The determinants of capital structure: Evidence from Sweden

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This paper investigates the predictions on capital structure made by the static trade-off theory and the pecking order theory in a Swedish context, from 2009-2013. Hypotheses were derived from both theories and have been tested using an ordinary least squire regression model. The empirical results show that the firm-level determinants profitability, tangibility, growth opportunities, size and liquidity play a significant role in determining the capital structure of Swedish stock listed firms. The results furthermore show that the static trade-off theory has the most explanatory power for the capital structure of Swedish stock listed firms.

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1. INTRODUCTION

The corporate financing decisions firms make are determined by a diversity of factors on different levels. These factors do not only affect the firms itself but also the suppliers of capital. One of the first to examine these factors were Modigliani and Miller (1958), who developed the so called irrelevance theory. This stated that the value of a firm is independent of its capital structure in a perfect market. The irrelevance theory opened a discussion about this topic and new theories emerged. Nowadays three commonly used theories exist: the static trade-off theory, the pecking order theory and the agency cost theory. The static trade-off theory argues that the capital structure of a firm is dependent on the trade-off between the gains and costs of debt (Myers, 1984). The second theory, the pecking order theory, states that a certain hierarchy of financing exists, which is caused by information asymmetry (Frank and Goyal, 2003). Firms prefer internal financing over external financing and if external financing is needed, debt is preferred over equity (Myers and Sunder, 1999). The agency cost theory is the third theory which is commonly used to explain the capital structure of firms. This theory tries to explain capital structure decisions by the agency cost which arise from conflicts in interests between shareholders and owners of a firm (Jensen and Meckling, 1976; Morellec et al., 2010). Many studies put their focus on the static trade-off theory and the pecking order theory and provide evidence for both theories (Brounen et al., 2006; Fama and French, 2002; Rajan and Zingales, 1995). This study will do the same and focusses on these two theories as well.

The capital structure problem firms face is a commonly studied topic and a wide variety of these studies exist (Graham and Leary, 2011; Rajan and Zingales, 1995; Song, 2005). Many of these studies are restricted to big countries such as the USA (Chen, 2004; Frank and Goyal, 2003; Rajan and Zingales, 1995). Besides these studies some research has been done on multiple countries, which sometimes included several smaller countries as well (Brounen et al., 2006; Deesomsak et al., 2004; de Jong et al., 2008). Therefore, studies on small countries on their own, such as Sweden, become more relevant. These specified studies make it possible to compare determinants between different countries. Overall the existing literature provide evidence for both the static trade-off theory and the pecking order theory (Fama and French, 2002; Rajan and Zingales, 1995). But both theories are unable to explain the large variety of capital structures on its own (Graham and Leary, 2011). Therefore conclusions made, based on these theories are far from complete. And the capital structure puzzle is yet to be solved.

Literature shows that capital structure can be determined by firm-level, industry-level and country-level determinants. This paper focusses on the firm-level determinants of Swedish stock listed firms. Which is especially relevant because firm-level determinants are not generalizable, they differ among countries (de Jong et al., 2008). This means that determinants which explain the capital structure of, for example Australian firms, do not necessarily explain the capital structure of Swedish firms. Therefore the research question of this paper is:

What are the firm-level determinants of capital structure of Swedish stock listed firms?

This paper generates a framework of the firm-level determinants which is useful for comparisons with older data or other countries. Studies on Sweden in specific are scarce, since most studies focus on bigger countries as stated before (Chen, 2004; Frank and Goyal, 2003; Rajan and Zingales, 1995). In addition, existing literature on Swedish firms often use older data, examples are de Jong et al. (2008) and Song (2005), whereas this paper uses recent data. But their studies provide useful material for comparisons with the results of this study. Furthermore, this paper provides managers with a better understanding of the capital structure puzzle they face.

The results of this paper highlight the differences between the static trade-off theory and the pecking order theory. The results are in favour of the static trade-off theory, whereas the pecking order theory finds little support. This means that Swedish stock listed firms tend to adapt their capital structure according to the principles of the static trade-off theory.

The following section of this paper reviews the existing literature on the topic of capital structure. The third section covers the methodological part of this paper. The fourth section describes the results of testing the hypotheses. The fifth section is the conclusion.

2. LITERATURE REVIEW

Modigliani and Miller (1958) were one of the first to examine the capital structure of firms. The discussion which was opened by their research led to the creation of new theories. The main theories will be discussed in this part after which hypotheses will be formulated accordingly.

2.1 Static trade-off theory

The Modigliani and Miller theory suggests that the value of a firm is independent of its capital structure under perfect market conditions. Which makes the capital structure choice irrelevant. Besides, there is no optimal leverage ratio, all different ratios of leverage are equivalents and give the same cost of capital (Modigliani and Miller, 1958). Some of the essential assumptions made by Modigliani and Miller were the absence of transaction costs, bankruptcy costs, taxes and information asymmetry (Bradley et al., 1984). But due to the fact that we do not live in a perfect world, their theory does not uphold and the capital structure choice is not irrelevant. Therefore, new theories were derived from the irrelevance theory. One of these was the static trade-off theory. It states that a trade-off between the benefits and costs of debt exists and this trade-off determines the optimal leverage ratio (Myers, 1984). Therefore a target leverage ratio exists, which the firm tries to achieve. Benefits of debt are the tax shields and the reduced agency costs of free cash flows (Green and Tong, 2005). These tax shields mean that the interest payments are tax deductible, which lower the taxes which have to be paid by the firm (DeAngelo and Masulis, 1980). The tax shields would lead to firms which are almost completely debt financed, because equity won't give these benefits (Modigliani and Miller, 1963). But these advantages have their limits, adding debt to a full extent would not be realistic. This new view on the irrelevance theory of Modigliani and Miller (1958) led to the introduction of the costs of debt. The costs consist of monitoring, contracting and financial distress costs which firms experience from increasing debt (Green and Tong, 2005; Myers, 1984). Financial distress costs are costs which incur from avoiding bankruptcy. Due to the fact that higher debt levels lead to a higher chance of going bankrupt these costs increase when more debt is used. In addition, suppliers may also be less willing to provide credit and there may be a need to lower the prices to remain competitive (Frank and Goyal, 2008).

To see if the static trade-off theory holds, hypotheses are formulated. One of the main benefits from using debt is the tax deductibility of the interest payments, which lowers the taxes which have to be paid. But firms might have tax deductibles related to other sources than debt, which lowers their corporate tax burden (Fama and French, 2002; Kolay et al., 2013). These other kinds of tax shields might occur from depreciations, R&D

costs and investment tax credits. They can shield income from taxes and therefore act as a substitute of the debt tax shields (DeAngelo and Masulis, 1980; Titman and Wessels, 1988). Therefore firms with large non-debt tax shields would be less triggered to hold great amounts of debt. That is why the first hypothesis is:

H1:Non-debt tax shields are negatively related to the leverage ratio of a firm.

One of the elements which plays a role in the creation of tax shields is the profitability of a firm. This is caused by asymmetric taxation, profits are much more heavily taxed as losses are subsidized. Therefore highly profitable firms are expected to have a higher tax rate (DeAngelo and Masulis 1980; Fama and French, 2002; Feld et al., 2013). This counts especially for progressive tax rates, which means that increasing earnings lead to an increase in the tax rate which is more than proportionally. And with this increase in the tax rate, the gain from the debt tax shield increases as well. Therefore the benefit from using debt increases for highly profitable firms (Hovakimian et al., 2011). In line with this reasoning the second hypothesis is:

H2: Profitability is positively related to the leverage ratio of a firm.

According to the static trade-off theory, having large amounts of tangible assets decreases the bankruptcy costs of a firm (Chen, 2004; Hovakimian et al., 2004; Rajan and Zingales, 1995). By increasing the amount of tangible assets the amount of assets which can be used as collateral is increased. Therefore tangible assets lower the bankruptcy costs and increases the amount of debt which can be used by a firm. This is supported by Chen (2004) who states that tangible assets are easier to act as collateral than intangible assets. This leads to the third hypothesis:

H3: Tangible assets are positively related to the leverage ratio of a firm.

As Myers (1984) already investigated in his research, intangible assets and valuable growth opportunities tend to have a higher chance of becoming less valuable in times of financial distress. Growth opportunities therefore increase the financial distress costs. Which, according to the static trade-off theory, have a negative impact on the leverage ratio of a firm, because they decrease the benefits received from using debt. This is supported by Graham and Leary (2011) and Gul (1999). In addition there has to be noted that growth opportunities do add value to a firm but cannot be collateralized (Titman and Wessels, 1988). Which is in line with the first hypothesis. From all of this the following hypothesis can be derived:

H4:Growth opportunities are negatively related to the leverage ratio of a firm.

Another factor influencing the financial distress costs is the size of a firm, because larger firms tend to be more diversified and less sensitive to bankruptcy than smaller firms (Chen, 2004; Titman and Wessels, 1988). Therefore the financial distress costs tend to be less for bigger firms. The static trade-off theory thus predicts a positive relation between firm size and the leverage ratio of a firm. A second argument in favour of the predicted positive relation comes from Myers and Majluf (1984). They state that the bigger a firm is, the lower the information asymmetry will be. This means that the information gap between insiders of the firm and outsiders is smaller for bigger firms. Causes are the regulations bigger firms face, such as obligated annual financial statements. Besides, bigger firms tend to be more transparent than smaller firms, which again is partially caused by regulations. Thus bigger firms tend to have lower information asymmetry and corresponding costs. Due to the fact that information asymmetry is a barrier for using debt, bigger firms have easier access to debt (Sufi, 2007). This leads to the fifth hypothesis testing the static trade-off theory:

H5: Size is positively related to the leverage ratio of a firm.

A sixth factor influencing the capital structure of firms is liquidity (Jensen, 1986; Mazur, 2007). Jensen (1986) and Mazur (2007) both argue that firms holding lots of cash should acquire new debt in order to prevent managers from wasting cash. Furthermore, illiquid firms tend to be restricted in attracting debt, because their bankruptcy costs are higher (Degryse et al., 2009). Therefore, according to the static trade-off theory, higher liquidity should lead to holding more debt. This positive prediction is widely supported by empirical evidence (Bevan and Danbolt, 2002; Mazur, 2007; Titman and Wessels, 1988). That is why the sixth hypothesis is:

H6: Liquidity is positively related to leverage ratio of a firm.

2.2 Pecking order theory

Another theory which is commonly used for explaining the capital structure of firms is the pecking order theory. It argues that a certain hierarchy of financing is present. In this hierarchy, internal financing is the most preferred kind of financing. Retained earnings are an example of internal financing. When internal financing cannot be obtained or is insufficient, firms use external financing. If external financing is used, debt is preferred over equity. Equity is only used as a last resort (Frank and Goyal, 2003; Myers, 1984). This hierarchy is caused by adverse selection. Which in turn is caused by transaction costs and information asymmetry costs (Fama and French, 2002). These transaction costs are the costs which arise from the issues of for example debt and equity. The information asymmetry costs on the other hand are the costs which arise from the fact that managers have more information about a firm than outsiders do. They know for instance more about the prospects and risks of a firm (Fama and French, 2002). Besides, managers tend to be less willing to share information to outsiders. Therefore internal financing is preferred over external financing. Furthermore, owners of debt ask less information than equity holders do. Because debtholders get their money back sooner than equity holders in case of a bankruptcy. Thus debt is preferred over equity (Myers, 2001). An optimal debt to equity ratio is absent, instead the driver for the use of debt is the need for external funding (Myers and Sunder, 1999). Therefore firms are not striving for a targeted leverage ratio.

In order to see if the pecking order theory applies to Swedish stock listed firms, hypotheses have to be formulated. One possible determinant is the profitability of a firm. Where the static trade-off theory predicts a positive relation with the leverage ratio of a firm, the pecking order theory predicts a negative relation, because internal financing is preferred over external financing. The possibility to finance a project with internal financing increases when firms become more profitable. This is caused by the fact that more profitable firms can generate more retained earnings due to their higher profits. Therefore highly profitable firms are more capable of creating internal financing and therefore use less debt (Fama and French, 2002). Several studies investigating the relation between profitability and the leverage ratio of a firm are in line with the prediction of the pecking order theory (Fama and French, 2002; Frank and Goyal, 2003; de Jong et al., 2008; Titman and Wessels, 1988). This leads to the first hypothesis according to the pecking order theory:

H7: Profitability is negatively related to the leverage ratio of a firm.

A second factor to determine the presence of the pecking order theory, is liquidity. Which is the capability of firms to meet current liabilities with current assets. This determinant is commonly used in the existing literature. (Deesomsak et al., 2004; de Jong et al., 2008). Due to the preference of internal finance by firms, they rather use existing cash than debt or equity financing. According to the pecking order theory, liquid assets can be used as a form of internal funding and are therefore preferred over external financing (Butt et al., 2013; de Jong et al., 2008). Thus highly liquid firms have more existing cash and consequently have less demand for external financing (Butt et al., 2013). From this the eight hypothesis can be formulated:

H8: Liquidity is negatively related to the leverage ratio of a firm.

Another factor playing a role in the capital structure according to the pecking order theory are growth opportunities. It predicts a negative relation between growth opportunities and the leverage ratio of a firm. This is caused by the fact that high growth firms tend to have more information asymmetry problems and therefore prefer internal financing. Managers tend to know more about the value of future growth opportunities, which increase the information asymmetry (Frank and Goyal, 2008). Myers (1977) also states that firms with high future growth opportunities should use great amounts of equity. Due to the fact that highly levered firms are more capable to pass up profitable investment opportunities (Myers, 1977; Rajan and Zingales, 1995). Therefore the final hypothesis testing the pecking order theory is the same as the one derived from the static trade-off theory:

H4:Growth opportunities are negatively related to the leverage ratio of a firm.

A summary of the before mentioned hypotheses is presented in table 1.

Table 1: Summary of hypotheses

Theory	Hypothesis	Predicted relationship
TOT	H1	Non-debt tax shields are negatively related to the leverage ratio of a firm.
TOT	H2	Profitability is positively related to the leverage ratio of a firm.
TOT	H3	Tangible assets are positively related to the leverage ratio of a firm.
TOT & POT	H4	Growth opportunities are negatively related to the leverage ratio of a firm.
TOT	H5	Size is positively related to the leverage ratio of a firm.
TOT	H6	Liquidity is positively related to the leverage ratio of a firm.
POT	H7	Profitability is negatively related to the leverage ratio of a firm.
POT	H8	Liquidity is negatively related to the leverage ratio of a firm.

TOT= Static trade-off theory. POT= Pecking order theory.

3. METHODOLOGY

This section starts with the method of analysis for testing the hypotheses. It continues with the description of all dependent and independent variables which are used in this study. At last the characteristics of the dataset which is used are elaborated.

3.1 Research methodology

In order to investigate which firm-level determinants affect the leverage ratio of Swedish stock listed firms a few analyses will be carried out. Beginning with the univariate analysis which describes the statistics of the independent variables. After this, a bivariate analysis will be done to check for correlations between the firm-level determinants and the leverage ratio of firms. Finally a multivariate regression analysis will be carried out by using the ordinary least square regression (OLS) analysis. This, in order to test whether the static trade-off theory or the pecking order theory is more dominant in explaining the capital structure of Swedish stock listed firms. To check for the robustness of the results, regression results per year will be compared with the results of the full time period.

The OLS analysis is a frequently used method for analysing the determinants of capital structure (Berger et al., 1997; Deesomsak, 2004; Heshmati, 2001; de Jong et al., 2008). It tries to estimate the linear relationship between the dependent and the independent variables. It produces a line of best fit, so the sum of the distance from the observations to the line are minimized. The OLS analysis makes assumptions such as the causal relationship between the dependent and the independent variables, linearity and independence of observations. These assumptions mean that the independent variables determine the dependent variables and that their relation is linear. Independence of observations means that each observation is unrelated to another observation and therefore they do not influence each other.

It is possible that the dependent variable (leverage ratio) causes the independent variables (determinants). Because this study tries to examine the relation of the determinants on the leverage ratio this might cause a causality problem. In order to overcome this problem, data from the independent variables are lagged one year behind the data of the dependent variable. This is done in more studies on capital structure and leverage ratios to make the research less biased (Deesomsak et al., 2004; Titman and Wessels, 1988).

The following model is formulated which is used in this study:

$$LEV_{it} = \alpha + \beta_1 NDTS_{it-1} + \beta_2 PROF_{it-1} + \beta_3 TANG_{it-1} + \beta_4 GROW_{it-1} + \beta_5 SIZE_{it-1} + \beta_6 LIQ_{it-1} \varepsilon_{it}$$

Where:

LEV_{it} = The leverage ratio of firm i at time t-1,

α = The constant in the model,

$NDTS_{it-1}$ = The non-debt tax shields of firm i at time t-1,

$PROF_{it-1}$ = The profitability of firm i at ime t-1,

$TANG_{it-1}$ = The tangibility of firm i at time t-1,

$GROW_{it-1}$= The growth opportunities of firm i at time t-1,

$SIZE_{it-1}$ = The size of firm i at time t-1,

LIQ_{it-1} = The liquidity of firm i at time t-1,

ε_{it} = The error term.

The above mentioned model is derived from similar models which have been used for studies on leverage ratios of firms. Examples are Deesomsak et al. (2004) and de Jong et al. (2008). Although there has to be noticed that they used some other independent variables, but the model is very similar to the one used in this study.

3.2 Dependent variables

A commonly used indicator for the capital structure of firms is their leverage ratio (Deesomsak et al., 2004; de Jong et al., 2008). In order to measure the leverage ratio of a firm the total long-term debt is divided by total assets. Both values used are book values. The usage of long-term debt instead of the total debt is in line with de Jong et al. (2008) and Titman and Wessels (1988). As de Jong et al. (2008) found out that long-term debt gives results which are better for interpretation. A reason for this is the fact that short-term debt largely exists of trade credit which is influenced by other determinants(de Jong et al., 2008). Therefore the usage of the total debt gives results which are hard to interpret.

3.3 Independent variables

3.3.1 Non-debt tax shield

As an indicator for non-debt tax shields, this paper uses depreciation over total assets. Which is done in multiple other studies on corporate leverage (Degryse et al., 2009; Fama and French, 2002; Heshmati, 2001; Titman and Wessels, 1998).

3.3.2 Profitability

In order to measure the profitability of a firm, the annual earnings before interest and taxes divided by total assets is used (de Bie and de Haan, 2007; Deesomsak et al., 2004; Fama and French, 2002).

3.3.3 Tangibility

According to Deesomsak et al . (2004), Heshmati (2001) and de Jong et al. (2008) the determinant tangibility can be calculated in the following way: the fixed assets over total assets.

3.3.4 Growth opportunities

There are multiple ways to measure growth opportunities. The definition used in this paper is the growth in total assets of a firm (Degryse et al., 2009). This definition can be written as the following formula: [total assets(t) − total assets($t-1$)]/total assets($t-1$).

3.3.5 Size

In this paper the determinant size is indicated by the natural logarithm of sales. This is a commonly used way to measure the size of a firm (de Bie and de Haan, 2007; Fama and French, 2002; de Jong et al., 2008; Titman and Wessels, 1988).

3.3.6 Liquidity

As an indicator for liquidity the conventional way is used, which is total current assets divided by total current liabilities (Deesomsak et al., 2004; de Jong et al., 2008).

3.4 Data

This study focusses on the capital structure of Swedish stock listed firms from 2009 until 2013. Due to the fact that the crisis started in 2008 and the independent variables lag one year, the year 2008 is excluded, because this year gives biased information. The first step in gathering the data is finding an appropriate sample, this means finding Swedish firms which meet a couple of criteria. To start with, the firms need to be listed on the Swedish stock exchange, the Nasdaq OMX Stockholm. Furthermore, firms in the financial sector are excluded from the sample, because these firms have different capital structures compared to firms in other sectors (Gauthier et al., 2012; Rajan and Zingales, 1995). This can be explained by, for example, legal capital requirements. Therefore the focus of this research is on industrial firms. Finally the firms need to have data for all the relevant years. If a variable is missing, the firm is excluded from the data set. The relevant years run from 2009 until 2013. These are the years which provide the latest data and therefore reflect the current situation the best. Because the independent variables lag one year behind the dependent variable and the variable growth opportunities demands data from two consecutive years, data is gathered from 2007 until 2013. Rajan and Zingales (1995) stated in their study that firms listed on the stock exchange are not representative for the average firm in a country. Instead they count for a small proportion of the firms in a country, the tip of an iceberg. But due to the fact that common institutions influence both the tip and all parts that are underneath it, the information of this study is useful in a broader sense (Rajan and Zingales, 1995).

After the selection of the firms which are used in the analysis, the required data to measure the determinants can be accessed via the database Orbis. This database gave 445 potential firms to investigate. But 130 firms provided the necessary data which gives us 425 firm year observations. In order to make this study more reliable, outliers are removed, because they can give biased results. Values are considered as outliers when they deviate more than two standard deviations from the mean. After this procedure 85 firms came out to be suitable for this study.

4. RESULTS

This section starts with an overview of the descriptive statistics of the variables used in this study. These statistics are compared with the descriptive statistics of other studies. After this the correlations between the variables are discussed. Finally an OLS regression analysis is performed and its results are compared with previous literature.

4.1 Descriptive statistics

A summary of the descriptive statistics can be seen in table 2.

Table 2: Descriptive statistics

Variable	Formula	Mean	Median	STD	Min	Max
LEV	Long term debt / Total assets	0.15	0.14	0.11	0.00	0.44
NDTS	Depreciation / Total assets	0.03	0.03	0.02	0.00	0.11
PROF	EBIT / Total assets	0.06	0.07	0.09	-0.31	0.26
TANG	Fixed assets / Total assets	0.53	0.52	0.18	0.16	0.92
GROWTH	[Total assets(t) − Total assets($t-1$)] / Total assets($t-1$).	0.05	0.04	0.17	-0.45	0.70
SIZE	Natural logarithm of total sales	13.24	13.17	2.08	8.04	17.37
LIQ	Current assets / Current liabilities	1.46	1.34	0.58	0.31	3.90

This table shows the formulas, means, medians, standard deviation, minimum and maximum values of the independent and dependent variables. The sample size for all variables is 425.

The mean value for the long-term debt ratio in this study is 0.15. De Jong et al. (2008) found a value of 0.103 which is lower than the value found in this study. An explanation for this difference in the long-term debt ratio is the different time periods which are used. De Jong et al. (2008) used data from 1997-2001 where this study uses data from 2009-2013. It shows that the current sample of Swedish stock listed firms hold more long-term debt or the value of the total assets has dropped. The average value for non-debt tax shields in this study is 0.03.

Song (2005) calculated a mean of 0.055 for this determinant in his study. The explanations for this difference is the fact that Song (2005) uses data from 1991-2000, where this study uses more recent data. Which means that the presence of non-debt tax shields in Swedish listed firms has decreased. The average for the determinant profitability is 0.06, where Song (2005) found a value of 0.080. This decrease in profitability is attributed to the financial crisis. The mean value for tangibility found in this study is 0.53, which is lower than the value found by Fan et al. (2012) who calculated a mean of 0.57. An explanation for the decrease in tangibility is the growing importance of intangible assets (Andrews and de Serres, 2012). For the determinant growth opportunities an average of 0.05 has been found. This average is higher than the one found by Lööf (2004), which is 0.035. This increase in growth opportunities is attributed to the different time periods which are used by Lööf (2004) and in this study. Lööf (2004) uses data from 1991-1998, where this study focuses on data from 2009-2013. The mean value for sales, which is measured as the natural logarithm of sales is 13.24 in this study. This value is much higher than the one found by de Jong et al. (2008), they calculated a value of 6.30. This higher value is in line with the statement that firms tend to grow bigger every year (Farinas and Moreno, 2000). For the variable liquidity an average value of 1.46 is found, de Jong et al. (2008) found a value of 3.081. Because de Jong et al. (2008) used data from 1997-2001, it can be said that de liquidity of Swedish firms has decreased.

4.2 Results bivariate analysis

For all the variables used in this study bivariate correlations are calculated. The correlations between the variables are represented in table 3. The results show that the independent variable tangibility is positively related to the leverage ratio of a firm. This correlation is significant at an 1% level, which means that the possibility that the correlation is created by chance is 1% or less. This correlation is in favour of the static trade-off theory, which predicts a positive relation between tangibility and the leverage ratio of a firm. This is consistent with hypothesis three. Firm size is also significantly correlated to the leverage ratio of a firm at an 1% level. This correlation is in line with hypothesis five, which was derived from the static trade-off theory. The hypothesis predicts a positive relation between firm size and its leverage ratio. Therefore this correlation is in line with the static trade-off theory. Furthermore, the analysis shows us a couple more correlations which are noteworthy, but not significant. The first correlation is a positive one between non-debt tax shields and the leverage ratio of a firm. This is in contrast with the static trade-off theory. Another correlation, between profitability and leverage ratio, is negative. This correlation is contradictory with the static trade off theory, but in favour of the pecking order theory. Next to this the variable growth opportunities shows a positive correlation with the leverage ratio. This correlation is in contrast with both the static trade-off theory and the pecking order theory and it is not strong and neither significant. Finally the analysis shows us a negative relation between liquidity and leverage ratio, which is also in line with the pecking order theory, but this correlation is not strong and significant.

Between the independent variables correlations are calculated as well. Some of the correlations between these variables are significant and noteworthy. Table 3 shows that the firm-level determinant non-debt tax shields is significantly and negatively correlated with the variables profitability, growth opportunities and liquidity. Non-debt tax shields are furthermore positively correlated with tangibility. All these correlations are significant at an 1% level. Profitability also shows a positive and significant correlation with growth opportunities, size and liquidity, all at an 1% level. Lastly table 3 reports a positive correlation between tangibility and size at a 5% level and a negative correlation between tangibility and liquidity at an 1% level.

Table 3: Bivariate correlations

	LEV	NDTS	PROF	TANG	GROWTH	SIZE	LIQ
LEV	1						
NDTS	0.06	1					
PROF	- 0.05	- 0.18**	1				
TANG	0.35**	0.24**	- 0.04	1			
GROWTH	0.01	- 0.16**	0.21**	- 0.03	1		
SIZE	0.16**	- 0.04	0.32**	0.10*	- 0.08	1	
LIQ	- 0.03	- 0.26**	0.28**	- 0.47 **	- 0.02	- 0.09	1

For definitions see table 2. *. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

To check for multicollinearity, which is the situation where correlations between independent variables are strong, variance inflation factors (VIF) are checked. As a rule of thumb VIF values above 4 indicate multicollinearity (O'Brien, 2007). All the independent variables show VIF values far below 4, which indicates the absence of multicollinearity. In addition, Huizingh (2006) states that multicollinearity is absent when the correlation coefficients between the independent variables are not higher than 0.7. The independent variables used in this study show correlation coefficients lower than 0.7, therefore multicollinearity is not a problem in this study.

4.3 Results multivariate analysis

The results of the multivariate regression analysis are presented in table 4. This regression analysis shows us to which degree the leverage ratio of Swedish stock listed firms is explained by the firm-level determinants. Table 4 contains two models. The first model contains the results of testing the variables of the pecking order theory. The second model contains the results of variables testing the static trade-off theory. The second model also shows the results of the analysis of both theories, due to the fact that all the variables used in this study are also tested by the static trade-off theory.

Table 4: Multivariate regression

	Predicted relationship	Model 1 Variables pecking order model	Model 2 Variables static trade-off theory
Constant		0.16 [a]	-0.18[a]
		(0.00)	(0.00)
NDTS	-		0.04
			(0.88)
PROF	+/-	-0.06	-0.23[a]
		(0.36)	(0.00)
TANG	+		0.27[a]
			(0.00)
GROWTH	-	0.01	0.05[c]
		(0.65)	(0.07)
SIZE	+		0.01[a]
			(0.00)
LIQ	-	0.00	0.05[a]
		(0.73)	(0.00)
N		425	425
Adjusted R^2		0.00	0.18

For definitions see table 2.
The subscripts a, b and c mean statistical significance at an 1%, 5% and 10% level respectively.
P-values are mentioned in parentheses.
No clear signs for hetroskedasticity are observed.

Table 4 shows us a slightly positive relation for the variable non-debt tax shields. This is in contrast with the first hypothesis, which predicts a negative relationship between non-debt tax shields and leverage ratio. Furthermore the p-value of 0.880 indicates that this relation is far from significant. This means that for this data set, the probability that non-debt tax shields do not explain the leverage ratio of Swedish stock listed firms is 88.0%. Therefore the first hypothesis has to be rejected. The results shown for non-debt tax shields are in line with Lööf (2004) who found a positive relation as well. Although the relation found by Lööf (2004) was significant where the relation found in this study was not. This difference can be attributed to the different datasets which are used. The second firm-level determinant, profitability shows a negative and insignificant relation in the first model, but a negative and significant relation in the second model. Due to the higher adjusted R^2 in the second model, more attribution should be given to the significant coefficient found in model 2. The negative coefficient is contradictory with the second hypothesis and therefore not in line with the static trade-off theory, which predicts a positive relation with leverage ratio. Thus the second hypothesis is not accepted. On the other hand according to the pecking order theory, higher profitability leads to less debt. Therefore the reported negative relation is in line with the seventh hypothesis and this hypothesis is accepted. The found coefficient is in line with de Jong et al. (2008) and Song (2005), both found a significant and negative relation as well. Although there has to be noted that the coefficient found in this study is stronger than the one from de Jong et al. (2008) and Song (2005). For tangibility a positive and significant relation is found. This is in line with the third hypothesis which is in favour of the static trade-off theory. Thus the third hypothesis is accepted. De Jong et al. (2008) and Song (2005) support the results found for the variable tangibility. Both found a positive and significant coefficient which is in line with this study, but their results showed a slightly stronger relation. Table 4 furthermore reports a positive coefficient for growth opportunities in both models. In the pecking order model the coefficient is insignificant. The positive coefficient found in the static trade-off model is significant at a 10% level. The coefficient found in the static trade-off model gets more support due to the higher adjusted R^2. Although the reported relation is significant, it is in contrast with both the static trade-off theory and the pecking order theory, both predict a negative relation. Therefore the fourth hypothesis finds no support and has to be rejected. This difference in the expected negative relation and the observed positive relation can be explained by the growth opportunities itself. Because valuable growth opportunities increase the firms value and therefore its debt capacity, they can lead to potential greater use of debt (Titman and Wessels, 1988). The results for growth opportunities are supported by Lööf (2004) and Song (2005) who found a positive relation as well. Although there has to be noted that they both found an insignificant relation, but this can be attributed to the different samples which are used. The reported relation between the variable size and leverage ratio is positive and significant. The fifth hypothesis, which is derived from the static trade-off theory, predicts that size has a positive effect on the debt level of a firm. Therefore the found positive and significant relation is in line with the static trade-off theory and the fifth hypothesis is accepted. The reported relation between size and leverage is in line with both de Jong et al. (2008) and Lööf (2004). Although de Jong et al. (2008) found a positive relation as well, their result was insignificant, where this study shows a significant relation. On the other hand Lööf (2004) found a slightly positive and significant relation comparable with this study. Table 4 reports a positive relation in both the first and second model. In the first model the relation found is insignificant, but in the second model a significant relation between the determinant liquidity and leverage ratio is found. More value should be given to the second model, because of its higher adjusted R^2. The relation found is in line with the sixth hypothesis, which predicts a positive relation between liquidity

and leverage. Therefore, the sixth hypothesis, supporting the static trade-off theory, is accepted. On the other hand, the relation is not in line with the eight hypothesis, which predicts a negative relation between liquidity and the leverage ratio of a firm. Therefore, the eight hypothesis, derived from the pecking order theory gets no support and is rejected. The results for liquidity show a positive and significant relation with leverage. The only article available for comparison is the one from de Jong et al. (2008). They found a weak negative and significant relation. However, some authors are in favour of the positive relation found in this study (Schleifer and Vishny, 1992; Sibilkov, 2009). The positive relation can be explained by the economic significance and substantiality of the costs which arise when a firm is being illiquid, therefore increasing the bankruptcy costs. Comparing these costs to the benefits of debt, managers try to control these costs by changing the leverage ratio of a firm (Sibilkov, 2009). The final element in table 4 is the adjusted R^2, this measures to which extent the observed data lies close to the line of best fit. The adjusted R^2 value of the pecking order model is 0.00 which means that 0.00% of the variance in the dependent variable leverage ratio is explained by the firm-level determinants used in the first model. On the other hand, the static trade-off model has an adjusted R^2 value of 0.18, meaning that 18.00% of the variance is explained by the firm-level determinants used in the second model. To check for robustness, regression analyses have also been performed for individual years instead of the full time period. The results of these regressions can be found in table 5 in the appendix. It can be observed that the regression results per year are similar to the results found for the full time period. Only for the variable growth opportunities the results differ. Therefore the results found for the full time period for the variable growth opportunities should be handled with caution.

Looking at the results, the leverage ratio of Swedish stock listed firms is significantly influenced by the variables profitability, tangibility, growth opportunities, size and liquidity. Three out of six of the hypotheses derived from the static trade-off theory are confirmed against one out of three in favour of the pecking order theory. In addition the static trade-off model shows a higher adjusted R^2 than the one for the pecking order model. This tells us that the static trade-off theory performs better than the pecking order theory in explaining the capital structure of Swedish stock listed firms.

4.4 Discussion

The results from this study should be handled with care, because there are some limitations. First of all, not all industrial firms which Orbis gave access to are used, because not all firms provided enough data. Therefore, there is an increased risk that the reported results are not representative for the firms which are excluded due to missing data. Secondly, this study only focusses on two theories. But multiple theories exist for explaining the capital structure of firms, such as the flexibility theory and the agency theory. But the focus on the static trade-off theory and the pecking order theory enables us to gain in depth knowledge. Thirdly, the use of proxies brings some limitations with it. Titman and Wessels (1988) argue that several dangers of the use of proxies exist. First of all, multiple proxies exist which can be used for a specific variable and some variables may not be well represented by the use a certain proxy. Secondly, Titman and Wessels (1988) state that multiple variables can be related to each other. Therefore the effects of multiple variables can be measured by using proxies, instead of measuring the effect of a single variable. Lastly, measurement errors of the proxies can have correlations with the measurement errors of the dependent variables, this can create spurious correlations (Titman and Wessels, 1988).

5. CONCLUSION

This paper aims at contributing to the evidence for the presence of the static trade-off theory and the pecking order theory in explaining the capital structure of Swedish industrial stock listed firms. Overall the firm-level determinants profitability, tangibility, growth opportunities, size and liquidity play a significant role in explaining the capital structure. Three of these determinants, tangibility, size and liquidity, support the static trade-off theory. Whereas only profitability supports the pecking order theory. Growth opportunities is significantly related to leverage ratio as well, however this relation is not in line with the expected relation derived from both theories.

This paper contributes to the existing literature by giving valuable insights in the determinants of the capital structure of Swedish stock listed firms. Studies on the capital structure of Swedish firms are scarce and often make use of older data, where this study used the latest data available. The findings of this study can be useful for Swedish firm owners in choosing there optimal capital structure. The findings also provide a framework of the firm-level determinants which are useful for comparisons with older data or other countries.

Further research on the capital structure of Swedish stock listed firms can be done by making a distinction between long-term debt and short-term debt, instead of only using total debt or long-term debt. Besides, more research can be done on other theories, such as the agency cost theory and the flexibility theory. Lastly, more detailed studies can be made on other determinants besides firm-level determinants, such as country-specific determinants.

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7. APPENDIX

Table 5: Multivariate regression per year

	Predicted relationship	LEV 2009	LEV 2010	LEV 2011	LEV 2012	LEV 2013	Full time period
Constant		-0.26 [b]	-0.22 [b]	-0.25 [b]	-0.15	-0.23 [b]	-0.18[a]
		(0.01)	(0.03)	(0.03)	(0.15)	(0.04)	(0.00)
NDTS	-	0.15	-0.17	0.55	0.07	-0.18	0.04
		(0.79)	(0.72)	(0.36)	(0.91)	(0.75)	(0.88)
PROF	+/-	-0.41 [a]	-0.41 [a]	-0.41 [b]	-0.03	-0.15	-0.23[a]
		(0.00)	(0.00)	(0.02)	(0.87)	(0.36)	(0.00)
TANG	+	0.30 [a]	0.26 [a]	0.28 [a]	0.28 [a]	0.32 [a]	0.27[a]
		(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
GROWTH	-	0.10	0.01	0.15 [b]	0.01	0.13	0.05[c]
		(0.12)	(0.84)	(0.05)	(0.91)	(0.12)	(0.07)
SIZE	+	0.02 [a]	0.01 [b]	0.01 [b]	0.01	0.01 [c]	0.01[a]
		(0.01)	(0.03)	(0.03)	(0.17)	(0.09)	(0.00)
LIQ	-	0.07 [a]	0.06 [a]	0.04	0.04	0.05 [b]	0.05[a]
		(0.01)	(0.00)	(0.15)	(0.11)	(0.03)	(0.00)
N		85	85	85	85	85	425
Adjusted R^2		0.24	0.19	0.17	0.10	0.15	0.18

For definitions see table 2.
The subscripts a, b and c mean statistical significance at an 1%, 5% and 10% level respectively.
P-values are mentioned in parentheses. No clear signs for hetroskedasticity are observed.