting their capital structure.

Financing decisions also affects other factors than the firm's cost of capital. For example, the choice of financing can change the risk of debt and equity investments in the firm, shift voting power between equity holders and affect investment decisions. The choice between forms of financing might thus be based both on hard financial facts and softer, personal incentives. Given the importance of financing as well as debt and equity investors' different incentives, the choice of capital structure is a cornerstone in the life of the firm.

Many economists have argued that the firm should strive to maximise shareholder value, thus it should seek to minimise its cost of capital. However, if other factors than purely financial affect a firm's capital structure, could it be rational to refrain from maximising the value of the firm? Understanding of what truly drives the choice of capital structure can shed light on the entire firm concept, and help to explain differences between firms. With this thesis, we aim to increase the understanding of which factors affect corporate financing decisions, particularly regarding the choice between debt and equity financing for Swedish firms. We argue that an important factor to increase the understanding of the financing characteristics in firms is the characteristics of the firm's operations. Thus, this thesis focuses on the impact of business risk on firm leverage. Further, it asks how the results of the thesis relate to previous studies, and how the determinants perform when examining only firms with certain characteristics. A delimitation of the study is that only Swedish listed firms will be studied, over a ten-year period spanning from the beginning of 2004 to the end of 2013.

The main hypothesis is that business risk is negatively related to leverage: the higher the business risk the firm is exposed to, the lower the leverage. Firstly, lenders are perceived to be less willing to lend to a firm that is exposed to high risk, ceteris paribus, since the risk that the firm will not be able to pay back the loan is higher. Secondly, equity holders in a firm exposed to high business risk are argued to be moderately interested in adding further risk in the form of financial risk arising from leverage.

Most previous studies in the field are performed on US data, or data from larger European economies. Since Swedish firms are exposed to another institutional setting than firms from other countries our results may differ. Thus, this study adds to previous research by investigating whether the empirical findings on US firms also hold for firms in a small, open economy. Further, when only examining firms with certain characteristics, we expect to find other results than when we examine the whole sample. The certain characteristics studied are high and low-levered firms, firms with high ownership concentration, board size and board diversification, market place for listing and firm age.

With this thesis, we aim to shed further light on an area within corporate finance research where the debate, despite over half a century of research, has not yet reached consensus about the factors that best explain capital structure. The main contribution of this thesis is threefold. Firstly, we show a statistically significant relationship between business risk and financial leverage which has not been consistently found in previous research. The results are, however, sensitive to the leverage measure used and a statistically significant relationship is found only for leverage based on financial debt but not for total liabilities. This indicates that financial and operating liabilities have different drivers. Secondly, this study contributes to existing research by confirming the robustness of four other determinants of capital structure – firm size, asset tangibility, firm profitability and investment opportunities. Thirdly, this study shows that the determinants of capital structure have different explanatory power for different types of firms depending on leverage levels, ownership structure, board composition, listing venue and firm age.

Pioneers in research of this field were Miller and Modigliani, with the publication of their famous paper in 1958, suggesting that capital structure is irrelevant in a perfect market. Much research post the publication of their paper has focused on identifying situations when capital structure actually matters, and how it can be optimised. The three major theories in modern corporate finance concerning capital structure optimisation are trade-off theory, pecking-order theory and market-timing theory. Of those, only trade-off theory can be used to suggest an optimal capital structure in the long term, as the other two theories only concern rational financing decisions in certain situations. Trade-off theory suggests that there is an optimal trade-off between debt and equity financing. This optimal capital structure is reached when each unit of leverage added results in a tax benefit of debt, which is exactly offset by the increase in expected bankruptcy costs of debt. Pecking-order theory suggests that a firm has a pecking order between different financing options, and that internally generated funds always are chosen to finance investments in first hand, followed by added debt, and lastly new equity. Hence, optimal financing of a new investment is depending on the firm's financial situation. Market-timing theory suggests that firms choose the form of financing that is most valued by the market at the time when additional financing is needed. Thus, it chooses equity financing if management believes that the firm is overvalued by the stock market, and debt financing if management believes that the firm is under-valued by the market and new equity should be expensive. Also, market-timing theory is dependent on the situation when the firm is in need of financing, and an optimal capital structure cannot be advised.

Empirical research suggests that there is an almost unlimited number of possible motives for a specific capital structure, but a number of determinants have been shown to be important in many studies. In a study in 1995, Rajan and Zingales concluded that there are four variables that have been identified as more important as determinants of leverage in a number of studies. These are firm size, asset tangibility, investment opportunities and profitability. Leverage has been shown to increase with firm size and asset tangibility, and to decrease with investment opportunities and profitability. In the same study, those variables are used as determinants of leverage in the different G7 economies, and the authors find both similarities and differences across the seven economies. Post Rajan and Zingales' study, those four variables have been consistently used in empirical capital structure research.

As argued above, one of the contributions of this thesis is that the Swedish economy is studied. Swedish firms are exposed to another institutional environment than firms in other countries, for example regarding bankruptcy legislation, ownership concentration, corporate governance, the power of banks and concerning corporate and personal taxes. Swedish bankruptcy legislation is considered to be more creditor friendly than for example the legislation in the US, which naturally affects the risk lenders are exposed to when providing debt financing to firms. Further, ownership in Swedish firms is less concentrated than in most European countries, but more concentrated than in most major Anglo-Saxon countries. Ownership concentration is argued to have effect on corporate financing decisions. Concerning the power of banks, Swedish firms are to a large extent externally financed by banks, and to a little extent dependent on for example the bond market. Further, there are relatively few banks present in Sweden. Thus, the power of banks is high in comparison to for example the US, which also might affect the capital structure of Swedish firms.

The variables to be used as determinants of leverage in this study is business risk, combined with the four variables used by Rajan and Zingales. We perceive business risk as an intuitively appealing determinant of leverage, since the riskiness of the operations should be fundamental when assessing the riskiness in a provided debt financing. As measure of business risk, volatility in ROA on a rolling period over the last 5 years is used.

Asset tangibility is measured as the ratio of tangible assets to total assets, and the rationale behind this is that tangible assets are easy to collateralise and generally have high recovery values in a bankruptcy situation, why they are well suited as collateral for debt financing.

Investment opportunities are measured as the market value of the company's assets to the book value of its assets. A high ratio indicates that there are large values that could not be recognised in the firm's balance sheet, but are valued by the market. Investment opportunities often have limited recovery values in a financial distress situation, why they are badly suited as collateral for debt financing.

Firm size is measured by total sales. The effect of size on leverage is theoretically ambiguous. It can be a proxy for expected bankruptcy costs, as expected bankruptcy costs are in relative terms smaller for

large firms than for small. However, information asymmetries should be lower for large firms than for small, and hence, it is more costly for small firms to issue information sensitive securities as equity. The effect of size has differed largely across countries.

Profitability is measured by ROA. Profitability is predicted to be positively related to leverage according to trade-off theory, as the expected bankruptcy costs in a profitable firm is expected to be low. According to pecking-order theory on the other hand, profitability is expected to be negatively correlated with leverage, as profitable firms are assumed to be able to generate substantial funds internally. According to previous research, the effect from pecking-order theory is the strongest, and profitability is expected to have negative impact on leverage.

The thesis applies a quantitative methodology. Two approaches are used: cross-sectional regressions, to be able to relate our findings to previous research, and panel data regressions, which allow us to follow the firms in the sample over time.

As measures of leverage, two variables are used: liabilities to market value of assets, and financial debt to the sum of debt and market value of equity. All explanatory variables are assumed to be linearly related to leverage, except for size, where the natural logarithm of sales is used as size measure.

The data analysed consists of quarterly data on Swedish listed firms, over the time period from 2004 to 2013. The business risk variable is measured as the volatility in annual ROA over the past 5 years, hence, the data for the business risk variable spans from 1998 to 2012. Accounting data from the Compustat database has been combined with market data from the Worldscope database. For ownership data, the SIS Ägarservice database has been used. The analysis is based on 8,788 firm-quarter observations in total.

The cross-sectional regressions show that business risk is negatively correlated with ROA; and significant on the 5 per cent level, which is in line with our main hypothesis. The other four variables of interest are significant, and with the expected sign, except the size variable which not is significantly correlated with leverage when using debt to the sum of debt and market value of equity as dependent variable.

When analysing the results of the panel data regression, all variables show the expected signs independent of the leverage measure used. The variable business risk is however only statistically significantly correlated with leverage when using debt to the sum of debt and market value of equity as leverage measure (significant on the 5 per cent level). When using liabilities to market value of assets on the other hand, business risk is not significantly correlated with leverage. These results may seem contradicting each other, but when analysing it further, it appeals more intuitive. Operating decisions, such as procurements, resulting in an operating liability to the seller, may generally not be preceded by an investigation of the creditworthiness of the firm from the seller's perspective, why the buyer's

business risk is of less importance when it comes to operating liabilities than to financial debt. Thus, business risk may be a better determinant of leverage when only debt and not operating liabilities is analysed in the leverage measure.

When restricting the sample to firms with certain characteristics, the analysis is further deepened. When dividing the sample into a high-leverage half and a low-leverage half, all variables are significant and have the expected signs in the high-leverage half. However, only size, investment opportunities and profitability are significant in the group of low-leverage firms. Thus, the variables are better at explaining leverage in firms with high leverage. This may indicate that the low-leverage firms are further from being borrowing constrained, and thus, could be able to increase their leverage further.

Firms with a controlling owner also show results other than the sample in general. Only the variable showing investment opportunities are significant in this group. This indicates that there are other factors of importance when analysing the leverage of this group of firms.

Firms with small boards of directors and boards without female directors are also exhibiting different results than the total sample. When it comes to firms with small boards, only investment opportunities is shown to have statistically significant effect of leverage. Regarding boards without female directors, investment opportunities and business risk are the only variables that show statistically significant correlation with leverage.

The choice of listing venue and the age of the firm do also affect the performance of the variables used as determinants of leverage. For firms listed on unregulated market places, business risk matters. The variable is significant at the 1 per cent level. However, on the Swedish Nasdaq OMX main lists, business risk is not significant. This may imply that well-known firms with small information asymmetries are less affected by their business risk when it comes to financing decisions, than firms listed on smaller, unregulated market places. Also for young firms, the identified determinants of leverage differ from the effects of the determinants in the whole sample. In firms that are 15 years old, or older, leverage is not shown to be significantly affected by business risk, whereas the factor is significant on the 1 per cent level for the firms that are younger than 15 years.

With this thesis, we confirm the robustness of previous studies by showing that four other determinants of capital structure, firm size, asset tangibility, firm profitability and investment opportunities, also hold in a Swedish setting. Further, which has not been found in previous research, business risk is shown to have significant impact on firms' financing decisions, when examining leverage measured as financial debt. When regressing on leverage measured on total liabilities, however, business risk is not shown to have a significant impact on the financing decisions, implying that a firm's operating liabilities is not significantly affected by the firm's business risk. Finally, the determinants of leverage are shown to perform better for explaining leverage for certain firms than for other. For firms with low leverage, with concentrated ownership, with small and undiversified boards, for firms listed at unregulated market

places, and for young firms, the determinants used in this thesis and in previous has low explanatory power. Business risk, on the other hand, is an even more significant determinant of leverage when analysing only small firms, firms with undiversified boards and firms listed on unregulated market places.

2. RESEARCH QUESTION

The aim of this thesis is to increase the understanding of the determinants of capital structure by investigating Swedish listed firms in terms of the relationship between business risk and capital structure in combination with the main determinants of capital structure examined in previous research. Therefore, the research question of this paper is as follows:

What are the main determinants of capital structure for Swedish listed firms, and more specifically:

(a) What is the relationship between business risk and capital structure?
(b) How do the determinants relate to findings in previous research?
(c) *How do the determinants perform when examining firms with different characteristics?*

3. HYPOTHESES

Intuitively, we find it likely that firms exposed to a more volatile business environment have less financial leverage than firms in a less volatile business environment, since a volatile business environment is likely to result in a higher degree of variation in earnings and cash flows. We see two main reasons for this. To begin with, lenders should be less willing to lend to a firm in a volatile business environment than to a firm in a less volatile business, ceteris paribus, since the loans to a firm in a volatile business will be associated with a higher risk than the lending to the firm exposed to less volatility. Further, the equity holders in a firm that is exposed to a higher degree of volatility will in a scenario where the firm is fully equity financed, already be exposed to high risk due to the volatility in the firm's business environment, and thus less interested in increasing its risk further, through higher financial leverage.

Our main hypothesis is therefore that firms' exposure to business risk is negatively correlated with leverage.

With respect to the determinants from previous research, we expect our results to be similar to findings from studies in general. However, most previous studies are based on data from the US or larger economies, such as the G7 countries, why differences in institutional settings between Sweden and the economies studied in previous research may be reflected in the results from this study.

Further, we expect to find different results compared to previous research, when only examining firms with certain characteristics. To operationalise the third sub-question in the research question, we will therefore examine firms that divert from what is "normal", in terms of leverage, ownership structure, board size and diversification, chosen market place for listing and firm age. The hypothesis for this

thesis is that firms with certain characteristics may have different drivers concerning capital structure and therefore deviate from the general findings in previous research.

Leverage

We expect firms with low leverage to be less influenced by business risk when determining leverage. Consider an assessment of creditworthiness for a firm with low leverage. Since a low-levered firm has a higher amount of equity that serves as a safety cushion, the volatility of operating earnings is not as important for lenders. In other words, we expect business risk to have less impact on firms that are further away from being borrowing constrained.

Ownership concentration

Firms with strong individual owners may have other determinants affecting capital structure than other firms. For example, low risk diversification from the current owners perspective may affect the risk aversion in the firm as a whole, which may lead to a lower leverage than what otherwise had been expected without presence of a controlling owner. For this reason, we expect the impact of business risk as a determinant of leverage to be weaker for this group of firms.

Board size and diversification

The size and the constitution of the board of directors in the firm are important factors in how firms make decisions. A large and well diversified board of directors may indicate a higher grade of professionalism in the firm. From a lender perspective, a professional firm might give confidence that the firm know its business well. In firms that appear less professional, business risk is expected to have a higher impact as a determinant of leverage.

Market place for listing

Listing on smaller, less regulated market places leads to less visibility in the firm's operations. A lender might thus be more careful when examining the firm's history when lending to a firm listed on an unregulated market than to a firm listed on a regulated market. Thus, business risk is expected to have a higher impact as a determinant of leverage for firms listed on unregulated market places.

Firm age

Young firms have less history to refer to when it comes to ability to survive periods of downturn. The risk of a future crisis in the business is thus more important in the lending decision, why business risk is expected to have a higher impact as a determinant of leverage for young firms than for old.

4. CONTRIBUTION

Despite being one of the most debated topics within corporate finance, the empirical evidence on the determinants of capital structure is still limited. There are empirical suggestions on the most important determinants but there is no general consensus in the literature regarding what factors are the most important in explaining variations in capital structure between firms and under what firm-specific conditions these determinants work.

In addition, the vast majority of existing research regards US or larger European countries. There are few studies made on Swedish data. This study aims to bring additional insight to the debate around the determinants of capital structure by investigating a small, open economy with an institutional environment different from the US and larger European countries. The main reasons for investigating the Swedish case are (1) differences in bankruptcy laws from the US in terms of liquidation versus restructuring opportunities, (2) the different institutional environment mainly in terms of ownership structure, the savings system and capital markets characteristics such as public debt markets and the concentration of commercial banks and (3) taxation differences, which may shift incentives of debt financing. Studying the determinants of capital structure with Swedish data will not only improve the understanding of the Swedish case but also test the robustness of the evidence brought forward in other studies regarding other countries with different institutional settings.

The main contribution of this thesis is threefold. Firstly, we show a statistically significant relationship between business risk and financial leverage which has not been consistently found in previous research. The results are, however, sensitive to the leverage measure used and a statistically significant relationship is found only for leverage based on financial debt but not for total liabilities. This indicates that financial and operating liabilities have different drivers. Secondly, this study contributes to existing research by confirming the robustness of four other determinants of capital structure – firm size, asset tangibility, firm profitability and investment opportunities. Thirdly, this study shows that the determinants of capital structure have different explanatory power for different types of firms depending on leverage levels, ownership structure, board composition, listing venue and firm age.

5. DELIMITATIONS

The delimitations of this study are primarily given by the scope of the research question, the choice of firms investigated and time period studied. The possible factors that determine capital structure seem

uncountable. Therefore, the scope of our research question limits this study to the four factors proven to be most important in explaining capital structure in other settings, plus the introduction of business risk as a potential determinant of capital structure.

The study is limited to Swedish listed firms investigated over a ten-year period covering 2004-2013. Refer to section 8 for more information regarding firms covered in the study.

6. PREVIOUS RESEARCH

A central question when it comes to financing decisions in a firm is what sort of funding the firm should seek to finance itself with. The two main alternatives available are equity and debt financing. The main difference between the two forms is that debt financers have a contractual right to assets in the firm through debt repayments, whereas equity investors have the right to the residual values remaining when all other obligations are settled. Hence, equity is more risky. Firms answer the financing question differently, and hence, the capital structure differs between different firms. This has led to an entire field within corporate finance research aiming to determine the optimal combination of debt and equity financing is and which factors affect the mix of equity and debt financing.

6.1. MILLER AND MODIGLIANI

Miller and Modigliani (1958) show that under a set of conditions referred to as a perfect market, the total value of a firm is equal to the market value of the total cash flows generated by its assets and is not affected by its choice of capital structure. The authors present two propositions. Miller and Modigliani proposition I states that the value of a levered firm is equal to the value of an unlevered firm. Miller and Modigliani proposition II states that the expected weighted return of a firm is constant regardless of how it is financed. (Berk & DeMarzo, 2011)

One of the more critical assumptions in the Miller and Modigliani propositions is that there are no taxes. In reality, however, corporations and investors must pay taxes on their income. Corporations pay taxes on income after interest expenses are deducted which means that interest expenses reduce the amount of corporate tax firms have to pay. Put differently, governments "subsidise" interest payments to debt holders. Thus, a levered firm pays lower tax than an unlevered firm, all else equal. This feature of the tax system creates an incentive to use debt financing.

The Miller and Modigliani propositions opened up for further research within the field of capital structure. The focus of capital structure research post Miller and Modigliani has been on identifying settings when these propositions do not hold. The vast majority of real life cases do not fulfil the conditions of perfect markets, and therefore, the Miller and Modigliani propositions do not hold.

When there are market imperfections, such as taxes and information asymmetries, capital structure suddenly matters for firm value. The choice of capital structure can, due to market imperfections, affect the costs of financial distress, alter management incentives and signal information to capital markets.

There are three major theories in modern corporate finance, trying to explain issues of capital structure: (1) trade-off theory, (2) pecking-order theory and (3) market-timing theory. These three theories are explained in more detail below.

6.2. Theories of Capital Structure

6.2.1. Trade-off Theory

In a perfect market with no bankruptcy costs, the risk of bankruptcy is not a disadvantage of debt. Bankruptcy simply shifts the ownership of the firm from equity holders to debt holders without changing the total value. In reality, however, bankruptcy is a long and complicated process that leads to both direct and indirect decreases in value for the firm and its investors. Direct costs of bankruptcy refer to the costs of the actual bankruptcy process, such as litigation costs, lawyer and advisor fees and administrative costs relating to the filing of bankruptcy. Warner (1977) argues that the direct costs of bankruptcy decrease when firm size increases, indicating that larger firms have lower direct costs of bankruptcy. Thus, direct bankruptcy costs are less important when large firms decide on capital structure.

Indirect costs of bankruptcy refer to decreases in firm value due to customer losses, fire sale of assets, and loss of employees etcetera. As argued by Baxter (1967), sales and profits may decline and firm value may fall when potential buyers perceive bankruptcy to be likely. While the indirect bankruptcy costs are difficult to measure accurately, they are often argued to be much larger than the direct costs of bankruptcy. (Berk & DeMarzo, 2011)

There is no general consensus regarding the size of bankruptcy costs. Warner (1977) argues that bankruptcy costs are less than 1 per cent of firm value, in contrast to Baxter (1967) who concludes bankruptcy cost to be about 20 per cent of firm value. More recent research by Andrade and Kaplan (1998) suggest that the total loss in value following a bankruptcy are 10 to 20 per cent of firm value, with the greater amount attributable to indirect costs of financial distress.

Introduction of bankruptcy costs indicate that there is a trade-off between the benefits and the cost of debt where the most commonly argued benefit of debt is related to taxes. The trade-off theory suggests that firms decide on their optimal leverage ratio with respect to tax advantages and the costs of financial distress associated with leverage. According to trade-off theory, the optimal capital structure is where each unit of bankruptcy costs added by each unit of additional leverage is exactly offset by the same amount of interest tax shields.

Whereas traditional trade-off theory focuses on the trade-off between the tax benefits and the bankruptcy costs of debt, later research on capital structure also focuses on trade-offs related to agency costs arising

due to conflicts of interest. Firstly, there is an agency issue related to the different risk profiles of debt and equity and therefore a conflict of interest between debt holders and equity holders. When a firm takes on debt, the expected return to debt holders is affected by the riskiness of the firm's operations. The equity holders and managers are still in charge of operating decisions, leaving room for managers to act in self-interest and engage in value destroying activities at the expense of debt holders. Shareholders implicitly own a call option on a firm's assets and can benefit from increasing the risk and volatility of projects. For example, managers may want to engage in risky actions they hope will benefit shareholders, who seek a high rate of return. If risky enough, this will lead to higher risk for debt holders as well, since it also may increase the risk that the firm will be unable to meet its debt service obligations, even though debt holders are paid before equity holders.

Another agency conflict arises in case of debt overhang. With large amounts of debt outstanding, shareholders do not want management to invest in projects with a positive net present value (NPV), since the proceeds would entirely benefit debt holders. (Myers, 1977) These complexities introduce other potential costs of increased leverage.

6.2.2. Pecking-order Theory

The pecking-order theory was first introduced by Donaldson (1961) and then refined by Myers (1984). The theory is an idea that firms prefer internal funding to external funding, and when external funding is needed, debt is preferred over equity. Thus, according to the pecking-order theory, a firm will always use internally generated funds to finance new projects instead of seeking external financing, and always debt over equity. This notion leads to adverse selection whenever a firm intends to issue financial securities, meaning that only the firms that have not generated sufficient internal funds will seek external financing. Likewise, regarding external financing, only firms that cannot issue debt will issue equity. This leads to only less profitable firms raising equity.

In contrast to trade-off theory, pecking-order theory does not provide guidance for an optimal capital structure. Instead, in the pure pecking-order theory, the firm has no well-defined target leverage ratio but will always choose internal funds instead of external financing. (Myers, 1984) Thus, pecking-order theory is rather a way of describing and understanding the empirical patterns of capital structure and corporate investment, i.e. that the vast majority of investments are funded by internal funds and that firms tend to be net repurchasers of equity and net issuers of debt. (Berk & DeMarzo, 2011)

Pecking-order theory introduces asymmetric information regarding firm value and future prospects, i.e. management has more information about the firm than outsiders have. This leads to the two main points of the theory. Firstly, there is a cost of relying on external financing. We usually think of the cost of external financing as administrative and underwriting costs, and in some cases under-pricing of the new securities. Asymmetric information creates the possibility of a different sort of cost: the possibility that the firm will choose not to issue, and therefore pass up a positive-NPV investment. This cost is avoided

if the firm can retain enough internally generated cash to cover its positive-NPV opportunities. Secondly, there is an advantage of debt over equity issues. The guiding principle is to issue the least risky securities first. This is because senior securities, such as secured debt, are paid first and therefore less risky compared to more junior securities. Thus, more senior securities are less sensitive to asymmetric information. The lower the riskiness of the securities issued, the lower the discount investors require due to asymmetric information. Hence, the pecking-order theory suggests that a firm's capital structure is a function of past investment opportunities and profitability as well as historically available financing sources. (Myers, 1984)

Pecking-order theory can help explaining patterns in capital structure that trade-off theory fails to explain. For example, the most profitable firms in an industry are usually the least levered firms, which according to the pecking-order theory is explained by the fact that profitable firms have more retained earnings and thus are able to finance projects internally to a greater extent. However, there is also substantial evidence that firms do not follow a strict pecking-order, as firms often issue equity even when borrowing is possible. (Leary & Roberts, 2010)

6.2.3. Market-timing Theory

As highlighted by the pecking-order theory, information asymmetries introduce indirect costs that influence firms financing decisions. The market-timing theory claims that these costs imply that managers' choice of financing will depend, among other factors, on whether they believe that the firm is currently under-valued or overvalued by investors. Thus, a firm's overall capital structure will depend in part on the market conditions that exist when it is to raise funds. As with the pecking-order theory, the theory of market-timing is descriptive rather than normative, i.e. it does not provide any guidance of the optimal capital structure of the firm.

Baker and Wurgler (2002), claim that market-timing is the most important determinant of a firm's choice between debt and equity. In other words, they argue that firms do not generally care about capital structure, they just choose the form of financing which, at that point in time, seems to be more valued by financial markets. Thus, firm capital structure is a result of the market condition that prevailed when it sought financing. The market-timing theory does not assume efficient markets with rational investors, and it does not provide any guidance on why the mispricing of a firm's securities occurs.

6.3. Empirical Research on Capital Structure

In addition to the theoretical literature, there is empirical research trying to find the determinants of leverage as expressed by firm characteristics and institutional conditions. The empirical evidence in the field is dispersed and unstructured. As pointed out by Harris and Raviv (1991) in their meta-analysis of empirical research about capital structure, the possible motives and circumstances that could determine capital structure choices seem nearly uncountable. A comprehensive review of empirical research on

the determinants of capital structure is therefore considered to be outside the scope of this thesis, but some of the more influential studies are presented below.

Generally, previous research suggests some firm and macro factors that influence on capital structure, but the robustness of the results varies. Titman and Wessels (1998) state asset structure, non-debt tax shields, growth, uniqueness, industry classification, size, earnings volatility and profitability as factors that may affect leverage, according to different capital structure theories, but find no significant empirical support for these hypotheses except for uniqueness and size. Frank and Goyal (2009) note that seven variables — median industry leverage, market-to-book ratio, collateral, profit, dividend paying, logarithm of assets and expected inflation — perform best in explaining the leverage of US firms. Harris and Raviv (1991) argue that the consensus is that "leverage increases with fixed assets, non-debt tax shields, investment opportunities, and firm size, and decreases with volatility, advertising expenditure, the probability of bankruptcy, profitability, and uniqueness of the product." However, both Titman and Wessels (1998) and Harris and Raviv (1991) point out that the search for suitable explanatory variables continues. In short, it seems that the empirical literature about capital structure agrees on a set of minimum explanatory variables that affect capital structure. However, there seems to be no consensus regarding which variables are most important and how robust these findings are between countries and over time.

A later paper by Rajan and Zingales (1995) investigates similarities and differences between determinants of leverage across the G7 countries. The authors argue that the four variables firm size, profitability, tangibility of assets and investment opportunities are shown to be the most important determinants of capital structure in research prior to the article and those four variables have been consistently used in later research. As regards these four variables, the authors find both similarities and differences between the G7 countries in terms on how they impact on aggregate corporate leverage.

6.4. The Swedish Case

As highlighted in the previous section, most empirical evidence on the determinants of capital structure is from US data. More recent research also investigates larger European countries or China and Japan. There are, however, few studies examining the determinants of leverage for smaller economies in general and Swedish firms in particular. There are several institutional differences between the US and a small, open economy like Sweden, which we argue can result in different drivers of capital structure.

Bankruptcy law is a fundamental part of the debt contract. Sweden differs substantially from US in this respect, especially in the sense that liquidation is emphasized over restructuring of an insolvent firm. Bankruptcy law in the US is in general more debtor friendly, giving management certain rights to continue business as usual, for example the right to propose a reorganisation plan within 120 days of filing and stay on claims by creditors. Even though restructuring is possible in Sweden, it differs substantially from the US form of restructuring, especially since the management is no longer in control

of the firm, but replaced by an outside administrator. Swedish bankruptcy law is thus more creditor friendly. When the firm is liquidated rather than reorganised, the indirect costs of bankruptcy are higher if the firm is worth more as a going concern than in liquidation. In line with this, firms in countries with stricter and more creditor friendly bankruptcy law will have less debt. (Rajan & Zingales, 1995) We argue that another implication of liquidation rather than restructuring of insolvent firms is that bankruptcy costs are higher and thereby is the threat of bankruptcy more important in determining leverage in countries with more creditor friendly bankruptcy law.

Another difference between Sweden and the US is the ownership structure of listed firms. Anglo Saxon countries as the US and the UK and to some extent Canada, have more dispersed ownership whereas continental Europe and Japan are dominated by more concentrated ownership. Sweden has less concentrated ownership than most European countries but a large fraction of Swedish firms displays concentrated ownership, often through the use of dual class shares (with different voting rights), pyramiding and crossholdings of families and institutional owners. (Faccio & Lang, 2002) Rajan and Zingales (1995), argue that the effect of ownership concentration on capital structure is far from obvious. On the one hand, the presence of large shareholders on the board could reduce the extent of agency costs between shareholders, the board and management and thus facilitate equity issues by reducing the information discount on equity issues presented in the previous section. Furthermore, these large shareholders may be undiversified which can increase their risk aversion to debt.

Capital structure is also related to corporate governance. The Anglo-Saxon countries with dispersed ownership also have an active takeover market that can force firms to increase leverage in order to generate a higher return on shareholders' equity. In contrast, the Swedish corporate governance system is not characterised by hostile takeovers but rather self-regulation and a more stakeholder-focused approach indicating less pressure from the takeover market to increase leverage. (Swedish Corporate Governance Board, 2014)

There are major differences between the power of banks and the power of public financial markets across countries. Whereas the Anglo Saxon countries have strong financial markets (market based economies), Japan and Germany are more bank oriented. (de Haan, Oosterloo, & Schoenmaker, 2012) It is argued that there are no systematic differences between bank- and market-based economies in terms of leverage. (Rajan & Zingales, 1995) A shortcoming of this classification is that mainly US, UK, Japan and Germany have been studied, countries that are relatively similar in terms of size, GDP- per-capita levels and growth. It is argued that Sweden is somewhere in between bank-based and market-based economies. However, an important difference is the concentration of commercial banks in Sweden. The four major banks together have a market share of approximately 70 per cent of both deposits and lending in Sweden. (Sveriges Riksbank, 2012) This is very high concentration compared to for example Germany where the three largest banks together accounts for less than 20 per cent of total savings and

deposits. (Chen, Lensink, & Sterken, 1998) Also, the Swedish savings system differs largely from for example Germany. Individuals in Sweden do generally save less in bank deposits and shares but rather through mutual funds as indicated by the large proportion of institutional owners in Sweden mentioned above. The financial environment affects the conditions under which corporations are to seek external financing and could therefore impact on the mix of debt and equity within firms.

Empirical studies suggest that taxes have no explanatory power (Mayer, 1990), but as Rajan and Zingales (1995) argue, when private taxes are introduced in addition to corporate taxes, another picture may emerge. This is, however, highly sensitive to assumptions regarding the marginal investors tax rate and therefore difficult to examine empirically. However, what *is* known, is that the relative tax benefit of debt differs between countries. The tax benefit of debt relative to retained earnings is almost twice as large in Germany compared to US. (Rajan & Zingales, 1995) According to trade-off theory, this should have an impact on firm leverage.

The fact that leverage is shown to differ between countries combined with the above discussion of institutional differences between Sweden and other countries call for a study of the determinants of capital structure on Swedish data. In addition to bringing light to the Swedish case, such a study will also test the robustness of previous studies between countries and over time.

6.5. Determinants of Capital Structure

As emphasized by Harris and Raviv (1991), the potential determinants of capital structure seem uncountable. For the purpose of this study, we will focus on the four factors used by Rajan and Zingales (1995) and the impact of business risk in determining financial leverage.

6.5.1. Business Risk

One of the most fundamental aspects of investment decisions is assessments of risks and returns of the potential investment. There is no guidance against the optimal trade-off between risk and return but it depends on the risk attitude of the different investors. As the previous sections highlight, in imperfect markets, capital structure does change the risk profile of a firm.

The total risk of a firm could be decomposed into business risk and financial risk (see for example Johansson & Runsten, 1998 and Penman, 2013). The total risk of a firm is important, since it determines the return investors require. The higher the total risk, the higher the weighted required return on capital for the firm. Business risk is determined by the characteristics of the firms' operations, such as the investment policy, products sold, competitive environment etcetera, whereas financial risk is determined by a combination of operating characteristics and financial leverage.

Risk is determined by the volatility in expected return. Thus, a good measure of business risk is the variability in operating profitability, for example return on total assets (ROA). (Johansson & Runsten, 1998)

$$ROE = \quad ROA \quad + \quad (ROA - CoD)\frac{D}{E}$$

$$\downarrow \qquad \downarrow \qquad \downarrow$$

$$Total\ risk = business\ risk + financial\ risk$$

$ROE = Return\ on\ Equity$
$ROA = Return\ on\ Assets$
$CoD = Cost\ of\ DebtD = Debt$
$D = Debt$
$E = Equity$

Equation 1

As seen from the illustrative equation 1 above, the same total risk can obviously be obtained by different combinations of business risk and financial risk. Thus, given that investors care about total risk and total return, this leads to an expected negative relationship between business risk and financial leverage. In other words, for a given level of return of equity, one would expect that the higher the operating risk the lower the financial risk.

The concept of business risk as determinant of leverage is highly supported by the logic of trade-off theory mentioned above. Firms with higher business risk as expressed by higher volatility in earnings or cash flows are expected to have lower financial leverage, all else equal. There are however limited empirical findings on this relationship to date. For example, Ferri and Jones (1979) and Titman and Wessels (1998) include business risk in terms of income volatility in their study but find no support for association with firm leverage. However, we argue that institutional differences between Sweden and other countries as well as differences in market conditions and cost of information when these studies were made call for more research on the role of business risk in determining capital structure.

6.5.2. Explanatory Variables from Previous Research

The economic rationales of the abovementioned factors that according to Rajan and Zingales (1995) most consistently have been shown related to leverage are presented below.

Asset Tangibility

Trade-off theory suggest that the tangibility of a firm's assets is expected be positively correlated with leverage. This is because tangible assets can be used as collateral to a larger extent than intangible assets. Thus, the indirect costs of bankruptcy would be lower since outsiders can more easily assign a value to tangible assets, facilitating liquidation. Therefore, the higher proportion of tangible assets, the lower the expected bankruptcy costs.

The pecking-order theory also suggests a positive relationship between leverage and tangibility but explains this in terms of asset mispricing. (Chen, 2004) When asset tangibility increases, the liquidation value of the firm does so as well, which leads to decreased indirect bankruptcy costs in case of failure.

Firms that are unable to provide collateral will have to pay higher interest, i.e. debt is becoming more expensive relative to equity both in terms of internal funds and equity issues. (Deesomsak, Paudyal, & Pescetto, 2004)

Investment Opportunities

Investment opportunities, or expected growth, are expected to be negatively correlated with leverage. A common way to proxy for investment opportunities is the ratio of the market value of a firm's assets to the book value of the assets. A firm with many attractive investment opportunities is expected to have a high market-to-book ratio, since investment opportunities with projected future returns are expected to be valued by the market, so called growth stocks. However, due to conservative accounting regulations, investment opportunities may often not be fully recognised in the financial reporting.

From a trade-off perspective, firms with high market-to-book ratios have higher costs of financial distress, since not recognisable assets also are expected to have low recovery values in a financial distress situation. Further, in line with the market-timing theory, it is likely that firms are more interested in equity issues when the market price of the firm's shares is high in relation to the book value of equity. This order of logic is consistent with the pecking-order theory as well – when the equity of a firm is highly valued, it becomes relatively cheaper to issue equity as compared to debt issues.

Firm Size

The effect of firm size on corporate leverage is theoretically ambiguous. One the one hand, firm size may be a proxy for expected bankruptcy costs, since the likelihood of defaults for large firms are expected to be lower than for small firms. Thus, it is expected to be associated with less risk to lend to a large firm than to a small, which can lead to lower cost of debt. From a trade-off perspective, size should therefore be positively correlated with leverage. However, the information asymmetries are expected to be lower for large firms, which implies that it is relatively less costly for larger firms to issue more information sensitive securities (i.e. less mispricing equity relative to debt) than for small firms. From a pecking-order perspective it is therefore expected that firm size is negatively correlated with leverage. Other researchers complement this negative relationship by stating that small firms have to pay much more compared to large firms when issuing new equity. Small firms therefore tend to be more levered. (Titman & Wessles, 1998) Based on empirical findings, Rajan and Zingales (1995) conclude, that the effect of size on leverage differs largely between different countries.

Profitability

Classic trade-off theory clearly predicts a positive relationship between profitability and leverage. Profitable firms are more likely to be able to benefit from the tax shields of debt. Also, profitable firms have lower expected bankruptcy costs. Both these factors would, according to trade-off theory, lead to higher leverage. Also, in line with the agency costs introduced in more recent research on trade-off theory, there may be a need for preventing management from misusing free cash flows in a profitable

firm, for instance through empire building. In those cases, a higher share of debt with fixed payment obligations could serve as a disciplining measure.

However, in accordance with pecking-order theory, profitability is expected to be negatively correlated with leverage. Profitable firms are expected to generate higher cash flows, and thereby to a higher extent be able to finance investments with internally generated funds. (Myers, 1984) Further, we argue that another aspect may be that according to asset pricing theories, higher expected return is expected to be generated by riskier investments. However, riskier investments are associated with higher risk of default, why it should be harder to achieve a high leverage on a risky investment.

Based on previous empirical observations, mentioned more in detail in section 6.3, we expect profitability to have a negative impact on leverage.

7. METHODOLOGY

To operationalise the purpose of the study and answer the research question, a quantitative approach is chosen. A quantitative approach facilitates the examination of a larger sample, and thus facilitating more general conclusions. A qualitative method on the other hand, facilitates a deeper perspective on the study, but impairs the possibility to draw general conclusions. Given the research question, with the overall aim to increase the understanding of the determinants of capital structure for Swedish listed firms, a quantitative approach is deemed suitable. The methodology used in the study will be described below, starting with a description of the econometric approaches used and followed by description of the variables. A more detailed description of the data sample used is to be found in section 8.

In addition to business risk, we will focus on four of the abovementioned potential determinants of capital structure, namely asset tangibility, investment opportunities, firm size and profitability, because these factors have shown most consistently as being related to leverage in previous studies. (Harris & Raviv, 1991; Rajan & Zingales, 1995; Frank & Goyal, 2009)

7.1. ECONOMETRIC APPROACH

We use two main approaches to examine the relationship between leverage and the different determinants, namely cross-sectional regressions and panel data regressions. In both approaches, ordinary least squares regressions (OLS regressions) are used to estimate a relationship between the dependent and the explanatory variables.

7.1.1. CROSS-SECTIONAL ANALYSIS

In a cross-sectional regression, the relations between dependent and explanatory variables are estimated at one given point in time. (Wooldridge, 2013) Thus, the purpose of the cross-sectional analysis in this study is to estimate a relationship between leverage and the explanatory variables in a static setting, at one moment in time. This is the main approach used in previous research on capital structure. (Rajan &

Zingales, 1995; Barclay, Smith & Watts, 1995) Thus, the cross-sectional approach allows us to compare our results to what is found in previous research.

The following regression model, where *i* denotes firm, is estimated:

$$Leverage_i = \beta_0 + \beta_1 Size_i + \beta_2 Tangibility_i + \beta_3 Market\ to\ Book\ Ratio_i + \beta_4 Profitability_i + \beta_5 Business\ Risk_i + \varepsilon_i$$

$Leverage_i = Leverage\ for\ firm\ i$
$\beta_0 = intercept$
$\beta_1 - \beta_5 = coefficients$
$\varepsilon_i = error\ term\ for\ firm\ i$

Equation 2

Refer to section 7.2.2 for a description of the explanatory variables.

A major drawback of the cross-sectional approach is the potential impact of omitted variable bias. If one or more factors that is important in explaining leverage is omitted, the estimates are likely to be biased. The main concern of this is if the omitted variable is correlated with one or more of the explanatory variables included. Suppose that we omit some, observable or unobservable, firm-specific factor that is important in determining leverage and this factor is correlated with one of the explanatory variables included. In that case, the OLS estimates of the included variables will be biased and show the impact of the omitted variable(s) as well. (Wooldridge, 2013) We argue that this is a very important issue in quantitative studies of capital structure since both theoretical and empirical evidence on the determining factors are really dispersed. Thus, the risk of omitted firm-specific factors that bias estimates is likely in the cross-sectional OLS setting. Yet, we argue that the cross-sectional approach is informative since it allows us to compare our results with previous studies.

7.1.2. Panel Data Analysis

In a panel data setting, several individuals (firms) are followed over a time period. Thus, the purpose of the panel data analysis is to estimate a relationship between leverage and the possible determinants over a period of time.

The panel data approach has several advantages over the cross-sectional approach. For example, following the same units over time allows for controls of certain firm- and time-specific characteristics of the dataset. (Wooldridge, 2013) We argue that this is a crucial feature of studies of capital structure since the existing empirical evidence is so dispersed. It is known that leverage varies between firms, there is consensus regarding the most important explanatory variables, but research is far from close to an exhaustive list of determining factors. This means that there could be other firm- specific factors that are correlated with leverage, not yet identified by research. The panel data approach allows us to control for this and the issue of omitted firm-specific variables as mentioned in the previous section is limited in the panel data setting.

The following regression model, where *i* denotes firm and *t* denotes time period, is estimated:

$$Leverage_{it} = \beta_0 + \beta_1 Size_{it} + \beta_2 Tangibility_{it} + \beta_3 Market\ to\ Book\ Ratio_{it} + \beta_4 Profitability_{it} + \beta_5 Business\ Risk_{it} + \delta_t + \gamma_i + \varepsilon_{it}$$

$Leverage_{it} = Leverage\ firm\ i\ at\ time\ t\ for\ firm\ i$
$\beta_0 = intercept$
$\beta_1 - \beta_5 = coefficients$
$\delta_t = time\ fixed\ effect\ at\ time\ t$
$\gamma_i = firm\ fixed\ effect\ for\ firm\ i$
$\varepsilon_i = error\ term\ for\ firm\ i$

Equation 3

Since we use panel data for a large sample of firms with quarterly data over a ten-year period, there is a risk of autocorrelation and cross-sectional correlation. Cross-sectional correlation occurs if error terms of firms are correlated within one period, for instance due to macroeconomic factors, which are not captured in the model. (Wooldridge, 2013) In order to mitigate this problem, we include time-fixed effects to control for time varying unobserved factors that affect all firms at one point in time. Technically, these factors are captured using time dummies.

Serial correlation of error terms, on the other hand, occurs if firm-specific factors that are constant over time are not captured in the model. In contrast to cross-sectional correlation, a positive serial correlation does not bias the estimates of the coefficients. Standard errors, however, will be smaller, leading to the false conclusion that estimates are more precise than they actually are. (Wooldridge, 2013) In order to avoid such problems, we also include firm fixed effects in our regression model. Firm fixed effects are handled by the statistical software used (Stata) and therefore not reported in the regressions. Further, to avoid biased standard errors due to heteroskedasticity we use Huber-White standard errors, which are robust against heteroskedasticity. (Wooldridge, 2013)

7.2. VARIABLES

7.2.1. DEPENDENT VARIABLES

There are many different measures of firm leverage, and the choice of leverage measure is an important matter for this study. The broadest measure of leverage is the ratio of total liabilities to total assets. It is a measure of what is left for shareholders in case of bankruptcy. However, it also includes operating liabilities, for example accounts payable which may reflect the characteristics of daily operations rather than financing decisions and therefore overstate the amount of firm leverage. Also, the ratio of total liabilities to total assets does not give any guidance regarding whether the firm is in or near default in the near future. (Rajan & Zingales, 1995)

Since we want to focus on financing decision, an improvement to the leverage measure is to exclude operating liabilities and only include financial debt in the numerator, i.e. use debt over total assets.

However, this measure fails to incorporate the fact that some assets are offset by liabilities not accounted for as debt, for example accounts receivable that are offset by accounts payable. Thus, Rajan and Zingales (1995) conclude that the effect of past financing decisions is best represented by the ratio of total debt over capital defined as total debt plus equity.

However, research suggests that Swedish firms are financed by operating liabilities to a greater extent than firms in other countries. (Balling et al., 2009) Thus, we argue that total liabilities to total assets may be an interesting point of reference for a leverage analysis on Swedish firms.

Based on the above discussion, two measures of leverage are used in this study: total liabilities to total assets and total debt to capital. The benefit of restricting the sample to listed firms is that a market approach to leverage can be used. Leverage measured as a ratio of debt or liabilities to book values of assets is highly affected by accounting values of firm assets, why accounting standards may have high impact on the leverage ratio. By using market pricing of the firm, the impact of potentially conservative accounting values on assets is minimised. Also, book values are backward looking rather than forward looking. (Barclay, Morellec, & Smith, 2006) On the other hand, by using market capital ratios, the measures are affected by fluctuations in market values. However, by using a panel data approach to control for time fixed effects, we argue that the benefits of using market values outweigh the negatives. On a technical note, book values of liabilities and debt are assumed to equal market values. This is considered a reasonable assumption for a firm that is going concern. (Penman, 2013)

Thus, the two dependent variables used in this study are as follows:

$$Liabilities - to - assets: \qquad Leverage_{it} = \frac{Liabilities_{it}}{Liabilities_{it} + MV(Equity)_{it}}$$

$$Debt - to - capital: \qquad Leverage_{it} = \frac{Debt_{it}}{Debt_{it} + MV(Equity)_{it}}$$

7.2.2. Explanatory Variables

Whereas the economic rationale for the explanatory variables used was explained in section 6.5.2, the technical definitions are now presented. On a technical note, all firm-specific explanatory variables are assumed to be linearly related to firm leverage except firm size, which will be used in logarithmic form. The logarithmic form is used to narrow the range and to approximate a linear relationship between firm size and leverage. (Wooldridge, 2013) Also, the logarithmic form is used in previous studies and thus allows for comparison.

Business Risk

Since business risk refers to the risk that profits or cash flows of the operations will be lower than anticipated, a measure of variability in profits is suitable. Again, since we want to capture the risk of the business as such, undistorted by financing decisions, we use the volatility in return on assets (ROA), i.e. operating income before taxes (EBIT) to total assets, to proxy for business risk. This is also one of the

most commonly used measures of business risk in previous literature (see for example (Banerjee, Heshmati, & Wihlborg, 2004)).

$$Business\ Risk_{it} = \sigma_{ROA,it}$$

We face two main difficulties related to the number of observations used to calculate volatility. The first question regards the time period used for estimation. As in most econometric analyses, there is a trade-off between, on the one hand, using a long time period to obtain reliable estimates and, on the other hand, using an overly extensive estimation window, which may result in an inadequate estimate of today's business risk since the characteristics of the firm's operations may have changed during the estimation period. Volatility measures based on five-year data on ROA are used in this study. We argue that five years is a sufficiently long period to capture firm characteristics and medium- to long-term business risk. It is, however, not considered long enough to be distorted by the risk that the firms have significantly changed operating characteristics and that the business risk is not representative.

The second question regards the number of observations used. A volatility measure is more informative of the variation in the underlying measures, the more observations used, which would call for using quarterly data. On the other hand, income volatility based on quarterly data would capture seasonal fluctuations in profitability. Thus, since we want to capture medium- to long-term business risk rather than seasonal fluctuations, we use yearly observations of ROA over the five-year estimation period. Regarding the panel data approach, it is worth mentioning that the volatility in ROA is calculated on a five-year *rolling* basis, i.e. the volatility for each observation is based on the 5-year period up to that date.

Firm Size

There are many different ways to measure firm size. Previous studies within the field of finance have used total sales revenue, total assets, and book value of equity or market value of equity as proxies for size of firm. (Al-Khazali & Zoubi, 2005) The most used in research on capital structure is the natural logarithm of sales and the natural logarithm of total assets. Those measures are broader than measures of equity values. In addition, a study of capital structure wants a size measure that captures operations, undistorted by financing decisions.

In this study, the natural logarithm of sales is used as a measure of firm size. As a robustness test to ensure that our results are not derived from an unsuitable proxy for firm size, the main regressions are estimated using the natural logarithm of total assets as well.

$$Size_{it} = ln\ (sales)_{it}$$

Tangibility

The variable tangibility is intended to proxy for assets that can be used as collateral. Thus, the ratio of property, plant and equipment to total assets is used. Property, plant and equipment is the balance sheet

line item that most strictly captures the amount of potential collateral in a firm since both intangible assets and current assets are more difficult to collateralise.

$$Tangibility_{it} = \frac{Property, plant\ and\ equipment_{it}}{Total\ assets_{it}}$$

Market-to-book Ratio

The market-to-book ratio is intended to proxy for market expectations and investment opportunities of the firm. In order to capture the expectations of the operations as a whole, unaffected by financing decisions, the market-to-book ratio of total assets is used. As for the dependent variable, the market value of liabilities is assumed to be equal to the book value of liabilities.

$$Market\ to\ book_{it} = \frac{Liabilities_{it} + MV(Equity)_{it}}{Total\ assets_{it}}$$

Profitability

As measure of profitability, an operating approach is used since we, once again, do not want the explanatory variables to be distorted by financing decisions. Thus, we are using return on assets (ROA) rather than return on equity.

$$Profitability_{it} = \frac{EBIT_{it}}{Total\ assets_{it}}$$

8. DATA

The data used in this study consists of quarterly data on Swedish exchange-traded companies over the ten-year time period from 2004 to 2013, 40 quarters in total. Accounting data from the Compustat database has been combined with market data from the Worldscope database. Companies with other reporting currencies than Swedish Krona have been excluded, since those are assumed to have a large fraction of their operations outside Sweden, and therefore might be affected by other institutional settings than companies with most of their operations within Sweden (for example concerning bankruptcy legislation). In line with previous research, financial companies have been excluded from the sample since their financing decisions are constrained by legal requirements and their operations and capital structure differ substantially from industrial firms and service businesses. After adjusting for missing data on relevant measures, 309 unique companies remained in the unbalanced panel containing in total 8,788 observations, an average of 28.4 quarterly observations per firm.

For the extended analysis, ownership and board data are collected from the database SIS Ägarservice. Since companies that are no longer listed cannot be found in this database, the ownership and board structure data is manually complemented by information from annual reports for the relevant firms.

8.1.1. Descriptive Statistics, Dependent Variables

Average sample leverage measures are presented in table 1 below. In addition to the leverage measures used in the analysis, also the sample average of liabilities as a fraction of book assets is presented for comparative purposes.

Descriptive statistics, dependent variables

Leverage measure	Mean	Std error	Minimum	Maximum
Liabilities-to-assets (book values)	57.2%	18.1%	3.0%	244.1%
Liabilities-to-assets (market values)	43.7%	19.4%	0.9%	99.4%
Debt-to-capital	25.8%	19.5%	0.0%	98.5%
Number of observations	*8,788*			

Table 1, average sample leverage

Figure 1 below illustrates variations in the leverage measures over the time period analysed.

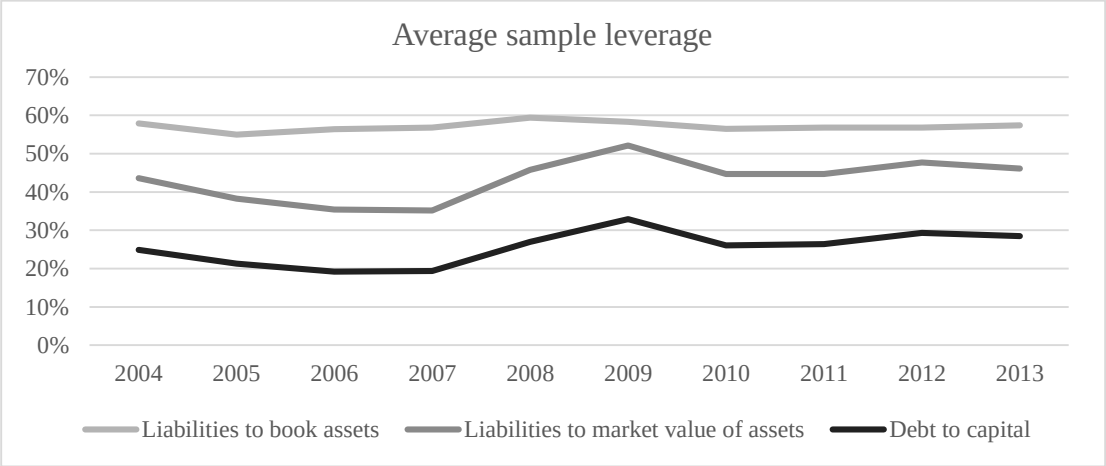

Figure 1: Variations in average sample leverage.

8.1.2. Descriptive Statistics, Explanatory variables

Descriptive statistics of the explanatory variables are presented in table 2 below.

Descriptive statistics, explanatory variables

Variable	Mean	Std error	Minimum	Maximum
ROA volatility	0.08	0.18	0.001	2.85
Ln sales	6.03*	2.39	-4.42	11.37
Tangibility	0.18	0.19	0.00	0.93
Market-to-book	1.54	0.96	0.29	27.62
Profitability	0.01	0.05	-0.63	0.31
Number of observations	*8,788*			

*Mean quarterly sales SEK 415m

Table 2: Descriptive statistics, explanatory variables

9. EMPIRICAL ANALYSIS

The empirical analysis of this study is divided into two sections, cross-sectional evidence and panel data evidence.

9.1. CROSS-SECTIONAL EVIDENCE

The initial focus of the empirical analysis in this study is cross-sectional evidence. The main purpose of the cross-sectional analysis is to test which of the determinants of capital structure that are relevant for Swedish firms and to compare them to what is presented in the existing body of research.

The results from cross-sectional regressions, as specified in equation 2, are presented below. Please note that all regressors are five-year averages of the period 2009-2013. This is in order to reduce the impact of extreme observations, following the research design in Rajan and Zingales (1995). For corresponding regression with all regressors estimated at the end of 2013, please refer to appendix, table A1.

Table 3 - Cross Sectional Regressions, 2009-2013

	Debt/Capital			Liabilities/Assets		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.195 **	0.09	-2.23	-0.030 **	0.01	-2.04
Ln sales	0.001	0.01	0.27	0.012 **	0.01	2.30
Tangibility	0.291 ***	0.07	3.94	0.197 ***	0.06	3.44
Market-to-book	-0.063 **	0.03	-2.38	-0.062 ***	0.01	-5.24
Profitability	-0.184 *	0.10	-1.90	-0.170 ***	0.05	-3.13
Constant	0.314 ***	0.06	5.44	0.415 ***	0.04	9.41
Firms in sample			251			251
R-squared			*0.25*			*0.36*

Robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

All of the four explanatory variables used in previous studies, i.e. all explanatory variables except business risk, show the same sign as for US firms in previous studies regardless of the leverage measure

analysed. (Rajan & Zingales, 1995) This is not surprising given that we focus on the four explanatory variables that most consistently have shown correlation with leverage in previous research. (Rajan & Zingales, 1995; Harris & Raviv, 1991) Thus, the first conclusion to be drawn is that determinants shown to be most important in explaining leverage for US firms are so also for Swedish firms. Hence, our results do confirm the robustness between countries of these four factors. Below, each of the explanatory variables are discussed in more detail and compared between the two different leverage measures used. Estimating the same regression on regressors at one given point in time rather than with five-year averages gives essentially the same results (appendix, table A1).

9.1.1. BUSINESS RISK

The cross-sectional regressions show that business risk as measured by volatility in ROA is negatively correlated with leverage and statistically significant at the 5 per cent confidence level for both measures of leverage. The results remain when regressing only at one point in time, rather than with five-year averages, as can be seen in appendix, table A1 (the results are actually significant even at the 1 per cent level for both measures of leverage in that regression).

As can be seen in equation 1 above, the total risk of equity is a function of business risk and financial risk, and a negative correlation between business risk and leverage, (i.e. business risk and financial risk) indicates that firms compensate low business risk with high financial risk, and vice versa, and thereby balance the total risk of equity in the firm. This indicates, in line with trade-off theory, that firms with more volatile and hence more risky operations are less levered.

Sweden has a liquidation bias for firms in financial distress. As argued by Rajan and Zingales (1995), liquidation increases the expected costs of financial distress by destroying more value than restructuring of financially distressed firms if the value as a going concern is larger than the liquidation value. Hence, higher risk of financial distress is relatively more costly in Sweden than for example in the US. Therefore, it might be rational to compensate a high business risk with a lower financial risk in Sweden to a greater extent than in the US. This might help explaining why previous research conducted on US firms has been unable to show statistically significant correlation between business risk and leverage.

However, it should be noted that in the cross-sectional setting, there is a risk that omitted firm-specific variables impact on the results and that the effect of business risk in fact represents other firm-specific factors omitted from the regression model.

9.1.2. SIZE

Looking at the effect of *size* on leverage, the sign of the coefficient reveals positive correlation with leverage. For *liabilities-to-assets*, this coefficient is statistically different from zero at the 5 per cent confidence level. This indicates that larger firms have more leverage when it comes to total liabilities. However, when examining leverage based on *debt-to-capital* the coefficient is not statistically

significantly different from zero. Thus, *size* has no explanatory power for Swedish firms when it comes to *debt-to-capital* but only *liabilities-to-assets* where the latter includes not only financial debt but also operating liabilities. Recognising the fact that Swedish firms are, to a relatively large extent, financed by short-term, operating liabilities (Balling, Bernet, & Gnan, 2009), this is not very surprising. Larger firms, with more bargaining power against suppliers and buyers may be able to negotiate more favourable buying and selling terms. Thereby, larger firms may be able to finance more of their business with operating liabilities and/or carry less operating assets.

The fact that *size* is not statistically significant when it comes to *debt-to-capital* is not surprising either. The effect of firm size on leverage is theoretically ambiguous, as previously described in section 6.5.2. In addition to the theoretical ambiguity, there is dispersed empirical evidence regarding the effect of *size* on firm leverage. For example, Rajan and Zingales (1995) show size to be positively correlated with leverage in the US, Japan and Canada but negatively related to leverage in Germany. For France, Italy and the UK, they find no statistically significant correlation. The authors explain these results mainly with differences in bankruptcy laws. In Germany, liquidation is more common than restructuring of firms, meaning that there may not necessarily be lower cost of financial distress in a large firm compared to a small firm. (Rajan & Zingales, 1995) The reasoning of bankruptcy law may very well be applicable in the Swedish case as well, since Swedish bankruptcy law is more similar to German bankruptcy law than the US equivalent regarding liquidation versus restructuring of firms in financial distress.

It is worth noting that different size proxies have been used in previous research. For example, (Ferri & Jones, 1979) uses the logarithm of total assets instead of logarithm of sales to proxy for firm size. To avoid the risk of drawing faulty conclusions based on unsuitable proxies, regressions with logarithmic assets as the size variable have been estimated and the results are essentially the same, but are not presented in this thesis.

9.1.3. Asset Tangibility

The effect of asset tangibility is positive and significant as expected, indicating that firms with relatively more tangible assets have more debt. The explanatory variable is statistically significant at the 1 per cent level using both measures of leverage. The magnitude of the coefficient is approximately twice as large for the regression estimated on *debt-to-capital* as the leverage measure compared to *liabilities-to-assets* (0.291 and 0.197 respectively) which is reasonable since total liabilities include operating liabilities, which are rarely backed by collateral.

9.1.4. Investment Opportunities

Investment opportunities, as measured by market-to-book ratio of assets are negatively correlated with leverage and statistically significant, which implies that firms with relatively more investment opportunities are less levered. This is in line with the fact that future investment opportunities included in market values but not book values often have low recovery values in case of financial distress. Thus,

the expected cost of bankruptcy is higher and the negative correlation supports trade-off theory. In addition, as expected by market-timing theory, firms are more interested in issuing equity when the market price of equity is high, i.e. there is a high market-to-book ratio. Hence, negative correlation between leverage and *market-to-book* is also in line with market-timing theory.

9.1.5. PROFITABILITY

Profitability is negatively correlated with leverage and statistically significant, which is also according to expectations. In line with pecking-order theory, firms prefer internal funds to external funds. Thus, a profitable firm with more retained earnings is able to finance project internally to a larger extent and thereby less dependent on external financing. Further, *profitability* might to some extent be a proxy for riskiness in operations. As discussed in section 6.5.2 above, in accordance with asset-pricing theory, investors are expected to demand a higher return for riskier investments than for less risky investments. Thus, firms delivering high returns might do so due to high risk in their operations, which can impair the debt capacity.

9.2. PANEL DATA EVIDENCE

To further investigate the determinants of capital structure, and more specifically the impact of business risk, we extend our research design to a panel data setting as described in section 7.1.2. The regression estimated is presented in equation 3. Table 4 below presents regression results from fixed effects panel regressions with the two measures of leverage. Both time fixed effects (by quarter) and firm fixed effects are used. Time fixed effects are reported in appendix (table A2). Corresponding regressions with annual data are to be found in the appendix, table A3. The results are essentially the same as for quarterly data.

Table 4 - Fixed effects panel regression 2004-2013, all firms

	Debt/Capital			**Liabilities/Assets**		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.061 **	0.02	-2.50	-0.017	0.02	-0.77
Ln sales	0.020 **	0.01	2.42	0.026 ***	0.01	4.26
Tangibility	0.211 **	0.09	2.40	0.230 ***	0.08	3.03
Market-to-book	-0.068 ***	0.02	-3.95	-0.030 ***	0.01	-3.58
Profitability	-0.351 ***	0.08	-4.32	-0.162 ***	0.05	-3.02
Time fixed effects	*Quarterly time fixed effects statistics to be found in appendix, table A3*					
Constant	0.230 ***	0.06	3.70	0.286 ***	0.03	8.49
Firms in sample			309			309
R-squared			*0.25*			0.28

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

Firstly, one can conclude that all signs are the same as in the cross-sectional setting which is as expected. The effect of *size* is now statistically significant for both measures of leverage. However, the coefficient has a lower significance level when regressing on *liabilities-to-assets* than when regressing on *debt-to-capital*.

The second conclusion to be drawn is that business risk is statistically significant in explaining leverage based on *debt-to-capital* but not *liabilities-to-assets* meaning that when we investigate the firms over time, controlling for both firm fixed effects and time fixed effects, business risk retain its explanatory power for *debt-to-capital* but not for *liabilities-to-assets*. The results are fascinating comparing to the cross-sectional setting but intuitive. If *debt-to-capital* represents the pure financing aspect and *liabilities-to-assets* represent both financing and operating aspects of capital structure, the fact that business risk does not have a statistically significant impact on leverage when the latter measure of leverage is used is intuitively appealing.

Financing decisions are indeed preceded by a more thorough investigation of the creditworthiness of the firm, where business risk is one important component. Operating decisions affecting capital structure on the other hand, such as procurement with deferred payments, are generally not preceded by such investigations of firm creditworthiness but is rather a consequence of the firm's business model. Again, Swedish firms are financed by operating liabilities to a relatively large extent, leading to significantly different leverage based on total liabilities as compared to only financial debt (refer to table 1). This, in combination with the different drivers of operating and financial liabilities may imply that these two leverage measures are affected differently by different determinants for Swedish firms which is a difference compared to the results in previous studies. Controlling for firm fixed effects and analysing the sample over time, business risk does not impact on leverage including operating liabilities but only pure financial debt.

9.3. Compilation of Results

The cross-sectional regressions and the panel data regressions have essentially given the same results, namely a statistical significant negative relationship between financial leverage and business risk. For the other explanatory variables, the results are strikingly similar to results in previous studies made on US data. In table 5 below, our regression results are compared with results predicted by the main capital structure theories. Note that the columns empirical observation concerns the regressions with *debt-to-capital* as dependent variable, to illustrate the impact of business risk.

Table 5 - Summary of theory and empirical findings

	Theoretical interpretation			Empirical observation	
Explanatory variable	**Trade-off**	**Pecking order**	**Market timing**	**Cross-sectional**	**Panel**
Business risk	-	N/A	N/A	-	-
Size	+	-	N/A	0	+
Tangibility	+	+	N/A	+	+
Market-to-book	-	N/A	-	-	-
Profitability	+	-	N/A	-	-

As can be seen in table 5 above, the empirical observations of the analysed data sample show the same results on the direction of all explanatory variables except *size*, regardless of if a cross-sectional regression or a panel data regression is estimated.

Regarding the business risk variable, both the cross-sectional setting and the panel data setting show negative correlation between business risk and leverage. Only trade-off theory provides guidance regarding the direction of a potential correlation. In accordance with trade-off theory, high business risk is associated with high risk of financial distress, and thereby high expected bankruptcy costs. In accordance with trade-off theory, business risk should be negatively correlated with leverage, which it also is suggested to be according to both regression settings.

For the *size* variable, the coefficient could not be shown to be significantly different from zero in the cross-sectional setting, whereas the panel data regression shows a positive relationship between *size* and leverage. The main theories predict different effects of firm size on financial leverage, trade-off theory predicts a positive relationship, since the expected costs of financial distress are argued to be lower in large firms, why the presence of tax shields makes it more attractive for large firms to increase their leverage. Pecking-order theory on the other hand argues that information asymmetries are lower in large firms, which makes it relatively cheaper to issue equity. In light of the contradicting theories, the different empirical results depending on which regression is estimated appears less perplexing.

Tangibility is suggested to be positively correlated with leverage in both the cross-sectional setting and the panel data setting.

The *market-to-book* variable has consistently been shown to be negatively correlated with leverage, which is in line with the main capital structure theories.

Profitability is negatively correlated with leverage in both regression settings, but theories suggest diverse directions of correlation. Trade-off theory predicts a positive relationship, since high profitability is suggested to be associated with low risk of financial distress, and thereby lower expected cost of financial distress. Pecking-order theory on the other hand suggests a negative relationship, since

high profitability is associated with much internally generated funds to finance new investments with, and thereby a lower need for external finance.

To conclude, data does not fully support any of the three classical theories but supports parts of the theories. A statistically significant relationship between business risk and leverage is established for *debt-to-capital* in both the cross-sectional and panel settings. The four determinants (except for *size* in the cross-sectional setting) proven to be important in previous research are found to be so for Swedish firms as well, regardless of the leverage measure used. In order to improve the understanding of under which conditions this relationship holds, the analysis is extended in the section below.

9.4. Extended Panel Data Analysis – Sample Splits

To increase the understanding of the determinants of capital structure, the panel data analysis is made with different separations of the dataset based on firm and corporate governance characteristics. The characteristics are (1) level of financial leverage, (2) ownership concentration, (3) board size, (4) if there are any female directors on the board, (5) listing venue and (6) firm age. The dataset is divided into two subsets based on each of these factors and the regressions are estimated within the two groups. All regressions are run using *debt-to-capital* as dependent variable.

9.4.1. Differences Between Leverage Quartiles

To further investigate the relationship between business risk and financial leverage and whether this relationship holds for different levels of leverage, the data is divided into quartiles based on the level of leverage. The average levels of leverage during the period analysed are used. Summary statistics of financial leverage ratios for the different quartiles are presented in table 6 below.

Table 6 - Summary of financial leverage by quartile, 2004-2013

Leverage quartile	**1**	**2**	**3**	**4**
Average debt/capital	*5.48%*	*13.36%*	*25.75%*	*45.41%*
Median debt/capital	*4.44%*	*12.01%*	*24.41%*	*43.18%*

Regressions on *debt-to-capital* on the sample divided into half (quartile 1-2 and quartile 3-4 respectively) are presented in table 7 below. Again, both time fixed effects (by quarter) and firm fixed effects are used.

Table 7 - Fixed effects panel regression 2004-2013

	Leverage quartile 3-4			Leverage quartile 1-2		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.061 *	0.03	-1.97	-0.003	0.02	-0.12
Ln sales	0.022 **	0.01	2.18	0.018 *	0.01	1.97
Tangibility	0.350 ***	0.12	3.01	0.110	0.07	1.63
Market-to-book	-0.201 ***	0.02	-8.28	-0.019 ***	0.01	-2.94
Profitability	-0.471 ***	0.12	-3.98	-0.137 **	0.06	-2.35
Time fixed effects	*Quarterly time fixed effects statistics to be found in appendix, table A5*					
Constant	0.410 0.000	0.08	5.31	0.053 0	0.05	1.00
Firms in sample			155			154
R-squared			*0.44*			*0.16*

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

As seen from the regression results above, all coefficients have the same signs as in the full sample regressions. For the more highly levered firms, quartile 3-4 presented in the leftmost columns above, the results are strikingly similar to the full sample. The effect of *tangibility* on leverage is stronger when including only the more levered firms whereas the effect of business risk is similar to the full sample. This indicates that the firms with higher leverage drive the results behind business risk as an explanatory variable for leverage in the full sample. The explanatory power of the regression, in terms of R-squared, is considerably higher when excluding firms with lower leverage, meaning that the five explanatory variables can explain the degree of leverage to a much larger extent in that group of firms.

Looking at the rightmost columns of the table, with the less levered firms, interesting differences compared to the full-sample regression can be observed. Whereas the signs of the coefficients are retained, the factors *tangibility* and business risk lose their explanatory power when only including less levered firms. Further, the magnitudes of all coefficients are lower for firms in quartile 1-2, and the total explanatory power of the regression is considerably lower for the low-leverage quartiles.

These results are intuitively appealing. Since *tangibility* is a measure of the potential amount of collateral in a firm, assets that can offer security for debt holders, it is reasonable that this factor is less important when firms have lower leverage. Consider a possible assessment of creditworthiness for a firm with very low leverage. When this firm is about to raise debt, the relative amount of collateral is not as important since the firm has a lot of equity that will absorb potential future losses before debt holders are hurt.

The same reasoning holds for business risk. The lower the leverage, the higher is the "safety cushion" of equity, and thus, the less important is the level of business risk in determining the creditworthiness of the firm. Put the other way around, the "classical" determinants of leverage is more important in explaining leverage for more levered firms, i.e. firms that are closer to being borrowing constrained.

9.4.2. OWNERSHIP CONCENTRATION

As discussed in section 6.4 above, one difference between the Swedish and the US equity markets concerns ownership concentration. Ownership is generally more diverse in the US than in Sweden, and a relatively large share of Swedish listed firms are controlled by one individual owner. Stulz (1998) relates ownership concentration to shareholder value and mentions capital structure changes as a means to achieve or retain control. Also, a survey of capital structure decisions in European small and medium enterprises (SMEs) reveals that dilution of shares and shareholdings is one of the most important factors when deciding on capital structure. (Bancel & Mittoo, 2004) Based on ownership data from SIS Ägarservice from the end of 2013, the sample is divided in two groups depending on if the largest owner controls 50 per cent or more of the votes in the firm or not. In some cases, the data from SIS Ägarservice is complemented by manually collected data. Firms without available ownership data have been excluded from these regressions.

When splitting the data in groups based on the largest owner's voting power, the explanatory variables differ in importance between the groups. The group without an owner in direct control behave as the sample as a whole. All explanatory variables are significantly different from zero, and the signs of the coefficients are the same as in the main panel regression. Firms with a direct majority owner behave differently. Signs for all explanatory variables except business risk are the same as in the main panel regression, but only *market-to-book* is statistically significant. Business risk is neither statistically significant nor does it have the expected sign.

Table 8 - Fixed effects panel regression 2004-2013

	No direct majority owner			**Direct majority owner**		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.058 **	0.02	-2.40	0.132	0.25	0.53
Ln sales	0.025 **	0.01	2.56	0.030	0.05	0.55
Tangibility	0.227 **	0.09	2.44	0.345	0.27	1.27
Market-to-book	-0.068 ***	0.02	-3.11	-0.062 *	0.03	-1.92
Profitability	-0.398 ***	0.10	-3.87	-0.697	0.45	-1.55
Time fixed effects	*Quarterly time fixed effects statistics to be found in appendix, table A6*					
Constant	0.179 **	0.08	2.37	0.078	0.32	0.24
Firms in sample			188			29
R-squared			*0.28*			*0.39*

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

The weak results in the group of firms with a controlling owner suggest that other factors than the explanatory variables used may be of importance in this group. As discussed in the introduction above, other factors than pure financial aspects may be of interest when deciding on a capital structure,

especially if a controlling owner has a large fraction of its wealth allocated to the specific firm. For example personal risk aversion or strive for empire building might affect financing decisions in the firm. When analysing the results in the regressions above, it is important to note that the group of firms with a controlling owner includes only 29 firms. However, the results are still illustrative in showing that other factors than the classical determinants drive leverage levels in majority owned firms.

9.4.3. BOARD SIZE

Researchers have pointed to a number of ways in which board size enhances the institutional and governance functions of the board. Firms with larger boards might be assumed to be governed by a more diversified group of people, with different competences and resources, whereas the diversity between the directors in a smaller board is lower. Thus, larger boards could be argued to being able to manage the firm in a more professional way. Some even suggest that firms with larger boards expect lower risk of failure. (Chaganti, Mahajan, & Sharma, 1985) On the other hand, larger boards can experience more organisational complexities, making strategic decisions more difficult. (Goodstein, Gautam, & Boeker, 1994) We have defined a board as small if it consists of four or less directors, whereas boards with five or more directors are considered large.

When splitting the data on board size, interesting results emerge. In the regression estimated on the large board sample, the results are very similar to the base case panel regression. All explanatory variables show the same signs and are within the same statistical significance intervals as in the panel regression run on the whole sample. In the group of firms with small boards on the other hand, the only statistically significant coefficient is *market-to-book*, which is significantly different from zero at the 5 per cent level. No other explanatory variable is significantly different from zero, and signs on *tangibility* and business risk are opposite to the regression results when analysing the whole sample.

Table 9 - Fixed effects panel regression 2004-2013

	Large boards			**Small boards**		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.064 **	0.03	-2.44	0.107	0.14	0.74
Ln sales	0.018 **	0.01	2.00	0.020	0.02	1.01
Tangibility	0.270 ***	0.08	3.29	-0.042	0.25	-0.17
Market-to-book	-0.069 ***	0.02	-3.50	-0.051 **	0.02	-2.07
Profitability	-0.417 ***	0.11	-3.88	-0.191	0.13	-1.44
Time fixed effects	*Quarterly time fixed effects statistics to be found in appendix, table A7*					
Constant	0.224 ***	0.07	3.15	0.294 ***	0.09	3.11
Firms in sample			247			62
R-squared			*0.28*			*0.18*

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

The puzzling results for firms with small boards are not intuitively appealing. One possible explanation might be that firms with small boards are managed less professionally than firms with large boards, and therefore they do not follow the same logic as more professionally managed firms do. The low R-squared suggests that only a relatively small fraction of the variation in leverage is explained by the five explanatory variables, which raises the interesting question if there are other financial determinants that are important for firms with small boards.

9.4.4. FEMALE DIRECTORS

The diversity and composition of the decision-making bodies in the firm are suggested to affect how decisions regarding operating and financing activities are made. For example, it is argued that women behave more risk-aversely and hence take less risky decisions than men. (Eckel & Grossman, 2008) To investigate the potential effects of board diversity on the determinants of capital structure, the dataset is divided into two pieces based on whether the firm has any female directors on the board of directors. Data on female directors is collected as per the last observation of the firm in the sample, i.e. each firm is included in the same group for the entire data period, regardless of if the diversity of the board of directors have changed over the period studied.

Table 10 - Fixed effects panel regression 2004-2013

	Firms with female director(s)			**Firms without female directors**		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.038 ***	0.01	-3.10	-0.127 ***	0.03	-3.95
Ln sales	0.020 **	0.01	2.06	0.018	0.02	1.19
Tangibility	0.255 ***	0.09	2.76	0.119	0.16	0.74
Market-to-book	-0.065 ***	0.02	-3.20	-0.077 ***	0.03	-2.66
Profitability	-0.501 ***	0.12	-4.22	-0.157	0.12	-1.35
Time fixed effects	*Quarterly time fixed effects statistics to be found in appendix, table A10*					
Constant	0.202 **	0.08	2.57	0.323 ***	0.08	4.08
Firms in sample			210			99
R-squared			*0.29*			*0.21*

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

The results for firms with female directors are similar to the results in the full sample. All coefficients have the same sign as in the full sample, all significant. The sample without female directors shows different results. Whereas all coefficients have the same sign as in the full sample, only business risk and *market-to-book* are statistically significant. Note that most of the firms (about two thirds of the whole sample) end up in the group with female directors, which may bias the results. However, the results indicate that the classical determinants of capital structure works better for firms with more diversified boards.

9.4.5. LISTING VENUE

In previous studies, stock listing venues where relatively large firms are listed have usually been analysed (see for example Rajan & Zingales (1995) or Titman & Wessles (1998)). The sample of this study on the other hand includes companies listed both on the Nasdaq OMX main lists, where larger firms are listed and other Swedish lists and market places,[1] usually with smaller firms. Further, Nasdaq OMX main lists are regulated market places, whereas lists as Nasdaq First North and Aktietorget are unregulated market places, and hence have lower listing requirements in terms of financial reporting quality than the Nasdaq OMX main lists.

When splitting the data on listing venue, all explanatory variables for firms listed on the Nasdaq OMX main lists except business risk are significantly different from zero and shows the same sign as in the main panel regression. Business risk on the other hand is not statistically significant, and the coefficient does even show the opposite sign to what is expected.

In contrast to firms listed on the Nasdaq OMX main lists, the regression estimated only on firms listed on other market places gives weaker results on the four first explanatory variables. *Tangibility* and *profitability* cannot be shown to be significantly different from zero, and the *size* and *market-to-book* coefficients are both less significant than in the group of firms listed on the Nasdaq OMX main lists. Business risk on the other hand is, as expected, shown to have negative sign and to be significant on the 1 per cent level.

Table 11 - Fixed effects panel regression 2004-2013

	Nasdaq OMX main lists			**Other lists**		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	0.083	0.06	1.34	-0.075 ***	0.03	-2.71
Ln sales	0.023 **	0.01	2.02	0.019 *	0.01	1.75
Tangibility	0.241 **	0.12	2.00	0.174	0.12	1.42
Market-to-book	-0.106 ***	0.02	-5.32	-0.041 **	0.02	-2.29
Profitability	-0.586 ***	0.17	-3.39	-0.128	0.08	-1.65
Time fixed effects	*Quarterly time fixed effects statistics to be found in appendix, table A8*					
Constant	-0.010	0.03	-0.35	0.000	0.00	0.00
Firms in sample			147			162
R-squared			*0.34*			*0.17*

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

The results from this data split suggest that business risk is an important determinant of leverage for firms on some market places, but not on all. Higher importance among the firms listed on other market

[1] Mainly the marketplaces Aktietorget and Nasdaq First North

places than the main lists might suggest that those firms are assessed differently when it comes to credit assessments. Explanations to this may include analyst coverage and general awareness of the firm and its business. Firms listed on the Nasdaq OMX main lists are generally larger, and investors and lenders might have higher confidence in their debt service abilities than smaller, more unknown firms. Lower significance of the *size* variable might be due to the fact that the split itself partly divides the firms in two size groups, why the variations in *size* in the two samples are lower than in the total sample before the listing venue split.

9.4.6. FIRM AGE

The financing needs of a firm and the ability to raise external financing is likely to change over the firm's life cycle, for example if the operating risk or the investment needs changes. In the beginning of the firm's life cycle, the firm may need to seek more external financing to conduct investments necessary to grow the business. Also, younger firms do not have the same "track record" as older firms to convince capital providers that they will be able to meet their obligations. This is reflected in the fact that older firms with longer credit histories tend to have lower default rates and costs of debt. (Diamond, 1989) Other factors that may influence differences in capital structure between younger and older firms are difference in size and difference in investors knowledge about the firm, for example in terms of number of analysts following the firm. Hence, it is suggested that other determinants of leverage prevail for younger firms compared to older firms.

The dataset is divided into two groups, observations where the firm is 15 years and older and observations where the firm is younger than 15 years. Hence, if a firm passes the 15-year threshold during the period studied, it will be included in both regressions (but not during the same time period).[2]

[2] Thus, the number of firms in sample sum to more than 309 since there is a degree of overlap between the regressions in terms of the firms included.

Table 12 - Fixed effects panel regression 2004-2013

	Firms, 15 year and older			Firms, younger than 15 years		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.074	0.06	-1.28	-0.053 ***	0.01	-4.48
Ln sales	0.024 **	0.01	2.53	0.003	0.02	0.18
Tangibility	0.198 **	0.09	2.20	0.274	0.33	0.82
Market-to-book	-0.086 ***	0.02	-4.34	-0.039 **	0.02	-2.03
Profitability	-0.455 ***	0.10	-4.35	-0.078	0.07	-1.07
Time fixed effects	*Quarterly time fixed effects statistics to be found in appendix, table A9*					
Constant	0.244 ***	0.08	3.10	0.224 **	0.11	2.10
Firms in sample			241			99
R-squared			*0.28*			*0.21*

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

All coefficients have the same sign as in the full sample regressions. Looking at the older firms, all of the four determinants used in previous research of capital structure are significant. Business risk, however, is not significant for the older firms. For the younger firms, only *market-to-book* and business risk are significant. As with the analysis on listing venue, one reason that *size* is not significant for the younger firms could be due to the fact that the sample split decreases the variation in *size* since younger firms generally might be smaller. The results from the divided regressions indicate that three of the determinants of capital structure used in previous research are only important for older firms. Business risk is important for explaining leverage only for younger firms. One possible explanation to this could be that older firms have a longer history of their business and can show that they previously have survived fluctuations in profitability without defaulting on their debt payments. Thus, the fluctuations in operating profitability are not as important as other factors in determining leverage. Younger firms on the other hand, have no such "track record" for credit providers to rely on. Therefore business risk, as expressed by variation in profitability, is more important when these firms are to raise debt.

10. CONCLUSION

The aim of this study is to bring light to what determines capital structure in Swedish listed firms and more specifically, to investigate the relationship between business risk and capital structure. Our findings suggest that drivers of capital structure shown to be significant in US studies are essentially the same for Swedish firms. Thus, this study confirms the robustness of previous studies across countries and over time.

Further, this study investigates the relationship between business risk and capital structure. This relationship is highly supported by theory but with limited empirical evidence. The findings of this study suggest a negative relationship between business risk, as expressed in terms of variability in operating profitability, and financial leverage. Swedish firms with more volatile results are thus less levered, all else equal. We argue that a possible explanation for the significant relationship between business risk and financial leverage for Swedish firms is the differences in bankruptcy legislation between Sweden and the US. Sweden has a liquidation bias for firms in financial distress, which is argued to increase the expected costs of financial distress. Hence, it might be rational to compensate a high business risk with a lower financial risk in Sweden to a larger extent than in the US.

However, the relationship between business risk and leverage seems sensitive to the leverage measure used. A statistically significant correlation is not found when investigating leverage based on total liabilities, but only when investigating leverage based on financial debt. Hence, there seem to be different drivers of different types of liabilities. Business risk is only an important factor in determining financial debt, not operating liabilities. However, the other four determinants used in previous research are statistically significant for both measures of leverage. This insight can help explaining why the empirical evidence of leverage and business risk in the existing body of research is weak.

This study shows that the classical determinants of capital structure, the "hard facts", work better for certain types of firms. Firstly, the factors tangibility and business risk have no explanatory power for firms with relatively low financial leverage. This finding indicates that when firms are far from being borrowing constrained, tangibility and business risk are less important. The results are not unreasonable, but raise the question regarding what determines leverage in these, low-leverage firms.

Further, when dividing the dataset into two pieces based on different firm and corporate-governance characteristics a more complex picture emerge. The four classical determinants used in previous research consistently work better for "normal" firms, i.e. firms with no direct majority owner, with relatively large and gender diversified boards or for older firms and firms listed on the regulated stock exchanges as opposed to unregulated market places. For business risk, however, another picture emerges for two of the sample splits. Business risk has a significant impact on leverage for younger firms but not for older firms and for firms listed on other lists than Nasdaq OMX main lists. This is puzzling and could also be a possible explanation for why empirical evidence on the relationship between business risk and

capital structure in previous research has been weak. Studies made on US data is often based on S&P 500, or other indices with larger firms, and do therefore exclude these type of firms.

To conclude, our findings suggest that there is a negative relationship between business risk and capital structure but there are unquestionably other factors that influence capital structure, especially for certain types of firms.

So far, research within the field of capital structure has focused on hard financial facts, such as the determinants used in this study. Maybe one just have to accept that financial numbers cannot explain everything. While these factors do a decent job in explaining capital structure for the average firm, the search continues for reliable and significant factors that explain capital structure for firms that deviate from the "standard setting". More qualitative studies in the field suggest that softer factors play an important role in corporate decision-making. The research design of qualitative studies, however, impairs the ability to draw general conclusions. The next step in the capital structure puzzle could therefore be to combine hard financial facts with softer factors, for example obtained by surveys to achieve higher explanatory power.

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APPENDIX

A1 – CROSS-SECTIONAL REGRESSION

Table A1 - Cross Sectional Regressions, 2013

	Debt/Capital			Liabilities/Assets		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.337 ***	0.13	-2.61	-0.402 ***	0.11	-3.66
Ln sales	-0.004	0.01	-0.55	0.014 **	0.01	2.46
Tangibility	0.406 ***	0.09	4.38	0.289 ***	0.07	4.19
Market-to-book	-0.039 **	0.02	-2.28	-0.048 ***	0.01	-3.71
Profitability	-0.387 ***	0.14	-2.73	-0.424 ***	0.09	-4.92
Constant	0.332 ***	0.07	4.62	0.383 ***	0.05	7.40
Firms in sample			251			251
R-squared			*0.17*			*0.18*

Robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

A2 – PANEL DATA REGRESSIONS, FULL SAMPLE WITH QUARTERLY FIXED EFFECTS

Table A2 - Fixed effects panel regression 2004-2013, all firms

	Debt/Capital			Liabilities/Assets		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.061 **	0.02	-2.500	-0.017	0.02	-0.77
Ln sales	0.020 **	0.01	2.420	0.026 ***	0.01	4.26
Tangibility	0.211 **	0.09	2.400	0.230 ***	0.08	3.03
Market-to-book	-0.068 ***	0.02	-3.950	-0.030 ***	0.01	-3.58
Profitability	-0.351 ***	0.08	-4.320	-0.162 ***	0.05	-3.02
FE2004Q2	-0.019 *	0.01	-1.710	-0.032 ***	0.01	-4.15
FE2004Q3	-0.023 *	0.01	-1.860	-0.028 ***	0.01	-3.37
FE2004Q4	-0.054 ***	0.02	-2.770	-0.037 ***	0.01	-4.08
FE2004Q1	-0.047 ***	0.02	-2.800	-0.047 ***	0.01	-5.37
FE2005Q2	-0.032	0.02	-1.610	-0.050 ***	0.01	-5.1
FE2005Q3	-0.030	0.02	-1.360	-0.051 ***	0.01	-4.66
FE2005Q4	-0.049 **	0.02	-2.160	-0.065 ***	0.01	-5.65
FE2005Q1	-0.041 *	0.02	-1.710	-0.075 ***	0.01	-6.1
FE2006Q2	-0.052 **	0.02	-2.100	-0.091 ***	0.01	-6.8
FE2006Q3	-0.049 **	0.02	-2.000	-0.072 ***	0.01	-5.45
FE2006Q4	-0.055 **	0.02	-2.230	-0.071 ***	0.01	-5.49
FE2006Q1	-0.056 **	0.03	-2.190	-0.081 ***	0.01	-5.7
FE2007Q2	-0.060 **	0.03	-2.300	-0.088 ***	0.01	-5.91
FE2007Q3	-0.050 *	0.03	-1.910	-0.085 ***	0.02	-5.61
FE2007Q4	-0.046 *	0.03	-1.730	-0.064 ***	0.01	-4.32
FE2007Q1	-0.037	0.03	-1.400	-0.038 ***	0.01	-2.65
FE2008Q2	-0.018	0.03	-0.670	-0.026 *	0.01	-1.73
FE2008Q3	-0.002	0.03	-0.070	-0.007	0.01	-0.5
FE2008Q4	0.006	0.03	0.240	0.022	0.01	1.51
FE2008Q1	0.091 ***	0.03	3.280	0.097 ***	0.02	6.31
FE2009Q2	0.067 **	0.03	2.430	0.061 ***	0.02	3.96
FE2009Q3	0.029	0.03	1.070	0.024 *	0.01	1.69
FE2009Q4	-0.018	0.03	-0.710	-0.001	0.01	-0.06
FE2009Q1	-0.018	0.03	-0.680	-0.011	0.01	-0.73
FE2010Q2	-0.032	0.03	-1.190	-0.018	0.02	-1.17
FE2010Q3	-0.016	0.03	-0.570	-0.003	0.02	-0.17
FE2010Q4	-0.035	0.03	-1.290	-0.005	0.02	-0.34
FE2010Q1	-0.042	0.03	-1.570	-0.024	0.02	-1.53
FE2011Q2	-0.037	0.03	-1.340	-0.022	0.02	-1.43
FE2011Q3	-0.022	0.03	-0.790	-0.008	0.02	-0.52
FE2011Q4	0.002	0.03	0.060	0.029 *	0.02	1.81
FE2011Q1	0.002	0.03	0.060	0.026	0.02	1.59
FE2012Q2	-0.013	0.03	-0.460	0.011	0.02	0.68
FE2012Q3	0.004	0.03	0.140	0.018	0.02	1.14
FE2012Q4	0.010	0.03	0.340	0.024	0.02	1.44
FE2012Q1	0.000	0.03	0.000	0.023	0.02	1.36
FE2013Q2	-0.008	0.03	-0.280	0.013	0.02	0.74
FE2013Q3	-0.015	0.03	-0.540	0.008	0.02	0.47
FE2013Q4	-0.008	0.03	-0.290	-0.005	0.02	-0.28
Constant	0.230 ***	0.06	3.700	0.286 ***	0.03	8.49
Firms in sample			309			309
R-squared			*0.25*			*0.28*

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

A3 – PANEL DATA REGRESSION, FULL SAMPLE WITH YEARLY FIXED EFFECTS

Table A3 - Fixed effects panel regression 2004-2013, all firms

	Debt/Capital			Liabilities/Assets		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.072 **	0.00	-2.24	-0.177	0.02	-0.78
Ln sales	0.006	0.01	0.63	0.025 ***	0.01	3.72
Tangibility	0.208 **	0.09	2.36	0.213 ***	0.07	2.91
Market-to-book	-0.072 ***	0.02	-4.18	-0.033 ***	0.01	-4.00
Profitability	-0.193 ***	0.05	-3.57	-0.132 ***	0.03	-4.98
FE2004	*Omitted*			-0.035 **	0.01	-2.48
FE2005	-0.005	0.01	-0.57	-0.059 ***	0.01	-4.62
FE2006	-0.011	0.01	-0.80	-0.080 ***	0.01	-6.79
FE2007	-0.011	0.02	-0.66	-0.081 ***	0.01	-7.09
FE2008	0.027	0.02	1.58	-0.018 **	0.01	-1.82
FE2009	0.067 ***	0.02	3.86	0.035 ***	0.01	3.62
FE2010	0.011	0.02	0.65	-0.016 *	0.01	-1.88
FE2011	0.018	0.02	0.97	-0.011	0.01	-1.64
FE2012	0.041 **	0.02	2.15	0.012 **	0.01	2.38
FE2013	0.030	0.02	1.53	*Omitted*		
Constant	0.280 ***	0.08	3.66	0.273 ***	0.05	5.91
Firms in sample			309			309
R-squared			*0.26*			*0.37*

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

A4 – Panel Data Regression Split in Leverage Quartiles, Quarterly Fixed Effects

Table A4 - Fixed effects panel regression 2004-2013

	Leverage quartile 3-4			Leverage quartile 1-2		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.061 *	0.03	-1.97	-0.003	0.02	-0.12
Ln sales	0.022 **	0.01	2.180	0.018 *	0.01	1.97
Tangibility	0.350 ***	0.12	3.01	0.110	0.07	1.63
Market-to-book	-0.201 ***	0.02	-8.28	-0.019 ***	0.01	-2.94
Profitability	-0.471 ***	0.12	-3.98	-0.137 **	0.06	-2.35
FE2004Q1	0.003	0.01	0.22	0.041 **	0.02	2.05
FE2004Q3	-0.010	0.01	-1.31	0.004	0.01	0.46
FE2004Q4	-0.060 ***	0.02	-3.77	-0.007	0.02	-0.4
FE2004Q1	-0.029 **	0.01	-2.22	-0.021 *	0.01	-1.83
FE2005Q2	-0.003	0.02	-0.16	-0.012	0.02	-0.78
FE2005Q3	-0.015	0.02	-0.81	-0.009	0.02	-0.44
FE2005Q4	-0.037 **	0.02	-2.05	-0.025	0.02	-1.24
FE2005Q1	-0.014	0.02	-0.75	-0.022	0.02	-1.06
FE2006Q2	-0.012	0.02	-0.63	-0.027	0.02	-1.23
FE2006Q3	-0.020	0.02	-0.95	-0.027	0.02	-1.19
FE2006Q4	-0.038 *	0.02	-1.88	-0.023	0.02	-1
FE2006Q1	-0.024	0.02	-1.16	-0.026	0.02	-1.1
FE2007Q2	-0.007	0.02	-0.32	-0.035	0.02	-1.49
FE2007Q3	0.000	0.02	-0.01	-0.028	0.02	-1.2
FE2007Q4	-0.019	0.02	-0.83	-0.031	0.02	-1.4
FE2007Q1	-0.008	0.02	-0.33	-0.027	0.02	-1.17
FE2008Q2	0.004	0.02	0.16	-0.013	0.03	-0.5
FE2008Q3	0.015	0.02	0.63	-0.011	0.03	-0.45
FE2008Q4	0.016	0.02	0.71	-0.007	0.03	-0.26
FE2008Q1	0.105 ***	0.02	4.25	0.041	0.03	1.42
FE2009Q2	0.080 ***	0.02	3.41	0.022	0.03	0.72
FE2009Q3	0.044 *	0.02	1.94	-0.005	0.03	-0.17
FE2009Q4	-0.005	0.02	-0.20	-0.038	0.03	-1.5
FE2009Q1	0.004	0.02	0.17	-0.043	0.03	-1.63
FE2010Q2	-0.014	0.02	-0.60	-0.052 **	0.02	-2.14
FE2010Q3	-0.004	0.02	-0.17	-0.041 *	0.02	-1.67
FE2010Q4	-0.022	0.02	-0.89	-0.051 **	0.02	-2.08
FE2010Q1	-0.030	0.02	-1.24	-0.045 *	0.02	-1.9
FE2011Q2	-0.026	0.02	-1.05	-0.043 *	0.02	-1.76
FE2011Q3	-0.013	0.03	-0.51	-0.039	0.02	-1.54
FE2011Q4	0.022	0.03	0.78	-0.034	0.02	-1.35
FE2011Q1	0.004	0.03	0.13	-0.028	0.03	-1.09
FE2012Q2	-0.009	0.03	-0.35	-0.034	0.02	-1.41
FE2012Q3	0.006	0.03	0.23	-0.026	0.02	-1.06
FE2012Q4	0.022	0.03	0.83	-0.026	0.03	-1.03
FE2012Q1	0.005	0.03	0.17	-0.023	0.02	-0.94
FE2013Q2	-0.005	0.03	-0.17	-0.018	0.03	-0.71
FE2013Q3	-0.013	0.03	-0.46	-0.030	0.03	-1.14
FE2013Q4	-0.003	0.03	-0.10	-0.024	0.03	-0.94
Constant	0.410	0.08	5.31	0.053	0.05	1.00
Firms in sample			155			154
R-squared			*0.44*			*0.16*

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

A5 – Panel Data Regressions, Split Based on Majority Owner. Quarterly Fixed Effects

Table A5 - Fixed effects panel regression 2004-2013

	No direct majority owner			Direct majority owner		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.058 **	0.02	-2.40	0.132	0.25	0.53
Ln sales	0.025 **	0.01	2.56	0.030	0.05	0.55
Tangibility	0.227 **	0.09	2.44	0.345	0.27	1.27
Market-to-book	-0.068 ***	0.02	-3.11	-0.062 *	0.03	-1.92
Profitability	-0.398 ***	0.10	-3.87	-0.697	0.45	-1.55
FE2004Q2	-0.014	0.01	-1.52	0.008	0.03	0.24
FE2004Q3	-0.025 **	0.01	-2.00	0.031	0.04	0.76
FE2004Q4	-0.052 **	0.02	-2.38	-0.013	0.04	-0.36
FE2004Q1	-0.052 ***	0.02	-2.84	-0.013	0.02	-0.72
FE2005Q2	-0.027	0.02	-1.18	0.014	0.03	0.44
FE2005Q3	-0.030	0.03	-1.19	0.009	0.03	0.3
FE2005Q4	-0.042	0.03	-1.56	-0.028	0.04	-0.79
FE2005Q1	-0.035	0.03	-1.29	-0.030	0.05	-0.66
FE2006Q2	-0.047	0.03	-1.60	-0.036	0.04	-0.9
FE2006Q3	-0.052 *	0.03	-1.77	-0.009	0.04	-0.23
FE2006Q4	-0.049 *	0.03	-1.67	-0.029	0.04	-0.72
FE2006Q1	-0.064 **	0.03	-2.11	-0.035	0.04	-0.9
FE2007Q2	-0.055 *	0.03	-1.75	-0.022	0.04	-0.51
FE2007Q3	-0.057 *	0.03	-1.83	0.006	0.05	0.12
FE2007Q4	-0.040	0.03	-1.28	0.009	0.05	0.17
FE2007Q1	-0.035	0.03	-1.13	0.064	0.06	1.11
FE2008Q2	-0.024	0.03	-0.76	0.104 *	0.05	1.9
FE2008Q3	-0.005	0.03	-0.17	0.128 **	0.05	2.74
FE2008Q4	0.010	0.03	0.32	0.066	0.05	1.28
FE2008Q1	0.094 ***	0.03	3.01	0.205 ***	0.04	4.65
FE2009Q2	0.071 **	0.03	2.28	0.201 ***	0.04	4.91
FE2009Q3	0.034	0.03	1.13	0.131 ***	0.04	3.1
FE2009Q4	-0.015	0.03	-0.51	0.033	0.06	0.59
FE2009Q1	-0.014	0.03	-0.46	0.038	0.05	0.72
FE2010Q2	-0.029	0.03	-0.96	0.011	0.05	0.2
FE2010Q3	-0.007	0.03	-0.23	0.023	0.06	0.41
FE2010Q4	-0.022	0.03	-0.70	-0.017	0.06	-0.28
FE2010Q1	-0.033	0.03	-1.05	-0.027	0.06	-0.47
FE2011Q2	-0.024	0.03	-0.77	-0.037	0.06	-0.63
FE2011Q3	-0.009	0.03	-0.30	-0.020	0.07	-0.29
FE2011Q4	0.011	0.03	0.33	0.019	0.06	0.31
FE2011Q1	0.014	0.03	0.44	0.031	0.06	0.56
FE2012Q2	-0.003	0.03	-0.08	0.021	0.06	0.34
FE2012Q3	0.014	0.03	0.43	0.031	0.06	0.48
FE2012Q4	0.014	0.03	0.43	0.072	0.07	1.08
FE2012Q1	0.005	0.03	0.16	0.041	0.06	0.68
FE2013Q2	-0.005	0.03	-0.16	0.037	0.06	0.63
FE2013Q3	-0.010	0.03	-0.32	0.037	0.06	0.59
FE2013Q4	-0.005	0.03	-0.17	0.068	0.08	0.89
Constant	0.179 **	0.08	2.37	0.078	0.32	0.24
Firms in sample			188			29
R-squared			*0.28*			*0.39*

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

A6 – PANEL DATA REGRESSIONS, SPLIT BASED ON BOARD SIZE. QUARTERLY FIXED EFFECTS

Table A6 - Fixed effects panel regression 2004-2013

	Large boards			Small boards		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.064 **	0.03	-2.44	0.107	0.14	0.74
Ln sales	0.018 **	0.01	2.000	0.020	0.02	1.01
Tangibility	0.270 ***	0.08	3.29	-0.042	0.25	-0.17
Market-to-book	-0.069 ***	0.02	-3.50	-0.051 **	0.02	-2.07
Profitability	-0.417 ***	0.11	-3.88	-0.191	0.13	-1.44
FE2004Q2	-0.019	0.01	-1.63	-0.025	0.05	-0.51
FE2004Q3	-0.024 *	0.01	-1.86	-0.020	0.03	-0.68
FE2004Q4	-0.057 ***	0.02	-2.95	-0.007	0.05	-0.13
FE2004Q1	-0.051 ***	0.02	-2.99	0.046	0.03	1.65
FE2005Q2	-0.035 *	0.02	-1.72	0.061 *	0.03	1.82
FE2005Q3	-0.035	0.02	-1.61	0.082	0.06	1.31
FE2005Q4	-0.054 **	0.02	-2.35	0.019	0.05	0.38
FE2005Q1	-0.045 *	0.02	-1.87	0.005	0.05	0.1
FE2006Q2	-0.055 **	0.03	-2.17	-0.018	0.04	-0.43
FE2006Q3	-0.051 **	0.03	-1.99	-0.021	0.04	-0.51
FE2006Q4	-0.052 **	0.03	-2.02	-0.052	0.04	-1.23
FE2006Q1	-0.057 **	0.03	-2.12	-0.039	0.04	-1.08
FE2007Q2	-0.054 **	0.03	-1.98	-0.065 *	0.03	-1.99
FE2007Q3	-0.045	0.03	-1.62	-0.051	0.04	-1.44
FE2007Q4	-0.040	0.03	-1.43	-0.067 **	0.03	-2.02
FE2007Q1	-0.036	0.03	-1.30	-0.022	0.04	-0.6
FE2008Q2	-0.017	0.03	-0.60	0.012	0.04	0.31
FE2008Q3	0.000	0.03	0.02	0.007	0.04	0.18
FE2008Q4	0.010	0.03	0.37	-0.001	0.03	-0.03
FE2008Q1	0.093 ***	0.03	3.20	0.095 **	0.04	2.16
FE2009Q2	0.075 **	0.03	2.60	0.029	0.05	0.6
FE2009Q3	0.034	0.03	1.23	0.011	0.04	0.29
FE2009Q4	-0.015	0.03	-0.55	-0.030	0.03	-1.02
FE2009Q1	-0.013	0.03	-0.47	-0.038	0.03	-1.1
FE2010Q2	-0.024	0.03	-0.87	-0.062 *	0.04	-1.69
FE2010Q3	-0.006	0.03	-0.21	-0.050	0.04	-1.4
FE2010Q4	-0.025	0.03	-0.89	-0.070 **	0.04	-2
FE2010Q1	-0.033	0.03	-1.19	-0.082 *	0.04	-1.94
FE2011Q2	-0.025	0.03	-0.89	-0.082 *	0.04	-1.93
FE2011Q3	-0.011	0.03	-0.38	-0.066	0.04	-1.5
FE2011Q4	0.005	0.03	0.19	0.000	0.05	-0.01
FE2011Q1	0.002	0.03	0.05	0.022	0.05	0.48
FE2012Q2	-0.008	0.03	-0.28	-0.019	0.05	-0.4
FE2012Q3	0.011	0.03	0.38	-0.017	0.05	-0.33
FE2012Q4	0.014	0.03	0.49	0.010	0.05	0.2
FE2012Q1	0.001	0.03	0.05	0.012	0.06	0.22
FE2013Q2	-0.006	0.03	-0.21	0.010	0.06	0.17
FE2013Q3	-0.009	0.03	-0.31	-0.027	0.07	-0.41
FE2013Q4	-0.004	0.03	-0.15	-0.010	0.06	-0.15
Constant	0.224 ***	0.07	3.15	0.294 ***	0.09	3.11
Firms in sample			247			62
R-squared			*0.28*			*0.18*

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

A7 – Panel Data Regressions, Split Based on Female Directors. Quarterly Fixed Effects

Table A7 - Fixed effects panel regression 2004-2013

	Firms with female director(s)			Firms without female directors		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.038 ***	0.01	-3.10	-0.127 ***	0.03	-3.95
Ln sales	0.020 **	0.01	2.06	0.018	0.02	1.19
Tangibility	0.255 ***	0.09	2.76	0.119	0.16	0.74
Market-to-book	-0.065 ***	0.02	-3.20	-0.077 ***	0.03	-2.66
Profitability	-0.501 ***	0.12	-4.22	-0.157	0.12	-1.35
FE2004Q2	-0.017	0.01	-1.55	-0.011	0.03	-0.33
FE2004Q3	-0.021 *	0.01	-1.73	-0.010	0.03	-0.38
FE2004Q4	-0.061 ***	0.02	-3.19	-0.008	0.03	-0.34
FE2004Q1	-0.049 ***	0.02	-2.94	-0.006	0.02	-0.28
FE2005Q2	-0.032	0.02	-1.56	-0.003	0.03	-0.13
FE2005Q3	-0.035	0.02	-1.55	0.022	0.04	0.59
FE2005Q4	-0.061 ***	0.02	-2.64	0.007	0.03	0.20
FE2005Q1	-0.046 *	0.02	-1.87	0.000	0.03	0.01
FE2006Q2	-0.054 **	0.03	-2.09	-0.023	0.03	-0.71
FE2006Q3	-0.052 **	0.03	-2.01	-0.013	0.03	-0.43
FE2006Q4	-0.056 **	0.03	-2.16	-0.036	0.03	-1.25
FE2006Q1	-0.058 **	0.03	-2.15	-0.029	0.03	-0.87
FE2007Q2	-0.051 *	0.03	-1.80	-0.069 **	0.03	-2.33
FE2007Q3	-0.044	0.03	-1.54	-0.053 *	0.03	-1.8
FE2007Q4	-0.040	0.03	-1.42	-0.050	0.03	-1.49
FE2007Q1	-0.033	0.03	-1.20	-0.041	0.05	-0.84
FE2008Q2	-0.018	0.03	-0.62	-0.006	0.04	-0.14
FE2008Q3	0.007	0.03	0.24	-0.022	0.05	-0.48
FE2008Q4	0.018	0.03	0.68	-0.019	0.04	-0.48
FE2008Q1	0.096 ***	0.03	3.29	0.085	0.05	1.59
FE2009Q2	0.074 **	0.03	2.55	0.058	0.05	1.1
FE2009Q3	0.037	0.03	1.32	0.019	0.05	0.41
FE2009Q4	-0.016	0.03	-0.60	-0.008	0.04	-0.21
FE2009Q1	-0.020	0.03	-0.73	0.006	0.04	0.13
FE2010Q2	-0.032	0.03	-1.15	-0.013	0.04	-0.29
FE2010Q3	-0.012	0.03	-0.42	-0.011	0.04	-0.26
FE2010Q4	-0.028	0.03	-0.97	-0.034	0.04	-0.91
FE2010Q1	-0.039	0.03	-1.36	-0.038	0.04	-0.89
FE2011Q2	-0.030	0.03	-1.05	-0.038	0.04	-0.90
FE2011Q3	-0.017	0.03	-0.59	-0.013	0.04	-0.33
FE2011Q4	0.001	0.03	0.04	0.026	0.04	0.69
FE2011Q1	0.003	0.03	0.09	0.021	0.04	0.49
FE2012Q2	-0.010	0.03	-0.33	0.001	0.04	0.03
FE2012Q3	0.009	0.03	0.29	0.012	0.04	0.29
FE2012Q4	0.007	0.03	0.25	0.046	0.04	1.21
FE2012Q1	0.001	0.03	0.04	0.025	0.04	0.59
FE2013Q2	-0.011	0.03	-0.36	0.032	0.04	0.75
FE2013Q3	-0.009	0.03	-0.29	-0.014	0.04	-0.31
FE2013Q4	-0.009	0.03	-0.30	0.017	0.04	0.39
Constant	0.202 **	0.08	2.57	0.323 ***	0.08	4.08
Firms in sample			210			99
R-squared			*0.29*			*0.21*

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

A8 – PANEL DATA REGRESSIONS, SPLIT BASED ON LISTING VENUE. QUARTERLY FIXED EFFECTS

Table A8 - Fixed effects panel regression 2004-2013

	Nasdaq OMX main lists			Other lists		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	0.083	0.06	1.34	-0.075 ***	0.03	-2.71
Ln sales	0.023 **	0.01	2.020	0.019 *	0.01	1.75
Tangibility	0.241 **	0.12	2.00	0.174	0.12	1.42
Market-to-book	-0.106 ***	0.02	-5.32	-0.041 **	0.02	-2.29
Profitability	-0.586 ***	0.17	-3.39	-0.128	0.08	-1.65
FE2004Q2	-0.013	0.01	-1.40	-0.008	0.01	-0.56
FE2004Q2	-0.013	0.01	-1.40	-0.037 **	0.02	-2.02
FE2004Q3	-0.018	0.01	-1.65	-0.012	0.02	-0.64
FE2004Q4	-0.051 ***	0.02	-2.86	-0.010	0.02	-0.52
FE2004Q1	-0.046 ***	0.02	-3.02	-0.010	0.03	-0.41
FE2005Q2	-0.025	0.02	-1.31	-0.028	0.02	-1.37
FE2005Q3	-0.023	0.02	-1.12	0.005	0.03	0.19
FE2005Q4	-0.042 *	0.02	-1.95	-0.016	0.02	-0.68
FE2005Q1	-0.042 *	0.02	-1.88	-0.004	0.02	-0.15
FE2006Q2	-0.041 *	0.02	-1.75	-0.010	0.02	-0.5
FE2006Q3	-0.048 **	0.02	-2.07	-0.031	0.02	-1.27
FE2006Q4	-0.054 **	0.02	-2.25	-0.054 **	0.02	-2.49
FE2006Q1	-0.049 **	0.02	-2.01	-0.033	0.02	-1.53
FE2007Q2	-0.034	0.03	-1.29	-0.033	0.02	-1.43
FE2007Q3	-0.030	0.03	-1.15	-0.047 *	0.03	-1.83
FE2007Q4	-0.032	0.03	-1.23	-0.024	0.03	-0.93
FE2007Q1	-0.012	0.03	-0.45	-0.013	0.03	-0.48
FE2008Q2	0.003	0.03	0.10	0.011	0.03	0.41
FE2008Q3	0.014	0.03	0.48	0.076 **	0.03	2.42
FE2008Q4	0.011	0.03	0.41	0.054 *	0.03	1.69
FE2008Q1	0.094 ***	0.03	3.27	0.037	0.03	1.27
FE2009Q2	0.072 **	0.03	2.49	0.006	0.03	0.23
FE2009Q3	0.029	0.03	1.06	0.012	0.03	0.43
FE2009Q4	-0.023	0.03	-0.86	-0.012	0.03	-0.44
FE2009Q1	-0.023	0.03	-0.85	0.002	0.03	0.07
FE2010Q2	-0.031	0.03	-1.14	-0.020	0.03	-0.78
FE2010Q3	-0.015	0.03	-0.51	-0.033	0.03	-1.15
FE2010Q4	-0.030	0.03	-1.06	-0.034	0.03	-1.2
FE2010Q1	-0.031	0.03	-1.13	-0.009	0.03	-0.35
FE2011Q2	-0.023	0.03	-0.81	0.006	0.03	0.22
FE2011Q3	-0.015	0.03	-0.52	0.002	0.03	0.09
FE2011Q4	0.004	0.03	0.14	-0.018	0.03	-0.65
FE2011Q1	0.006	0.03	0.21	0.001	0.03	0.04
FE2012Q2	-0.002	0.03	-0.07	0.029	0.03	0.94
FE2012Q3	0.012	0.03	0.39	0.011	0.03	0.34
FE2012Q4	0.010	0.03	0.35	0.019	0.03	0.59
FE2012Q1	0.004	0.03	0.12	0.002	0.03	0.07
FE2013Q2	-0.008	0.03	-0.25	0.025	0.04	0.69
FE2013Q3	-0.013	0.03	-0.44	0.233 ***	0.06	4.12
FE2013Q4	-0.010	0.03	-0.35	0.000	0.00	0
Firms in sample			147			162
R-squared			*0.34*			*0.17*

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*

A9 – PANEL DATA REGRESSIONS, SPLIT BASED ON FIRM AGE. QUARTERLY FIXED EFFECTS

Table A9 - Fixed effects panel regression 2004-2013

	Firms, 15 year and older			Firms, younger than 15 years		
Regressor	**Coefficient**	**Std error**	**t-statistic**	**Coefficient**	**Std error**	**t-statistic**
ROA volatility	-0.074	0.06	-1.28	-0.053 ***	0.01	-4.48
Ln sales	0.024 **	0.01	2.530	0.003	0.02	0.18
Tangibility	0.198 **	0.09	2.20	0.274	0.33	0.82
Market-to-book	-0.086 ***	0.02	-4.34	-0.039 **	0.02	-2.03
Profitability	-0.455 ***	0.10	-4.35	-0.078	0.07	-1.07
FE2004Q2	-0.024	0.02	-1.54	-0.006	0.01	-1.12
FE2004Q3	-0.030 *	0.02	-1.78	-0.013	0.02	-0.69
FE2004Q4	-0.061 **	0.03	-2.42	-0.010	0.02	-0.44
FE2004Q1	-0.054 **	0.02	-2.43	-0.033	0.02	-1.59
FE2005Q2	-0.047 *	0.02	-1.92	-0.001	0.02	-0.03
FE2005Q3	-0.050 **	0.02	-2.04	0.035	0.05	0.76
FE2005Q4	-0.062 **	0.03	-2.22	0.007	0.03	0.21
FE2005Q1	-0.052 *	0.03	-1.77	0.015	0.04	0.34
FE2006Q2	-0.062 **	0.03	-2.06	0.007	0.04	0.18
FE2006Q3	-0.055 *	0.03	-1.80	-0.018	0.04	-0.45
FE2006Q4	-0.064 **	0.03	-2.06	-0.005	0.04	-0.14
FE2006Q1	-0.059 *	0.03	-1.85	-0.024	0.03	-0.7
FE2007Q2	-0.067 **	0.03	-2.08	-0.018	0.04	-0.48
FE2007Q3	-0.056 *	0.03	-1.74	-0.015	0.04	-0.4
FE2007Q4	-0.051	0.03	-1.52	-0.011	0.04	-0.29
FE2007Q1	-0.046	0.03	-1.33	-0.001	0.03	-0.03
FE2008Q2	-0.024	0.04	-0.68	0.001	0.03	0.02
FE2008Q3	-0.009	0.04	-0.26	0.023	0.04	0.63
FE2008Q4	0.002	0.03	0.06	0.020	0.04	0.52
FE2008Q1	0.080 **	0.04	2.20	0.107 **	0.04	2.54
FE2009Q2	0.055	0.04	1.52	0.085 **	0.04	2.1
FE2009Q3	0.017	0.04	0.49	0.052	0.04	1.4
FE2009Q4	-0.030	0.03	-0.87	0.013	0.03	0.38
FE2009Q1	-0.032	0.04	-0.92	0.026	0.04	0.72
FE2010Q2	-0.043	0.04	-1.23	0.007	0.04	0.19
FE2010Q3	-0.029	0.04	-0.79	0.020	0.03	0.57
FE2010Q4	-0.046	0.04	-1.30	0.009	0.03	0.27
FE2010Q1	-0.057	0.04	-1.60	0.003	0.03	0.07
FE2011Q2	-0.049	0.04	-1.37	0.004	0.04	0.1
FE2011Q3	-0.031	0.04	-0.84	0.003	0.04	0.09
FE2011Q4	-0.006	0.04	-0.17	0.024	0.04	0.65
FE2011Q1	-0.008	0.04	-0.21	0.030	0.04	0.77
FE2012Q2	-0.020	0.04	-0.56	0.012	0.04	0.31
FE2012Q3	-0.002	0.04	-0.06	0.027	0.04	0.66
FE2012Q4	0.005	0.04	0.13	0.028	0.04	0.7
FE2012Q1	-0.005	0.04	-0.15	0.024	0.04	0.62
FE2013Q2	-0.011	0.04	-0.30	0.015	0.04	0.38
FE2013Q3	-0.026	0.04	-0.70	0.024	0.04	0.6
FE2013Q4	-0.028	0.04	-0.76	0.044	0.04	1.11
Constant	0.244 ***	0.08	3.10	0.224 **	0.11	2.10
Firms in sample			241			99
R-squared			*0.28*			*0.21*

Regressions with firm fixed effects, quarterly time fixed effects and robust standard errors

, ** and * denote statistical significance at the 10, 5 and 1 percent level, respecively.*