Determinants of Capital Structure in the Swedish Dairy Farm Industry.

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Abstract

We have examined the capital structure of the Swedish dairy farm industry and the driving forces behind this capital structure. This industry has undergone some major changes during modern time. These changes constitutes mainly of the number of farms and technological development. This, in combination with reported low profitability in the industry, has sparked a high media coverage about the survivability of the agricultural industry due to its important social function. The survivability of a business can be seen in its capital structure since that contains long term debt that can force a firm to become bankrupt and also the equity that contain retained earnings that can help a company weathering periods of low profitability.

Research question: How can a change in debt level for firms in the Swedish dairy farm industry be explained by financial investment theory and financial variables?

We formed three objectives in order to answer the research question. The first one was to examine how financial investment theory can explain the change in debt level. The second objective was to analyze relevant financial variables to find additional indicators of influence from investment theory as well as compare our results to previous research. The final objective was to analyze financial variables to substantiate our findings and find further explanations to the capital structure of the industry.

The theories used in order to explain the capital structure are the Pecking order theory and the Static trade-off theory. Both theories are established theories in capital structure research. The Pecking order theory states that different capital financing option follow a strict hierarchy with internal capital as the primary choice, debt financing as secondary and the equity financing option as the least preferable option. The Static trade-off theory states that there is an optimal debt level that companies strive towards. This optimal level depends on the interest tax shield and bankruptcy costs. We performed a quantitative study with a deductive approach to perform this study. The sample comprised of annual financial information from 100 Swedish dairy farms during the period 2000-2013. Criteria was formed in order to sample full-time limited liability companies.

The results show that the Pecking order theory was the most significant determinant for the change in long term debt. The Static tradeoff model showed some incompatibility with our population, reducing its reliability. The indicator variables size, asset structure and growth was found to be positively related to the debt levels, while the profitability was negatively related to all debt variables. The risk of the firm was only significantly negative for long term debt and leverage ratio.

The Pecking order theory showed to be predominant in the Swedish dairy farm industry. This is substantiated by the indicator variables taken together and by the descriptive statistics. We also found that on average, the industry is suffering from low profitability and struggled to make profitable investments although the profitability differs a lot within the sample.
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Sincerely,

Sten Bergmark and Emil Dahlberg
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1. Introduction

Historically the agricultural sector has been of vital importance to society. The sector has since, like many others witnessed modernizing changes that affects its operations and requirement of capital. We will in this chapter introduce the reader to modern changes that the Swedish agriculture has gone through, the agricultural market situation and present a connection to capital structure theory.

1.1. Swedish agriculture development

The Swedish agricultural sector has witnessed vast structural changes in recent years (Djurfeldt & Gooch, 2002, pp. 75-77). The trend is fewer and bigger farms that can utilize economy of scale. This is illustrated by the fact that during the period 2005-2013, the total number of Swedish full-time farms dropped by 20% to 16,296, where dairy farms stood for the biggest decline with 46%, while the total cultivated area remained virtually unchanged (Statens Jordbruksverk [SJV], 2015a, p. 1). This trend has been going on in Sweden for a very long time. According to Statistics Sweden there were about 352,000 Swedish full-time farms in 1949 with an average of 13.3 ha farmland (SCB, 1950, pp. 2-3) compared to an average in 2013 of 112 ha per farm (SJV, 2015a, p. 1).

Even though the Swedish agricultural sector has declined steadily for a long time it still constitute an important function in the society and contribute significantly to the national economy. The sector accounted for 0.4% (13.4 BSEK) of total Gross Domestic Product (GDP) (SJV, 2014, p. 185) which might not seem like much but the sector had a total gross investment of 6.26 Billion SEK during 2013 (SJV, 2015b, p. 30). This investment rate has a big financial impact on the rural areas, and provides many job opportunities. When investing, the agricultural sector makes big (relative to size) investments, meaning that they invest a high degree of their turnover annually. This means that the sector is relatively sensitive to changes in interest rates. That is an important socioeconomic attribute since when a recession hits, interest rates will drop and the agricultural investments will increase and when the economy is overheated the interest rates will rise, causing an investment restraint in the agricultural sector. Thus the agricultural sector has a smoothing effect on the economy as a whole by investing and generating work opportunities in recessions and focusing on debt repayment in an overheated economic market situation.

Another socio-economic benefit from the agricultural sector is that it keeps the rural areas open. Without agriculture the farmland in these areas would be overgrown by brushwood, destroying the view from most rural houses, causing the house prices to drop (SJV, 2010, p. 11). This would diminish the real estate market and reduce the government tax income from the sales of these houses. Domestic food production also reduces the need for importing food, increasing the national balance of trade. The last socio-economic benefit is the security offered from having domestic food production (SLC, 2014). This means that in the case of a national emergency or a global food shortage, the availability of food is secured.

These social and socio-economic benefits have during the recent years caused an increase in media coverage and debate about the survival of the industry in general and the dairy farm industry in particularly due to low profitability. The problem of low
profitability is caused by an increased international market effect on prices combined with high production costs. One reason that the Swedish agricultural industry has higher production costs is because of what is considered the world's most extensive animal protection regulations (Svenska djurhälsovården, n.d.). These rules are implemented in order to improve the development of animal protection regulation internationally and the Swedish government is leading by example (SJV, 2012, pp. 1-2). These rules increase the quality of the Swedish agricultural production but also mean a lower competitiveness internationally. This changes the market environment of the agricultural sector and the farms have to change with it. These changes can be seen in the recent drop in the number of active farms and the increase in average area of cultivated farmland.

The change towards fewer but bigger farms has been going on for a very long time but since the beginning of the 1990th the agricultural sector has also witnessed a huge leap in technology and automation (Stafford, 2000, p. 267), similar to the development in the heavy industry during the 1990th (Magnusson & Ottosson, 2003, pp. 57-59). This change has been titled precision agriculture or precision farming and has, due to high implementation costs (Tozer, 2009, pp. 80-87), added a higher financial aspect on the agricultural business. The base of precision farming is to maximize production and minimize consumption on an individual level, through the use of technology. This is applicable in all types of agriculture but it is in dairy farming that precision farming has had the highest impact and reached the highest refinement. Today, automated milking is a central part of modern dairy farming (Douphrate, et.al., 2013, p.199) and that has created a foundation for further development.

According to Bewley (2010, p. 2) some of the automated systems currently utilized in dairy production, in addition to automated milking, are also monitoring and recording milk yield, milk components (protein, fat and cell-count), pedometers, body temperature, milk conductivity, body weight and estrus detection. Another system used are automated feeding, often in conjunction with the automated milking, that distribute feed adjusted for individual cows and record continuously how much each cow has eaten. The predominant reason for not using these technologies are financial, the farmers either have other investments with higher priority(48%) or they are unsure of the financial benefit(38%) (Steeneveld & Hogeveen, 2015, p. 714).

Precision farming are occurring in all orientations of agriculture. According to Stafford (2000, pp. 267-273) crop producers use several advanced technologies in their production, like GPS assisted steering, reducing overlap. Tozer (2009, p. 86) concludes that precision agriculture equipment are more expensive than traditional farm equipment but can be profitable, especially in areas with lower productivity. This is because precision agriculture have less input usage and input levels has a better match to the productivity of the land on a detailed level. This makes precision farming an attractive option for Swedish farms since many farms are located in areas with relatively low productivity compared with continental Europe who also have a warmer climate and therefore a longer growth season compared to Sweden.

The technological development within precision agriculture combined with the increase in farm size, the farmers` need for investment capital has increased. To acquire this investment capital, the farms can either find equity investors that purchases shares in the business or they can get a loan from a bank. Sweden has a strong bank sector and the
whole economy is bank driven. Because of this the Swedish farms have historically mainly financed their investments through debt. This means that financial institutions play an important role in the development of the agricultural sector. According to Jansson, et. al. (2013, pp. 7, 20) the Swedish credit market, for the agricultural sector, consists of mortgage institutions, commercial banks and farmers cooperative banks. They further conclude that this differs from the credit market of other small and medium-sized enterprises (SME) by being more restricted, but despite the restricted market farmers can more easily get financing than other rural SMEs. Jansson et. al. (2013, p. 13) further found that the most important factors for a creditor, when granting a loan, is expected cash-flow from the investment and the availability to collateral. This would mean that cash-flow projections due to investments in the agricultural sector is easier to estimate and there is a higher access to collateral in the form of land and buildings and this is also confirmed by Mac an Bhaird and Lucey (2006, p. 7). The cash-flow accuracy derives from the fact that farms can sell all they produce to a, more or less, fixed price even when making big production capacity changes.

Because of the strong bank situation, equity financing has up to today been almost non existent within the agricultural sector (Berg, 2012). Another reason for that can be that many farms has been passed down through several generations and farmers are reluctant to release control over such a farm. Since farms historically have been small, the interest of investors to make equity investments might also have been low compared to other types of SMEs with higher growth opportunities. The knowledge of the agricultural market among equity investors might also be low, making them reluctant to invest in farms. Previous research has not stated any other reasons that would prevent agricultural equity financing in the modern capital market. Many farms are showing large growth opportunities, making them more interesting as an investment. Today there should also be an interest from investors to place capital in the agricultural sector as a way of risk differentiation and to get a “green” profile on their investment portfolio in addition to the classic yield motivated investing motif.

1.2. Farm-specific attributes
There are some major financial differences between agricultural firms and other SMEs. Most of these differences have been hard to verify using reliable sources. This is due to the fact that these differences are considered common knowledge for all actors within the industry and those outside of the industry has no use of the information. This has led to a situation where much information about farm-specific attributes has remained undescribed in text and research. However, since one of the authors have in-depth knowledge of the industry attributes and we deem it relevant for the understanding of the thesis, we attempt to explain them anyway. We will instead try to present these differences in detail and with logical reasoning in order to substantiate them as much as possible.

The first is that the firms in our population is more affected by weather-related risks than many other firms, which will eat into the profits of the firm and hence also affect its capital structure at the closing of the fiscal year. A thing to note is that agricultural firms usually have a fiscal year that ends either before or after the summer, i.e. the harvest, instead of at the year end. This brings us to the other main difference, namely inventory since the harvest is an inventory item.
Agricultural firms, for the most part, create their own inventory by growing it and raising cattle. This means that individual years can have highly different harvest yield for a similar total cost, causing a high fluctuation in the results between years depending on the level of harvest and the valuation process since the change in inventory is an article in the income statement (Lutero and Pizzoli, 2011, pp. 5-6). It also means that changes in inventory may not primarily be a cash flow item since the cost of producing the harvest can be the same two individual years and the inventory produced can differ a lot and be valued at market value. Many farms value the harvest at market value because of the difficulties involved in trying to estimate production costs. In most farms the production costs are too complex to reliably estimate in difference to many other types of SMEs where the cost of inventory is the purchase cost, resulting in agricultural companies that are forced to value the inventory at market value. From an accounting standpoint it can in this type of farm appear as if an increase in inventory between years appeared out of thin air.

In contrast to other types of SMEs, agricultural businesses in general and dairy farms in particular, can sell the full produced volume instantly because they do not have a demand side that needs to be taken into account. Most other types of companies need to first create a greater demand for their products in order to sell more before they can make investments to increase production. The main reason that the dairy farms can sell all their production is that in order to expand, the agricultural business primarily need to acquire more land to be able to produce feed for the animals, since the number of cows are the most significant factor of dairy production volume. This expansion of land need to be obtained from another farm, primarily smaller farms in the area that are downsizing or seizes their production. That means that when one company increases production volume, another is decreasing production volume with a similar amount. This creates a cannibalistic market environment where a company cannot increase production internally, except for marginal changes. The only time that an agricultural sector as a whole can increase the production volume significantly is when land is obtained from another sector, for example total milk production can only increase if land is converted from crop production to dairy production or if forest is converted to farmland. The need for additional farmland in order to increase production also has the implication that there is an absolute upper limit for production volume, on the individual farm level, that depends on the availability of farmland in the vicinity of the farm. This is an input restraint where most companies has the restraint on the output side and this is most often not an absolute limit since output can change over time or by marketing.

The cash flow is another difference between SMEs in general and agricultural businesses and even between different sectors of agriculture. Crop producers and most meat producing companies deliver the whole yearly production at once, or divided between a few points in time, making liquidity a problem. Dairy farms on the other hand deliver their production daily because of the need for keeping the milk fresh. They get paid once a month and because the production only varies marginally over the year, these payments are relatively stable and evenly spread out over the year. This means that the dairy sector has a lower risk of defaulting than both other SMEs and other agricultural sectors in regards of easier being able to make interest payments since they have a steady cash flow and can more easily predict cash flow in the future.

The combination of a low risk for defaulting and a high amounts of fixed assets available as collateral, makes dairy farms very low risk for an investor and increases the
availability of investment capital, especially from banks. This can also make dairy farms more likely to make investments than other companies. Partially because the availability of investment capital but also because of the availability of potential investments with a positive net present value. These potential investments consists of investments in increasing production volume, precision agriculture and other efficiency enhancing investments.

Another difference is the Rural development programme that supports rural and primarily agricultural businesses. This is a support that is handled regionally in Sweden, through the County Administrative Board, and the prerequisites differ between regions to better adapt to the conditions of that region (Länsstyrelsen, n.d.). The financing of this support comes from the European Union (European Union, 2011). The Rural development programme has many parts and targets for their support activity but for this study the most relevant part is their support for agricultural investments. This investment support functions as a subsidization of investments made to enhance productivity in the company, under certain condition. During the timeframe of this study most companies has been able to apply for 30% of the cost of an investment made. In practice this means that an agricultural firm can make an investment in a building and when all costs are paid they can apply for a refund of 30% of the costs from the County Administrative Board. This reduces the need for long-term financing, effectively transforming 30% of the cost into a need for short-term debt that will be financed through the Rural development programme.

The investment support on the agricultural sector further favours a debt financing alternative for the companies within the agricultural sector. It is easier to approach a bank with both the long-term and the short-term debt at the same time instead of trying to find equity financing for the long-term part and simultaneously negotiate with the bank to get the short-term financing part. An alternative is finding equity financing for the whole amount and when the payment from the County administrative Board becomes available, repurchase 30% of the equity shares. Of all these scenarios the alternative that only involves the bank is the easiest to achieve since it is probably cheapest but definitely the least time-consuming option.

1.3. Capital structure

Ever since Modigliani and Miller’s (1958) theory of capital irrelevancy, the area of capital structures has been of interest to scholars and the source of extensive research (Harris, & Raviv, 1991). A firm's capital structure is the composition of capital from various sources, such as retained earnings, debt and equity investments. The capital structure of a firm is of importance because it can affect the operations in terms of profitability. Within the area of capital structure there are some key phrases that are of importance. One is leverage, which refers to the degree of the capital that is borrowed through interest bearing debt. A high leverage can have a positive effect on the profits of the firm, due to the tax deductibility of interest rate and the fact that the firm can utilize lenders capital and make investments with higher yield than the interest rate of debt. This increases the profitability of the company and the owners’ equity capital to a high degree (Hull, 2012, p. 14). However, with leverage comes a risk of not meeting interest payment demands, potentially resulting in bankruptcy. The problem of not meeting the interest payments can stem from unexpectedly low yield on investments or a long cash conversion cycle that creates a low liquidity within the firm (Hull, 2012, pp.
Bankruptcy is also associated with certain costs, which is often referred to as bankruptcy costs. These include costs such as the legal costs of filing for bankruptcy and the loss of capital to stakeholders (Hull, 2012, pp. 14-16).

The theoretical background in the area of capital structures consist of many different theories. The ones we have identified are Jensen and Meckling’s (1976) extension of Fama and Miller’s agency theory (1972), the static trade-off theory, which was introduced by Miller (1977), the pecking order theory by Myers (1984), the expected utility model (Collins, 1985), the organisational theory by Myers (1993) and the market timing theory (Baker & Wurgler, 2002).

Both the static trade-off theory and the pecking order theory has seen significant usage in attempts at explaining the capital structures of firms (Frank & Goyal, 2007). More recently there has however been a more focused interest in the explanation of the capital structures of SMEs. It is notable that the finance of SMEs differ from large firms in that it involves greater information asymmetry, higher transaction costs as well as higher risks (Altman & Sabato, 2007, p. 353; Dietsch & Petey, 2004, p. 786). Many of these studies found that both theories hold some explanatory value, although the pecking order theory prevailed in explanatory significance (Cassar & Holmes, 2003, p. 142; Mac an Bhaird & Lucey, 2006, p. 21; Swinnen et al., 2005, p. 18). In studies that examine the capital structure it is also quite common to examine variables that can affect the capital structures of the firms, such as profitability, size and asset turnover.

1.4. Problematization
The capital structure is determined by examining various key figures of the business as well as factors that affect the operation of said business. Titman and Wessels (1988, p. 13) analyzed factors they believed to affect the capital structure of firms and found that transaction costs and firm size influenced the capital structure of the examined firms (Titman & Wessels, 1988, p. 17). Additionally to these factors, a firm's capital structure is, at times, also discussed in the light of outside factors, such as the financing constraints that are caused by the banks market power. Carbo-Valverde et al. (2009, p. 334) found evidence that suggested that the market power of banks increased the financing constraints of SMEs in the Spanish market. It is notable that the spanish SME market is, much like the Swedish market, heavily dependent on bank financing (Carbo-Valverde et al., 2009, p. 334; Frisell et. al., 2007, p. 2). Gutierrez (2002, p. 102) examined the Italian agricultural sector between the years 1960-1996 and found that the average profits are reduced while in the presence of financial constraints (Gutierrez, 2002, p. 113).

An area that is less examined is the capital structures of firms within the agricultural sector. Guan and Oude Lansink (2006, p. 644) argues that agricultural firms are different from corporate firms on many levels and that the difference can affect the capital structures. Meanwhile, Wu et al. (2014, pp. 122, 126-127) found evidence both for and against the influence of factors that had been significant in studies of the capital structure of Dutch farms. The change in agriculture production caused by the introduction of precision agriculture, both in The Netherlands (Steeneveld & Hogeveen, 2015, p. 714) and in Sweden, has led to an increased capital investment requirement. This development, in the Swedish market, is best seen in dairy farms where the
combination of both milk and crop production has made it possible to utilize precision agriculture in several aspects of the firm, increasing the usage of these systems.

An investment in precision agriculture can be a financially viable option and farms tend to have access to collateral. This combined with the fact that banks and mortgage institutions are the predominant source of capital in Sweden, makes bank financing a strong contender as the source of capital when making investments. Growth of dairy production require large investments and, as previously mentioned, precision agriculture equipment are more expensive to invest in. This should lead to a change in the capital structure of Swedish dairy farms, by increasing debt in the firms within the industry.

While examining the theoretical area we have identified a geographical gap in the research. A large portion of the relevant studies in agriculture investments and capital structures concern the situation in the USA (Barry et al., 2000; Penson et al., 1981) and Netherlands (Guan & Oude Lansink, 2006; Wu et al., 2014) but no studies that focus on the situation on the Swedish market. The relevance of this information in regards to the research gap is that the Swedish market may differ from of both the US and the Netherlands market in several aspects (Reijs et al., 2013). One such example is that the loan to value ratio of for the agricultural sector of Sweden is lower than that of Netherlands (Jansson, et. al., 2013, pp. 18-19) and as previously mentioned, there is evidence that suggest that financial constraints may affect the capital structure (Gutierrez, 2002, p. 113). Therefore, results that hold for these markets may differentiate from results of a Swedish study.

1.5. Research question
How can a change in debt level for firms in the Swedish dairy farm industry be explained by financial investment theory and financial variables?

1.6. Objectives
The main purpose of this study is to find the drivers of change in debt level and therefore the capital structure in the Swedish dairy farm industry. To achieve this we have formed three objectives to help us answer the research question:

- First, we will examine how financial investment theory can explain a change in debt level for our sample.
- The second objective is to analyze relevant financial variables to find additional indicators of influence from investment theory as well as compare our results to previous findings in the relevant area of research.
- The final objective is to analyze financial variables to substantiate our findings and find further explanations to the capital structure of the industry.

By conducting this study we intend to broaden the knowledge of the relevance these theories has as an explanations for the capital structures in the Swedish agricultural sector. Additionally, since agricultural firms differ from other SMEs, we deem this study to be of importance to the various lending services that exist within the Swedish market. Moreover, by examining the relationship between optimal capital structure theory and the current structure of the farms the results of the study will benefit financial consultants and policy makers.
1.7. Delimitations

In this study we are focusing on the Swedish agricultural sector. The limitation to Sweden is partially due to an increased interest in the financial situation of Swedish farms, and also because of the gap in research where only superficial studies have been performed previously. Another reason is that there are country specific factors that differentiate Swedish farms from farms in other countries, namely taxation and production costs.

We are further limiting our study to dairy farms since the development towards fewer and bigger companies are most significant in that area of business. With the introduction of precision agriculture, investments in technology should make dairy farms more prone to utilize a higher extent of leverage. A higher extent of leverage is also less risky in a dairy farm compared to other types of agricultural businesses since their cash flow is more evenly distributed over the year, making it easier to access liquid capital to make interest payments. These attributes makes dairy farms the most suitable type of business to examine in this thesis.

In order to only include full time farms we will only include farms with more than 1M SEK in turnover. Farms below this limit is also of less interest in this study since they can be considered to have insufficient capital to have an investment strategy. We will further only examine limited liability companies since, according to Swedish accounting standards, they are the only type of company that has to publish their annual report. That excludes all other types of companies in this study since we cannot acquire the financial information needed for our analysis from them.
2. Theoretical Methodology

In this chapter we will describe the author's views and values regarding knowledge and social actors and their interactions. We will also convey the author's preconceptions regarding the research area and a critical analysis of sources that were used in this study. All of these things are important to describe to the reader since it otherwise is hard to know the motivations of the researcher and the choices that were made in the study. This enhances the reader's ability to understand the information presented and to critically examine the information.

2.1. Ontology

According to Saunders et al. (2009, p. 110) ontology concerns the assumptions on the nature of the world and how we see it. Bryman and Bell (2011, p. 20) explains ontological views as whether the social entities are to be viewed as a construction of the perceptions of the various actor in society, or that these entities can be seen as unaffected by these perceptions and are therefore to be considered objective. There are two forms of ontological views (Bryman & Bell, 2011, p. 20; Saunders et al., 2009, p. 110). Saunders et al. (2009, p. 110) call these positions objectivism and subjectivism, while Bryman and Bell (2009, p. 110) refer to them as objectivism and constructionism.

The objectivist approach is described by Bryman and Bell (2011, p. 21) as recognising that we are affected by factors that are outside our ability to influence. Moreover they argue that people are bound by rules and procedures that control or limit our actions in a given setting, such as that of an organisation. Saunders et al. (2009, p. 110) argue that this type of ontological view has a focus on the structural aspect of the examined area. Additionally, they mean that this view assumes that the function of the examined area, while relative differences may be observed, is virtually homogeneous.

The constructionistic ontological view in contrast of that of the objective view is described by Strauss et al. (1973, cited in Bryman et al., 2011, p. 21) as general understandings and patterns that develop through agreements with involved parties within the examined area, rather than sets of predetermined rules. Additionally, Saunders et al. (2009, p. 111) points out that the subjective view involves interpretive elements where an emphasis lies on understanding the reason of an action as a means of gaining understanding of the action itself.

The ontological view of both authors are the objective approach. This is partially due to our understanding of capital structures having a homogenous role in firms. It is also due to the fact that we see the existence of capital structure as external and independent to social actors. Moreover, our preconception of the area of capital structure tells us that there are factors outside farmers’ possibility to influence, which has proven to have an effect on firms’ capital structures (Carbo-Valverde et al., 2009, p. 334). If the capital structure of the firms did not hold the same meaning and implications in each firm but instead were a construction of the views of the involved parties we would instead see the area through a constructivist view. The objective view of the authors can also be seen in the chosen research question that implies that despite some differences between individual companies the industry as a whole is homogenous and follow the same ruleset.
The implication that a constructionist approach would have, is that instead of looking at the capital structure of the firm as dependent on a set of objective variables, we would instead aim to gain for example understanding of how the shareholders of the firms see and understand capital structure and from there try to gain knowledge of why the capital structure look as it does. A constructionist ontology would also have an effect on the data collection and analysis of said data. If the study followed a constructionist approach the data would best be collected through interviews or surveys that targeted the owners of the Swedish farms, and the conclusions would have been interpreted by the authors subjective eyes. Since our purpose with this study is to measure the debt level among dairy farmers in Sweden and explain the result we get with already scientifically accepted theories. This is usually done with quantitative data, such as publicly available annual reports or other data that easily can be verified, which means that the debt level we find would be the same if anyone did the same research over again with the same set of data. We therefore claim to take an objectivistic stance.

2.2. Epistemology

Epistemology can be described as what the researcher considers be acceptable knowledge in the field that is examined. Some researcher believe that everything is more or less quantifiable and only these areas are worthwhile to examine (Saunders et al., 2009, pp. 112-113). Other researchers have the view that it is the underlying factors which determines the quantifiable variables that are the interesting subject to examine. This difference depends on whether the researcher sees the social world as an object that can and should be examined in the same manner as natural science researchers conduct their experiments (Bryman & Bell, 2011, p. 15).

Most authors conform regarding the categories positivism and interpretivism and these have been the most frequently used for a long time. The positivistic researchers only regard information that is observable and produced by credible data as knowledge, thus taking the approach of the natural scientist (Bryman & Bell, 2011, p. 15; Saunders et al., 2009, p. 113). They further state that positivistic researcher only values scientific statements as development and knowledge in contrast to normative statements that cannot be reproduced in detail. This also lead to the need for researchers to be objective, to avoid influencing the data collected since biased information cannot be conceived as knowledge by the positivistic researcher. In social science research the main implication of positivism is that people and human interaction can be measured in the same way as natural sciences (Mertens, 2004, p. 8). According to Creswell (2003, p. 7) the positivistic advocate believes that the absolute truth is impossible to find, researcher do not prove hypotheses but instead fail to reject them.

Interpretivism states, in contrast to the positivistic view, that social situations and their participants i.e. people and institutions cannot be studied the same way as social sciences since they are fundamentally different (Bryman & Bell, 2011, p. 16). This implies that the same research methods cannot be used in both areas. According to Saunders et al. (2009, p. 116), interpretivistic researchers claim that knowledge cannot be obtained if complex social interactions are reduced to objective generalisations.

Both authors consider, measurable data that can be substantiated, as more reliable knowledge than information that has been interpreted. Because of this we aim to produce a study that is possible to reproduce in order to substantiate the findings. This
means that we have a positivistic approach that is influenced by a natural science research method. This view on knowledge is also represented in our choice of research area and in our research question. The research question is best answered by analyzing quantitative data in order accomplish generalizable results for the whole industry. If we had an interpretivist view on knowledge the research question in this study would have been stated in a manner that was, for example, more aligned towards making a case study and produce normative results that only hold true for the selected companies in one point in time.

The positivistic view on knowledge also has the implication that within this study we aim to answer our research question through hypothesis testing. Within our epistemological view we will not be able to prove these hypotheses but instead fail to reject them. A failure to reject a hypothesis will mean that we have found evidence that show evidence that our tested hypothesis is likely to hold true for the entire population. We will also be careful regarding personal values in order to produce unbiased results, with an objective mindset. This will ensure credible results and enable us to generalize these results on the whole population.

2.3. Research approach
When conducting research there are two different approaches to choose between, deductive and inductive approach, according to Bryman and Bell (2011, pp. 10-11). The choice between these is very important since it will influence the research the whole way and basically decide your whole research method. The main differences between the two different approaches is whether you test an existing theory or develop a new (Saunders et al., 2009, p. 124).

Deductive approach is the most commonly used approach and it is based on the notion that you use existing knowledge to form theories and/or hypotheses and then gather data to test your theories or hypotheses against to possibly be able to revise existing theory (Bryman & Bell, 2011, pp. 10-11; Saunders et al., 2009, pp. 124-125). This method of approach is then performed over again so that theory develops and gets better and better. It is not hard so see why the deductive approach is predominantly used by positivistic since the method of constructing a theory and then conduct strict testing is the method of choice in natural science. The deductive approach is also a very suitable method if the researcher wants to test causality between factors, something that also attracts the positivistic researcher (Saunders et al., 2009, p. 125).

Inductive, in contrast to the deductive approach, is based on the collection of data that is then used to form theory (Saunders et al., 2009, p. 126). That means that the researcher can examine an area of interest without the need of reading up on the previous research ahead of time, to be able to view the area without any preconceptions. The first step is instead to gather data in the area of research and then analyse it, lastly the finding are translated into theory. This method puts an emphasis on understanding the underlying factors that cause an event or action, as well as including the human views and interpretations of their surrounding (Saunders et al., 2009, p. 126). This more focused view made the approach popular among the 20th century social scientists. The inductive approach is primarily used when there are no existing theories in the area, when it is unclear what theories to use or when the researcher is of the opinion that the existing theory is inadequate to explain a situation. The inductive approach is predominantly, but
not exclusively, used by researchers that are examining qualitative data (Bryman & Bell, 2011, p. 13).

This study uses a deductive approach since we base it on previous knowledge in order to test if it holds true in our chosen research area. This is in line with our positivistic epistemology since the natural science based positivistic view tend to favour a deductive approach in order to be able to develop and expand theory. The deductive approach is also suitable when examining capital structure since there are established theories in the area that is examined and expanded in research in the recent years. As we are to collect quantitative data and analyze this data from the perspective of existing theories our study falls under that of the deductive approach.

Had we instead opted for a data collection and analysis method that meant collecting in-depth data and from that data draw conclusions and make models of how the capital structure of the firms could be explained we would be in line with the inductive approach. Even though we have chosen an deductive approach we still need to have an understanding of the inductive method since the deductive research approach also includes a part of induction in the last stages of research according to Bryman and Bell (2011, p. 11). They state that this happens when the analysis is finished and the researcher are trying to find the implications of the results on the theory that originated the study in order to improve the existing theory. This is an important step in the deductive approach since it in this step that knowledge in the field is evolved and expanded. We have already stated in the introduction that there has been very few studies produced about agricultural firms and capital structure, hence we have chosen to go for a deductive approach in our study to get a better understanding within the field regarding the situation for the Swedish dairy farmers.

2.4. Research method

While there are combinations of research methods with varying characteristics, there are mainly two building blocks that form these methods. Namely the quantitative and qualitative techniques (Bryman & Bell, 2011, p. 28; Creswell, 2003, p. 208; Saunders et al., 2009, p. 151). The quantitative research method involves collecting quantifiable data that can be used to draw conclusions about the studied area (Saunders et al., 2009, p. 151). Historically, the quantitative studies has according to Campbell and Stanley (1963, pp. 2-4) been of the positivistic and post-positivistic perspective. More recently the quantitative studies has been focused on variable testing with more complex models and number of variables (Creswell, 2003, p. 13). On the other hand, the qualitative method requires the researcher to collect in depth information through the use of interviews, pictures, videos and other recordings (Mertens, 2004, p. 229; Saunders et al., 2009, p. 151).

As previously mentioned there are combinations of the quantitative and qualitative methods. When making your method choice you can either adopt a mono method or, one of these combinations. According to Saunders et al. (2009, p. 152) these multiple method choices are the multi-method and mixed method. He further describes the multi-method as taking advantage of more than one data collection techniques while not mixing qualitative and quantitative methods. The mixed method however is described by Saunders et al. (2009, pp. 152-153) as consisting of two forms, one being the mixed method research approach and the other the mixed-model approach. The mixed method
approach is described as utilizing both quantitative and qualitative data collection and analysis techniques parallel or sequential to each other (Saunders et al., 2009, p. 152). The mixed-model approach however does not make this distinction and hence mean that the researcher can mix the methods together in other part of the study. This means that although the qualitative data collection method is mostly related to qualitative research, it is at times possible to quantitise the data, effectively making it possible to analyse through statistical tools (Saunders et al., 2009, p. 153).

As Mertens (2004, p. 231) presents it, the qualitative method has a more natural link to the constructivist and transformative view of the world. With our ontological and epistemological views we therefore find that the quantitative method is most appropriate in order to solve our research question. This is because we intend to look at historical data collected from annual reports and from this data draw objective conclusions regarding the development of the capital structure and its connection to the theories we intend to use as reference points. Had this been a qualitative study we would instead chosen conduct interviews with the owners of the firm in order to get an understanding of how they perceive the development of their firm and what factors may lie behind the explanation of the capital structure.

We could also have used a mixed method to be able to find qualitative data to further enhance our findings. This would have enabled us to view the research area from another perspective but our positivistic view would have had the implication that our qualitative finding are less reliable than our findings from the quantitative data analysis. This is because the qualitative data is considered normative and therefore only suited as supportive arguments to the main findings to further strengthen the conclusions drawn. To transform the qualitative data to be able to use statistical methods for analysis could have circumvented this but as with all types of transformation this would lead to all nuances to disappear and also introduce more bias in the data. This additional bias stems from the fact that the researcher chooses the method used to transform the data and this reduces both the reliability of the data but also the ability to reproduce the study. As such, we argue that the quantitative method is more in line with what we intend to examine and should therefore be best suited for the study. We can back this statement with the fact that a vast majority of the articles that we have read and based our understanding of the research topic on has been conducted using a quantitative method.

2.5. Axiology
The preconceptions of the authors is important to disclose since it enables the reader to determine if there are biases that have had an impact on the results of the study. The preconceptions can explain some of the choices that the authors make and can improve the understanding for the reader since it enables the reader to understand the view of the research area that the researchers have. This disclosure also improves the ability to reproduce the research in the future since it provides an explanation to the choices made and a higher degree of comparability.

One of the authors do not have any pre-existing experience in the farming industry, but has prior knowledge of finance, economics, and statistical tools and references due to enrollment in the International Business Program of Umeå University. The author’s background within economics has the implication that, while he is not familiar with the practical operations of a farm, he is still able to understand the business part of its
operations. Moreover, the author is aware that his inexperience within the industry may cause a bias where normally applicable knowledge and assumptions may not hold true. Furthermore, the author, as a student, is prone to be colored by the institution of which he is enrolled within, of which he is aware of. By recognising potentially bias influences the author aims to remain objective as to be able to produce reliable results.

The other author has substantial knowledge about the farming industry. Due to growing up on a dairy farm and working many years on different dairy farms he has gained a deep understanding of the industry and its driving forces. He is also a student on masters level in the Business school of Umeå University which gives him an understanding in economics, finance and statistics. This background knowledge is positive in the remark that he can understand and interpret the results in this study in a very credible way. He can also provide explanations to results that are specific for the industry and therefore provide a better analysis. This background also implies that he has an increased risk of bias due to misconceptions and prejudices of the industry. This bias depends on the risk that the author have made observations that seem to have correlation but fail on causality, meaning that even though he has observed tendencies of financial behaviour in the farms he is familiar with, this might not hold true for the industry as a whole. The author is well aware of this risk and aims to remain objective to produce a reliable result in this study. Since this author is a major in accounting, he may not have adequate knowledge in financial theories used in this study. This he also is aware of and has tried to remedy this by conducting a substantive literature study in the area, though this can still leave him with a lack of understanding. On the other hand is this complemented by the first author who is a major in finance and therefore well versed in finance theory.

These backgrounds makes the capital structure of agricultural firms an area of research that is compatible with both authors field of knowledge. It is also a research area that both authors are interested in and competent to analyze. Since both authors are well aware of the biases that is connected to their respective background and clearly discloses them, the biases has a risk of influencing the results of the study in any direction.

2.6. Literature search

In order to establish an understanding of the subject matter we collected and read scientific articles, statistical analysis from institutions, sections from books and home-pages of relevant actors. To find relevant previous studies we have used the Business Source Premier database through the Umeå University Library, as well as Google Scholar. The resulting articles were found through a series of key phrases; agriculture capital structure, SME capital structure, technological development in agriculture, theories in capital structure, static trade-off theory, pecking order theory, farm capital structure, finance in agriculture. Additional articles were found through a review of the reference list of relevant articles that emerged with the use of these key phrases. The articles that we have based our understanding of has included both highly cited papers, such as the Modigliani and Miller (1958) paper that presented their propositions and the Myers (1984) paper on pecking order, as well as newer less cited papers that deal with the area of capital structure. We have put a focus on basing our understanding on both new and old papers as a means to gain knowledge of the whole picture of the research area and that the theories still hold value.
The literature also served to provide knowledge in methodological approaches and the correct use of statistical models the analysis of said models, where the primary source of information came from books that had been mentioned in previous studies.

2.7. Source criticism

According to Ejvegård (2009, pp. 72-73) there are four criteria that are of importance when analysing how trustworthy an information source is. These criteria are authenticity, independence, objectiveness and validity. For all sources used in this study we aimed to use primary sources in order to ensure the highest possible authenticity. We have also used the most recent sources available in order to use as relevant and valid information as possible. Most of the sources used in this thesis are published and peer reviewed articles collected from renowned journals and publishers like Ebsco and Elsevier. Peer reviewed articles have a higher degree of credibility since the article have been examined by researchers in the area previous to publishing. The articles used that are not peer reviewed are mostly made by established researchers and have been cited by many other researchers, making the articles more credible as a source of information. One source that is worth mentioning is the Swedish department of agriculture (Statens jordbruksverk, SJV). They have been producing official statistics about the agricultural sector for a very long time and is considered to be a very reliable source of information since they are appointed by the government as expert authority in the agricultural political field (SJV, n.d.). Some websites have been used as sources and that kind of information is considered less credible. The information used from websites are mainly from companies that are active in the business or associations within the industry. These sources are used with caution and mainly as sources that supports an argumentation. In the few instances where we have used this kind of information to draw conclusions, we have valued the information provided as trustworthy and have been able to confirm the information through third parties. Based on the nature of the sources that has been used for information collection in this study we have been able to rule the collected information as having a high degree of authenticity.

The data that has been collected for analysis in this thesis comes from Retriever Business. This is public information that has been reported by the companies themselves to the government and can be considered a credible source of company information since it is an unaltered primary source even though it is provided by a third party. This reasoning concludes that the main body of information used in this study have a high degree of independence and objectiveness.
3. Theory

Modigliani and Miller (M&M) wrote their famous “proposition 1” in 1958, which can be seen as the starting point for the research area of capital structure. Since then there has been debates regarding optimal capital structure models. We are in this chapter going to present, argumentation for the chosen theories of the study, the implications of the chosen theories, as well as their evolution into theories we see today.

3.1. Modigliani & Miller Proposition

In this article Modigliani and Miller (1958) discuss the cost of capital and how the cost of capital relates to the investments of assets. In the paper they first set forth a set of assumptions that would allow for analysis of the firms. One assumption was a restriction on financing means, limited to; common stock and bond issuance or its equivalent (Modigliani & Miller, 1958, p. 265). Another assumption was that the firms could be categorized in groups of equivalent return where the return on each of the firms shares was proportional to that of the other firms in the group (Modigliani & Miller, 1958, p. 266). With these assumptions in place, Modigliani and Miller (1958, p. 267) were able to construct a formula dealing with uncertain streams.

The authors continue with introducing debt financing, which has an effect on the shares of the firm. By introducing debt finance the firms is taking on a financial risk. This risk makes the firms different from others in the group and as such they can no longer be considered a perfect substitute for the other firms in the group (Modigliani & Miller, 1958, p. 268). Following their assumptions, the price of the shares should be the same as that of a share with equivalent return. This reasoning led to the first proposition that stated that the market value of a firm is independent of its capital structure (Modigliani & Miller, 1958, p. 268). The argument stands that if a firm generate a higher return on its shares at the same price as other firms, then investors will take advantage of the arbitrage and the opportunity to make risk free return will disappear.

The second proposition that Modigliani and Miller (1958) presented dealt with how the cost of capital is affected by debt financing. Debt financing is considered a less expensive way of gaining new capital. However, the second proposition states that the cost of capital is unchanged by the capital structure of the firm (Modigliani & Miller, 1958, p. 272). The reasoning behind this goes, as the return of a share rises with taking on debt to finance its operations, so does the risk of the equity investment and as such the required return on invested capital increases to the point where it offsets the lesser cost of the debt financing.

3.2. Theoretical choice

As has been mentioned previously, there are many theories within the capital structure area of research. Jensen and Meckling’s (1976, p. 308) agency based theory of explaining the capital structure is based on the relation of agents and principals. According to this theory, the agent may not always work in the best interest of the principals the firm and making the agent compliant with the principals will infer costs. When the manager of the firm owns 100 percent of the equity within the firm, the decisions that he makes will be those that maximize the utility of the firm and thereby his own (Jensen & Meckling, 1976, p. 8). If the manager does not have full ownership of the firm, he will undertake operations which maximize his own utility portion of the
ownership, to the detriment of the other shareholders (Jensen & Meckling, 1976, p. 8). Since the theory is based on firms having more than one owner that may not share the optimal view of the firm’s operations we deemed this theory to not be suitable when examining and analysing the capital structure of Swedish dairy farms.

The static trade-off theory by Miller (1977) is built on the idea of utilizing the interest tax shield to increase the firm value to an extent where the benefits of the tax shield in relation to the negative effects of the increased risk of bankruptcy costs is at its greatest (Myers, 1984, p. 577). This mean that the firm should use debt finance instead of relying on the internally generated funds if they can carry the interest costs. We chose to include this theory as a base for the analysis of the results of the study. This is because the theory could provide insight in the reasoning as to why a firm choose to take upon itself long term debt when alternative debt maturities are an option. In the literature review we had also found that the theory had been used in a number of previous studies, which made it relevant for ours (Atiyet, 2012; Bancel & Mittoo, 2004; Shyam-Sunder & Myers, 1999).

Myers’ (1984, p. 582) pecking order theory is built on the concept of information asymmetry between the firm management and the outsiders. It includes a hierarchical structure of preferred financing methods for firms based on risk and the cost of the capital (Myers, 1984, p. 581). We saw this as an important theory to include in the analytical base for the results of this study seeing as it has been widely used in previous research (Cassar & Holmes, 2003; Chittenden et al., 1996; Krasker, 1986; Mac an Bhaird & Lucey, 2006; Michaelas et al., 1999; Swinnen et al., 2005; Van der Wijst & Thurik, 1993; Wald, 1999; Wu et al., 2014).

The utility maximizing model that Collins (1985, p. 1) presented looked at the structure of farms from the perspective of maximizing the return on equity. The model that determine the capital structure is based on variables such as the expected return on land and other farm related operations. Collins (1985, p. 4), with the use of the model in his paper, argue that the financial risk that the firm is willing to take is dependent on more variables than the business risk, namely the expected net rate return on equity, interest rates and risk aversion parameters. The model that Collins (1985, p. 1) presents is however built on information that we will be complicated to gain access too, such as the expected capital gains on the land tenures. This was the reason as to why we did not include this model as a base for the analysis. Based on the detailed information required, this model would in our opinion be more suited for a case study.

The organisational theory that Myers (1993, p. 89) developed deals with the maximizing of organizational wealth instead of the more classical view of corporate finance that focus on maximizing the shareholder wealth. The organisational theory perspective on wealth would mean that each equity issue increase the wealth (Myers, 1993, p. 91) and that the firm therefore should issue more equity. The firms that we examine does not have easy access to equity markets and can therefore not effectively undertake this perspective of wealth and its generation. Because of this, we did not include the organizational theory as a base for the study.

Baker and Wurgler (2002, p. 1) brings up the concept of market timing when discussing the capital structure. According to them, the manager has an incentive to enter the equity market when the valuation of the firm is high in comparison to past valuations of
the firm. Baker and Wurgler (2002, p. 27) state their theory as “...capital structure evolves as the cumulative outcome of past attempts to time the equity market.” Even though the authors found a large effect of the market values on the leverage ratios of the firm we did not find this theory to be a relevant one in the explanation of the capital structure of Swedish dairy farms. This is due to the formulation of the theory and firms that we have analysed. The reasoning as to why it is not relevant in our study is because the firms we have examined and analysed are not publicly traded and it is therefore harder to examine if they have issued equity from outsiders and what the implication of the past attempts to time the market were on the capital structure.

3.3. Static Trade-off Theory

As a response towards the criticism that the Modigliani and Miller paper of 1958 received they published a response 1963 in which they included taxes. This paper showed a linear relationship between firm value and leverage (Modigliani & Miller, 1963, p. 439). As a response, Robichek and Myers (1965, pp. 42-43) argued that as leverage increases, so does the risk of interruptions of reinvestments and as such the firm value would decrease as leverage increases. However, Kraus and Litzenberger (1973, p. 918) showed in their paper that the market values of firms were not always a concave function of leverage, as assumed with the traditional net income valuation approach. As a retort to the optimal capital structure theories on debt financing and cost of debt, Miller (1977, p. 262) argued that the costs of debt were smaller in relation to the benefits than previously assumed. Moreover, Miller (1977, p. 263) makes the assumption that if the deadweight cost of loans started to eat up the tax benefits, the holders would be looking for other sources of capital. In further argumentation regarding the benefits of debt, Miller (1977, p. 266) points towards a gap between the equilibrium of optimal capital structure and the current structural situations, which he argues cannot be explained by the bankruptcy or agency costs of debt. Instead he assumed that this fact must indicate that the benefits of debt financing is lesser than what previous knowledge suggested.

Furthermore, Miller (1977, p. 267) proposed an expression that would give the gain of leverage:

$$G_L = \left[ 1 - \frac{(1 - T_c)(1 - T_{ps})}{1 - T_{pb}} \right] B_L$$

Where;

- $G_L$=Gain from leverage
- $T_c$=Corporate tax rate
- $T_{ps}$=Personal tax rate on income of common stocks
- $T_{pb}$=Personal tax rate on income from bonds
- $B_L$=Market value of firm debt

Additionally, Miller (1977, p. 269) presented a market equilibrium model for corporate bonds where he showed that an increasing quantity of corporate bonds would drive the interest rates up to a point where it is higher than the benefits of the interest rate tax shield and as such has a negative effect on the firm. An illustration can be seen in Figure 1 where the interest on the bond has to off-set the personal income taxes on interest (Miller, 1977, p. 268). As the tax rate is progressive it makes the curve of the demanded interest on the bonds to rise continuously. The horizontal line is the tax-exempt rate of the corporate tax rate and the intersection of the demand curve with this line gives the
equilibrium $B^*$ (Miller, 1977, p. 269). When the interest rates goes above the $B^*$, the option of further leveraging the firm will be a losing one, while it will be advantageous to offer bonds if the interest is lower than what is given by intersect $B^*$. What this means is that the firm will gain by taking on more leverage until the interest payment are higher than the tax deduction.

Figure 1: Market Bond Equilibrium Model  
*Source: Miller, 1977, p. 269*

This relation means that there is a value maximizing equilibrium to be found. According to Myers (1984, p. 577), the theory says that firms debt to equity ratio would lie on its optimal equilibrium level if there were no costs of adjustment. However, he then argues that there are adjustment costs that cannot be ignored and that these costs causes lags in the adjustments of the capital structure which could explain the variation in capital structures (Myers, 1984, pp. 577-578).

Additionally, Myers (1984, p. 577) presents in his paper “The Capital Structure Puzzle” a figure illustrating the present value of financial distress effects on the benefits of the tax shield.
As the Figure 2 shows, the benefit of the tax shield is pushed down by the cost of the increase in bankruptcy costs that is associated with the increased debt. In Figure 2 we can see that there is an optimal equilibrium where the benefit of the tax shield is greatest. This equilibrium will however not be a stable level of debt for the firm, and each firm will have a different equilibrium. As events unfold on the market, this equilibrium will move and the static trade-off theory suggests that firms should chase this equilibrium in order to maximize the value of the firm. Hence the theory assumes that each firm has a target debt level where the firm’s value is at its maximum. This target debt level will however vary for each firm as the relative cost of the debt can vary between firms, depending on their operations. Moreover, there can be differences in the taxation of the various industries in the market which will affect the optimal debt level for the firms operating within the industry.

3.4. Pecking order theory
The pecking order theory was developed by Myers (1984), in his article “The capital structure puzzle”, in reaction to the fact that the, previously mentioned, M&M theory of capital structure and the static trade-off theory did not explain the financing behaviour actually conducted in companies. Instead Myers (1984, p. 567) proposed an alternative view on financing choices. He said that companies follow a pecking order when deciding on the type of financing they choose. When financing an investment, companies prefer internally generated funds to external funds and they prefer debt to equity issues (Myers, 1984, p. 581). This means that companies issue the safest security first if they need external financing. It also implies that there is no target debt-to-equity ratio since equity is present in two places at once, firstly internal equity (retained earnings), that is at the top of preference, and then equity issuing at the bottom. Myers (1984, p. 582) do not consider this theory to hold in every individual case, since there will always be firms that issue equity when they could issue public debt or go to the bank, but to be a strong explanatory factor in the aggregate.

This order of preference can be explained in many ways, one is risk aversive management behaviour, another is an unwillingness to give away control of the
company, both explanations leads to the conclusion that companies avoid issuing stocks or convertible bonds if they can. The explanation Myers (1984, pp. 582-585) use is based on information asymmetry and is as follows. Investors have no detailed information about an investment a firm is about to make so if the firm issues stock to finance the investment, the investors will not pay full price for the stock because of the risk he faces due to the information asymmetry. This means that if a firm wants to do an investment of 10M with NPV 12M they might need to issue stocks for 12 M to get the 10M needed for the investment. This scenario would mean that the company would not do the investment since the total NPV is zero. The only scenario where a company would issue stock, under these assumptions would be when the stocks are overvalued (Myers & Majluf, 1984, p. 195). This also means that there exists an equilibrium level between issuing shares and debt. Investors are aware of this type of corporate behaviour nowadays and stock issues is generally met with suspicion from the market. This forces a company who need external funds to take on debt instead, thus forcing the company to adopt a pecking order, even though this situation is a bit stylized (Myers, 1984, p. 585).

3.5. Additional theoretical development in Pecking order theory
Narayanan (1988, p. 40) support the argument that when stocks are undervalued, companies tend to issue debt instead, and issue stocks when they are valued high. Narayanan (1988) also includes the possibility of risky debt and financial “lemons” into the model. The introduction of risky debt in the model makes the choice between debt and equity more difficult. The fact that companies issues equity when they are highly valued speaks against both the pecking order theory and the static tradeoff in their basic form (Myers, 1984, p. 586). Under static trade-off theory, when the value of the firm increases, the debt-to-value decreases and the company should therefore issue debt instead of equity to maintain the target ratio, which they do not. According to pecking order, companies only issue equity when the information asymmetry is high enough and it is not likely that information asymmetry is systematically higher when stock prices are higher (Myers, 1984, p. 586). Nonetheless, the empirical evidence in the article of Narayanan (1988) support the pecking order theory as a significant explanatory factor in the market and increased the explanatory power of the model.

3.6. Additional research in capital structure
Since the introduction of pecking order theory and static trade-off theory, there has been extensive research made regarding capital structure. These theories has become the two big competitive theories of capital structure (Swinnen et al., 2005, p. 2) and a lot of researchers have examined the existence of the theories in different areas.

In a cross-country study between France, Germany, Japan, the United Kingdom and the United States, Wald (1999, p. 161) examined the effects of a set of variables on the capital structure of the firms and how they differ from each other in the various countries. Wald (1999, p. 184) found that the many of the variables that he examined had various effects on the capital structure in the different countries. The evidence suggested that risk, growth, size and the inventory effects on the firms were not consistent across the countries. The evidence provided by Wald (1999) tells us that our study is likely only representative for the Swedish market and cannot be used to make reliable generalizations across the border. However, it may provide an idea of how the
capital structure may look in countries with similar farming environment and stand as an idea of what to expect as well a base for comparison.

Krasker (1986) found evidence for an adverse selection function when companies seek external financing, supporting the existence of pecking order. On the other hand, Frank and Goyal (2003, p. 241) found only weak support for pecking order during specific points in time, when examining publicly traded american firms during the period 1971 - 1998. Bancel and Mittoo (2004, p. 131) found evidence for static trade-off when they examined managers views on capital structure choices in 16 European countries. They also found differences in the decision process between Scandinavian managers and non-Scandinavian managers. Atiyet (2012, p. 9) found strong evidence for pecking order in french companies when comparing pecking order and static trade-off. But when adding the two theories together Atiyet (2012, p. 7) found that the new model had an explanatory power of ($R^2$) 96% in that sample. This means that if the sample is representative of the population, almost all financing decisions can be explained by either theory but predominantly pecking order.

The application of the financial theories had proved its applicability on the larger firms and an interest in their explanation of the capital structures of SMEs has grown. Cassar and Holmes (2003, pp. 127, 130) examined and analysed the firm characteristics effect on debt ratios of 13 000 australian businesses. The study showed that the static trade-off theory and the pecking order theory were supported by the results of the proxy variables effect on the debt ratios, which reconciled with the expected outcomes (Cassar & Holmes, 2003, p. 142).

Swinnen et al. (2005) examined 899 SMEs in Belgium and found strong evidence for pecking order since companies increase or decrease financial debt in correspondence to the availability or lack of internal funds. Mac an Bhaird and Lucey (2006) found some support for pecking order in Irish SMEs. The explanation to why SMEs in Ireland do not show a stronger influence of pecking order is that many firms in the sample had much fixed assets which negated some of the effect from asymmetric information (Mac an Bhaird & Lucey, 2006; 2010).

Another study of SME capital structure was made by Van der Wijst and Thurik, (1993, p. 58) who studied the German SMEs. The data used in this study was from third party data collector and consisted of panel characteristic data which was retrieved through the use of surveys. This told us that there are more than one viable way to collect data for our analysis. However, the nature of how this data was collected requires a long time frame as it spans several years. What Van der Wijst and Thurik (1993, p. 62) found was that the pecking order theory was relevant in the explanation of the capital structure as many of the variables they tested were in line with how the pecking order would explain it.

There has been several additional studies that examine the capital structure of European SMEs. One of which was a study by Chittenden et al. (1996, p. 62) who examined the capital structure of a sample of 3480 firms within the U.K. The study was based on financial data retrieved from a third party program. With the data they were able to run regressions on the firm characteristics effects on the debt levels. In the study they found indications that the Modigliani and Miller (1958) propositions do not hold for small firms. Moreover, the results were supportive of the framework that the pecking order
theory presents and therefore suggest that it is an applicable theory when examining SMEs (Chittenden et al., 1996, p. 67). This study further proves that the inclusion of the pecking order theory in the analytical framework was not baseless.

Another study in the same geographical area was conducted by Michaelas et al. (1999, p. 117) who examined a sample of 3500 SMEs in the United Kingdom. The study’s data spanned a period of ten years, on which they tested how the tax based, asymmetric cost and agency cost theories would explain the capital structure and if the variables related to each theory were significant. The results of the study show that both the pecking order theory and the agency theory had explanatory value of why the capital structure of the SMEs look as they do (Michaelas et al., 1999, p. 126). They did however not find that the tax based theories that they had put to the test had explanatory value. An interesting note on this study is that the authors found that not only did some of the variables have explanatory power of the gearing of the firm, but also on the maturity of the debt finance (Michaelas et al., 1999, pp. 126-127). This would indicate that there are variables that are stronger predictors for the pecking order theory which includes a hierarchical element to the preferred financing method. Another result that should be noted is that Michaelas et al. (1999, p. 127) found evidence that SMEs capital structure were affected by macroeconomic events. This information tells us that there is a likelihood that the firms in our population too is affected by macroeconomic events and that it should be worth to look at. The fact that the time period under which our data comes from includes a large financial crisis makes this find all the more important for our study and makes changes in interest rates and its connection to debt finance an interesting side note to look at.

Since this is a situation that might apply to the agricultural sector there has also been done some research on the capital structure in that area. For example Hubbard & Kashyap (1990) find evidence of tendencies that are in line with pecking order in US farms. Wu et al. (2014) examined 340 Dutch farms and concluded that farms capital structure are dependent on the profitability and many farms use extensive collateral to be able to finance investments. These results are in line with pecking order theory. The results of the studies in this chapter shows that it is likely that pecking order are predominant in Europe and especially in SMEs. In agriculture, because of the availability to collateral to raise low risk loans, equity issues appears to be very rare. This is also in line with pecking order.

It is important to note that these theories are devised with the ordinary firms in mind and may differ in the explanatory width in comparison to that of firms in previous research. The agricultural sector of Sweden is, as previously discussed, somewhat different from other firms in its availability of outside finances and customer base. We would however argue that part of the difference in outside investors stem from a choice made by the business owner and not a restriction placed on the owner by outside forces. This is because there is no legal restraints that prohibit equity investments in agriculture. Moreover, the fact that firms can generate close to maximum revenue capability from investments in assets in a short time after its acquisition may differ from other firms and may therefore yield different results than many other firms.

3.7. Previous findings in agriculture capital structure

When looking at the research area of capital structure in the agriculture sector most findings have been descriptive in nature. In a report by Ifit et al. (2014, p. 8) they note
that the average leverage ratio of the dairy farming industry has increased between the years 1992 and 2011, while the average leverage ratio of the agricultural sector decreased from 13% to 9% between the years (Ifft et al., 2014, p. 2). Zhao et al. (2008, p. 811) investigated signaling of credit risk and its effects on the capital structure of US farms in Illinois. They found that ROA had a significant positive effect on short, but not long term debt ratios, while lagged ROA was positively significant for both debt ratios (Zhao et al., 2008, p. 814). It is also notable that the farms use the debt to make investments in fixed assets as can be noted in the regression table of their study.

Descriptive statistics show that the mean debt to asset ratio among the examined farms was 31% and that the average ROA was 4.33% (Zhao et al., 2008, p. 813). In a report of the debt finance landscape of U.S. farms, Harris et al. (2009, p. 29) show that the farms’ profitability rose from the year 1992 to 2007 and that the farms with a very high leverage were more profitable in the latter year. There is however evidence that suggest that the farmers are not favorable towards debt. Barry et al. (2000, p. 931) found that farms with a higher cash flow tend to invest and grow while paying of the debt.

Another study that found differences in capital structure between farms by Petrick and Kloss (2012, p. 8) found some variation in loaning trends of farms between seven EU members. They also found that the leverage ratio effect on the willingness to pay for credit differed between the regions (Petrick & Kloss, 2012, p. 11), which indicates regional differences in the industry. Further evidence for differences in the capital structure among farms of different countries is provided by Benjamin and Phimister (2002). In their study they found a difference in the investment sensitivity to cash flow and available collateral between French and Britsh farms (Benjamin & Phimister, 2002, p. 1127). In addition to these studies, Wu et al. (2014, p. 125) found that profit and growth had a significant effect on the leverage ratio and that size, asset structure and risk did not have a significant effect.

### 3.8. Indicator variables

When examining capital structure one often look at proxy variables that can be connected to the the relevant theories that aim to provide an explanation of the capital structure. The reasoning behind using proxy variables is according to Van der Wijst and Thurik (1993, p. 56) that the determinants of the capital structure is often attributed to factors that cannot be measured by researchers. A review of previous research has provided a set of variables that are usually looked at when one is examining the capital structure of firms.
3.8.1. Size
In order to understand why size would be a predictor of the capital structure of the firms we must first explain some benefits that may come with a larger sized firm. Among other things, Wald (1999, p. 173) argued that a large size opens up the possibility for the firm to reduce its transaction costs and as such have an effect on the capital structure. However, some of the characteristics that Wald (1999, p. 173) mention does differ in our researched area in comparison to many other industries. For example the possibility of a large firm having a more diluted ownership, which is rare in the Swedish agricultural sector. The argument that the size of the firm is important to take into account when talking about capital structure can be boiled down to idea that the size of the firm should reduce the information asymmetry, and therefore the risk, and as such reduce costs and availability of external finances. Therefore, according to the pecking order theory, the larger firms should have a larger portion of debt finance than the smaller firms as debt is a less costly way of gaining capital for larger firms.

There are many studies that has found that the size of the firm does have an effect on the capital structure of the examined firms. Wald (1999, p. 183) found that size had a significant effect on the capital structures of firms, although varying between countries. Moreover, Scherr et al. (1993 p. 30) found a positive relationship between firm size and debt level. Other studies that found that size is a significant variable when examining capital structure are Cassar and Holmes (2003, p. 136), Chittenden et al. (1996 p. 66), Michaelas et al. (1999, p.122) and Swinnen et al. (2005, p. 23). On the other hand, Jordan et al. (1998, p. 19) found little evidence that the firm size influenced the capital structure among small UK firms. Moreover, Van der Wijst and Thurik (1993, p. 61) did not find evidence for firm size being significant at the 5% level in their study of small firms. Wu et al. (2014, p. 125) found that the size had a significant effect in only one of the quantiles. Contrary to what the theory suggest, Michaelas et al. (1999, p.122) also found that size had a negative relationship with short term debt.

This leads us the hypotheses that the size of the firm should be positively related to the leverage, short- and long-term debt levels.

H1: Size has a positive relation to leverage ratio.
H2: Size has a positive relation to long term debt ratio.
H3: Size has a positive relation to short term debt ratio.

3.8.2. Profitability
According to the pecking order theory, firms would first use the internally generated funds in order to finance its operations as well as make new investments as this source of capital is less costly than seeking capital from outside sources. It would therefore stand that a more profitable firm would take less loans. One could argue that a more profitable firm would be able to seek outside financing at a lower cost than a less profitable one, but according to the pecking order theory the firm would prefer to utilize the internally generated funds. Many previous studies has found that the profitability of a firm has an impact on its capital structure (Cassar & Holmes, 2003, p. 135; Michaelas et al., 1999, pp. 120, 122; Swinnen et al., 2005, p. 23; Van der Wijst and Thurik, 1993, p. 61).
Not all studies did however find that profitability had an impact on the capital structure. Chittenden et al. (1996, p. 64) found a negative relationship between profitability and short term debt, but did not find that profitability was statistically significant in determining long term debt. Furthermore, Jordan et al. (1998, p. 19) did not find that profitability was statistically significant in its impact on firm leverage and hence its capital structure.

Based on this information we can formulate our hypothesis that the firms profitability is negatively related to the firms’ debt levels.

H4: Profitability has a negative relation to leverage ratio.
H5: Profitability has a negative relation to long term debt ratio.
H6: Profitability has a negative relation to short term debt ratio.

3.8.3. Asset Structure
The idea that asset structure should affect the capital structure of the firm is related to information asymmetry. Harris and Raviv (1991, p. 303) argued that in the event that the firm has to default, the investors control the liquidation of the assets and can from there retain some of the value of the investment and as such a higher liquidation value should be a positive characteristic of the firm. Therefore, it stands to reason that the investors would look favourably upon a firm with a higher degree of tangible assets in comparison with other alternative asset structures. Furthermore, the firms can reduce the moral hazard costs and the adverse selection problem by using fixed assets as collateral when taking loans (Cassar & Holmes, 2003, p. 128). The evidence from previous studies suggest that there is a positive relationship between a high degree of fixed or fixed tangible assets and leverage (Chittenden et al., 1996, p. 64; Jordan et al., 1998, p. 19; Michaelas et al., 1999, p 120; Van der Wijst & Thurik, 1993, p. 61).

From this information that was provided by the authors of the previous studies and the theories that the thesis is based on we can formulate hypotheses that the asset structure of the firm should be positively related to the debt levels.

H7: The asset structure has a positive relation to leverage ratio.
H8: The asset structure has a positive relation to long term debt ratio.
H9: The asset structure has a positive relation to short term debt ratio.

3.8.4. Growth
By viewing growth from the perspective of the pecking order theory, a firm with a higher growth will have more demand on its retained earnings being re-invested in the firm. According to the pecking order, the firm will therefore start looking for external finances in order to continue investing in its growth yielding operations. Cassar and Holmes (2003, p. 137) argue that these firms will therefore look for less secure short term debt than the alternative long term debt and that this results in high growth firms having a higher leverage ratio. The empirical studies conducted by researchers appear to have produced conflicting results, although most show a significant effect of growth on leverage. Michaelas et al. (1999, p. 121) found that firms with high growth opportunities had a higher leverage ratio. As did Wu et al. (2014, p. 125) in their examination of farm capital structure. Meanwhile, Chittenden et al. (1996, pp. 64, 66) found that growth opportunities in combination with a lack of access to the capital
markets had a positive effect on leverage. Moreover, Swinnen et al. (2005, p. 14) did not find that growth opportunities were significant in determining the debt ratio at the 1% level.

As the pecking order theory suggest that the firm follow a hierarchical pattern its use of financial of tools to gain capital we can formulate two hypotheses regarding the growth relation to debt levels.

H10: Firm growth will have a positive relation to leverage ratio.
H11: Firm growth will have a positive relation to long term debt ratio.
H12: Firm growth will have a positive relation to short term debt ratio.

3.8.5. Risk
The risk that a firm is exposed to should according to the static trade-off theory affect the capital structure of the firm. This is due to the relationship that risk has with bankruptcy costs. Therefore, a firm that experiences a higher risk will be less willing to take on more debt as a means to finance its operations and growth. It should also, according to the static trade-off theory, mean that the firm has a lower level of optimal debt to equity ratio as the increased cost is higher than the tax benefit of debt. As explained earlier, bankruptcy can be caused by the inability to pay interest on the debt. As such, the operating risks are of importance when examining the relevance of the static trade-off theory as an explanation as to why a firm has the current debt level. A volatile profitability of the firm can therefore be seen as an operational risk of not being able to meet the interest payments. That being said, previous studies have found that the risk exposure has had a positive relationship with leverage (Jordan et al., 1998, p. 20; Michaelas et al., 1999, pp. 120-121). In addition to these studies, Cassar and Holmes (2003, p. 139) also found that operational risk had a positive relationship with leverage ratio for larger SMEs and that the variable was not significant in explaining the leverage ratio of smaller SMEs.

These studies have provided contradictory results in regards to what the theories of capital structure suggest. The static trade-off theory is built on the notion that the firm should use the debt levels where the benefits of the debt is at its peak against the increased risk of bankruptcy. As we intend to look at the theories explanation of the capital structure we chose to formulate the hypothesis based on the theory and not the findings of these studies. Though the studies will be an interesting tool for comparing results.

H13: Operational risk has a negative relation to leverage ratio.
H14: Operational risk has a negative relation to long term debt ratio.
H15: Operational risk has a negative relation to short term debt ratio.

3.8.6. Non-debt tax benefit
There are more ways that one can reduce the tax burden on the firm than the interest tax shield. According to the tax based theories, a firm that is profitable and has a low non-debt tax shield should utilize the benefit of the interest tax shield to a greater extent, meaning that they will have a higher leverage ratio (Michaelas et al., 1999, p. 114). The reasoning for this relationship is that the non-debt tax shields are substitutes for the interest tax shields, as argued by DeAngelo and Masulis (1980, p. 4). The results from
the previous studies that looked at the non-debt tax benefit effect on the capital structure does however not support this claim. Titman and Wessels (1988, p. 17) did not find that the non-debt tax shield had a significant effect on the debt ratios of the examined firms. However, they do recognize that it could be a modeling issue as the variables may not capture all the relevant aspects of the non-debt tax benefits as suggested by the theories. Moreover, Michaelas et al. (1999, p. 119) did not find statistically relevant evidence that the non-debt tax shield had a negative effect on the debt ratios. In fact, contrary to what one would assume based on the theories predictions, the results that these authors received showed that the coefficients of their proxy variable were positive, in its explanation of the debt ratios. In addition to this study, Van der Wijst and Thurik (1993, p. 60) found that the non-debt tax benefit had no significant effect on the debt ratios of the firms. In a similar manner as the result of the Michaelas et al. (1999) and Van der Wijst and Thurik’s (1993, p. 60) results showed that the coefficient of the proxy variable was positive for short term debt.

As is discussed, the theories suggest that there should be a negative relation between the non-debt tax shield and the debt ratios, though the results of the previous studies did not find a significant relation. Based on the theory, our hypothesis is that the non-debt tax benefits should have a negative effect on the debt ratios.

H16: Non-debt tax benefits has a negative relation to leverage ratio.
H17: Non-debt tax benefits has a negative relation to long term debt ratio.
H18: Non-debt tax benefits has a negative relation to short term debt ratio.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Hypothesis</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Size</strong></td>
<td>H1: Size has a positive relation to leverage ratio.</td>
</tr>
<tr>
<td></td>
<td>H2: Size has a positive relation to long term debt ratio.</td>
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<tr>
<td></td>
<td>H3: Size has a positive relation to short term debt ratio.</td>
</tr>
<tr>
<td><strong>Profitability</strong></td>
<td>H4: Profitability has a negative relation to leverage ratio.</td>
</tr>
<tr>
<td></td>
<td>H5: Profitability has a negative relation to long term debt ratio.</td>
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<td></td>
<td>H6: Profitability has a negative relation to short term debt ratio.</td>
</tr>
<tr>
<td><strong>Asset structure</strong></td>
<td>H7: The asset structure has a positive relation to leverage ratio.</td>
</tr>
<tr>
<td></td>
<td>H8: The asset structure has a positive relation to long term debt ratio.</td>
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<td></td>
<td>H9: The asset structure has a positive relation to short term debt ratio.</td>
</tr>
<tr>
<td><strong>Growth</strong></td>
<td>H10: Firm growth will have a positive relation to leverage ratio.</td>
</tr>
<tr>
<td></td>
<td>H11: Firm growth will have a positive relation to long term debt ratio.</td>
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<td></td>
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</tr>
<tr>
<td><strong>Risk</strong></td>
<td>H13: Operational risk has a negative relation to leverage ratio.</td>
</tr>
<tr>
<td></td>
<td>H14: Operational risk has a negative relation to long term debt ratio.</td>
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<td></td>
<td>H15: Operational risk has a negative relation to short term debt ratio.</td>
</tr>
<tr>
<td><strong>Non-debt tax benefit</strong></td>
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<td></td>
<td>H18: Non-debt tax benefits has a negative relation to short term debt ratio.</td>
</tr>
</tbody>
</table>
4. Practical Methodology

When conducting research and examining a theory and its explanatory value there are different types of models that one can adopt as well as statistical tools and methods of testing these models. We are in this chapter going to present the models that has been used in this study, as well as present an explanation of the chosen statistical tools.

4.1. Models

In order to test the Pecking order and Static Trade-off theory we have used the models presented by Shyam-Sunder and Myers (1999, pp. 224, 226). We would argue that the models that these authors present are credible due to their background and the nature of the research conducted by the authors.

The dependent variable in these model is the book debt ratio, which they define as the book value of debt to book value of assets (Shyam-Sunder & Myers, 1999, p. 228). The model for the Pecking order theory is given by Shyam-Sunder and Myers (1999, p. 224) as following:

$$\Delta D_{it} = a + b_{PEO} \cdot DEF_{it} + e_{it}$$

Where DEF is:

$$DEF_{t} = DIV_{t} + X_{t} + \Delta W_{t} + R_{t} - C_{t}$$

The independent variable of Static trade-off is defined as:

$$\Delta D_{it} = a + b_{TA} \cdot Z_{it} + e_{it}$$

The components are defined as:

- C: operating cash flows, after interest and taxes
- DIV: dividend payments
- X: capital expenditures
- ΔW: net increase in working capital
- R: current portion of long-term debt at start of period
- D: long-term debt outstanding
- Z = D* - D_{it-1}

The Pecking order theory model did provide one problematic variable that, due to the reporting requirements, were impossible for us to device. This variable was the current portion of long-term debt at start of period (R). Trying to solve this problem we turned to existing literature to see if anyone else who examined small companies has had the same problem and if they found a solution. The authors who did a similar study either did not encounter this problem or did not explain how they solved it in their articles. We tried to construct a model using the few companies who did account for the current portion of long term debt at start of period, applying that model to the companies that did not but we did not manage to find a suﬃceable way of estimating this value due to the variation of how each firm may deal with debt payments. Therefore the variable has been omitted from the calculation. This does however mean that this is not a real test of
the theory. We would however argue that the other variables included in the analysis would still provide an indication of how the pecking order theory explain the capital structure of the firms. This is because the majority of the weight of the change will lie on the capital expenditures.

In addition to these models, Atiyet (2012, p. 6) combined these two models in his significance testing. We tested this model in addition to the individual models. The combined model Atiyet (2012, p. 6) presented looks as follows:

$$\Delta D_{it} = a + b_{PO}\ast\text{DEF}_{it} + b_{TA}\ast\text{Z}_{it} + e_{it}$$

Because the pecking order theory model is not complete, we looked at variables such as the size, profitability, growth, risk and non-current assets effect on the capital structure, as has been done in previous research in order to analyse how the pecking order theory and static trade-off explains the capital structure of the firm.

4.2. Firm characteristics

In addition to the models that has been presented, we used proxies in order to examine the firms and the explanation of the capital structure by the theories. The reason behind this decision stem from the argument that it may be difficult to observe the underlying factors that determine the capital structure (Van der Wijst & Thurik, 1993, p. 56). Another reason is due to the fact that the model for pecking order presented by Shyam-Sunder and Myers (1999) is, in our case, incomplete. Additionally, the static trade-off model may present results that may not hold true in its theoretical sense due to some companies not having any long term debt and therefore the calculated target debt level would be zero and the company would be exactly on the target debt level continuously. According to the static trade-off model this should not be possible since the target debt level is constantly shifting due to interest rates, profitability and so on. The proxy variables that we intend to use in our analysis are; size, profitability, assets structure, growth, risk and the non-debt tax benefit.

4.2.1. Size

We have in the literature found various ways in which the authors has proxied the size of the firms. Scherr et al. (1993, p. 26) used the actual size of the firm to proxy the expected size based on a survey. Van der Wijst and Thurik (1993, p. 59), Chittenden et al. (1996, p. 63) and Michaelas et al. (1999, p. 118) used the total assets as absolute values as their proxy variable. A variant of the asset based size proxy was used by Cassar and Holmes (2003, p. 132). They used the log 10 of total assets instead of the absolute values. By using the log 10 of total assets they compress the variable so that the difference between the firms are reduced. Wald (1999, p. 173) proxied the size with the natural logarithm of total assets. Titman and Wessels (1988, p. 6) on the other hand used the natural logarithm of sales to proxy size. They argued that the size effect, if there would be any, would only affect the small firms. Another article that used figures from the income statement rather than the balance sheet was Jordan et al. (1998, p. 4) who used the turnover of the firms as the proxy variable. The benefit of using a natural logarithm of the size indicator is that it reduces the effect of companies that are significantly larger than others, due to the decreasing marginal effect. Both the turnover and the asset based measurements have benefits and drawbacks. The turnover
measurement method is much more sensitive to changes in the market, while the asset based method gives a picture of a diminishing firm size due to depreciation of assets. For large firms the depreciation will have little effect on the firm size as reinvestments are made continuous, however, it may have a noticeable effect on small sized firms. On the other hand, the asset based measurement bases the firm size on the actual book value of the firm, while the turnover method better portrays the volumes that the firm are able to create.

By looking at the development of the natural logarithm of total assets (Appendix A Figure A1) and the natural logarithm of turnover (Figure A2) over time we saw that there had been a market effect within the examined time frame. This market effect was displayed as dips and peaks of the turnover curve that differentiated the curve with the asset curve. We therefore opted to use the natural logarithm of assets as the proxy variable for the size of the firms.

Size = Ln(total assets)

### 4.2.2. Profitability

Profitability has seen various forms of methods of proxying. Scherr et al. (1993, p. 26) who examined start-up firms capital structure proxied the expected profitability with total income before tax over the total capitalization. Chittenden et al. (1996, p. 63) used the pre-tax profits over the turnover (Pre-tax profit margin) as a proxy variable. Michaelas et al. (1999, p. 118) proxied the profitability of the firms with the use of three years historical pre-tax profit margin. The benefit of proxying the profitability in this way is that it creates a picture of the firm’s profitability that is more robust against fluctuations in the market and as such provides a better figure of the firm’s true profitability. However, this becomes a problem when using panel data with limited accessibility to information. In our case, this would mean that the first year in our data set is given a profitability value that is based on a different method than the rest of the data set due to unavailable data. Van der Wijst and Thurik (1993, p. 61) proxied the profitability of the firms in their study with the return on investments (ROI). The ROI is a good way to examine the profitability of the investments of the firm and from there gain understanding of the firm’s overall profitability. The way it could be estimated would be to look at the increase in earnings before interest and taxes (EBIT) in relation to capital expenditures, which would give the profitability of the invested capital in fixed assets. However, in our case this variable will be hard to properly estimate as an increase in the operating income may stem from other factors than investments, such as increased efficiency in the operations. Another method that has been used in the previous studies that we have read was the operating return on assets (Operating ROA). The Operating ROA is a good indicator of a firm’s profitability as it shows how much value is generated from the assets of the firm. A firm that is able to utilize its assets more efficiently and effectively will have a higher Operating ROA than others and hence being more profitable. The method of using Operating ROA to proxy the profitability was used by Cassar and Holmes (2003, p. 132) and by Titman and Wessels (1988, p. 6) who also used the operating income over sales, or return on sales (ROS). In a similar manner to the Operating ROA, Swinnen et al. (2005, p. 9) proxied the profitability with the pre-tax profits over the total assets, which they also smoothed out by averaging it over two years.
Based on our availability of data we opted for the use of Operating ROA as our proxy for the profitability of the firms. Our data will allow us to derive the Operating ROA for all of the examined years in the same way for each year. A reason for not using both the Operating ROA and the ROS as Titman and Wessels (1988) is because of the colinearity of the two variables in our sample. This collinearity will reduce the significance of the variables and may therefore give results regarding the profitability effects on capital structure that may not hold true.

\[
\text{Profitability} = \text{Operating ROA}
\]

### 4.2.3. Asset Structure

In order to measure the effect of the asset structure of the firms, a variety of proxy variables has been used by the authors of previous studies, although much less so than for other variables. Swinnen et al. (2005, p. 9) proxied the asset structure with the intangible assets over the fixed assets, a method that was also used by other authors (Friend & Lang, 1988, p. 275; Michaelas et al., 1999, p. 118). Another way to proxy the asset structure was to take the fixed assets over the total assets. This is a method used by Cassar and Holmes (2003, p. 132), Chittenden et al. (1996, p. 63) and Van der Wijst and Thurik (1993, p. 59). This will give a value that show the allocation of value among the relevant asset types of the firms.

In our study we have used the fixed asset over total asset. This is due to the fact that the idea behind the asset structure connection to the pecking order theory is that these assets are to be used as collateral and as such decrease the information asymmetry effect of the firm on the financial market. The non-tangible assets that are in the firms that we have examined are the ownership portions of the customer supplier firms, which can be immediately liquidated in the event of bankruptcy.

\[
\text{Asset structure} = \frac{\text{Fixed assets}}{\text{total assets}}
\]

### 4.2.4. Growth

The growth rate of a firm has been proxied with similar methods across the previous studies that we have read. The use of sales as a base for the proxy is predominant (Cassar & Holmes, 2003, p. 132; Chittenden et al., 1996, p. 63; Wald, 1999, p. 172). Another proxy method that was used was basing it on the asset growth (Michaelas et al., 1999, p. 118; Wu et al., 2014, p. 122). A third way of proxying the growth of the firm was presented by Titman and Wessels (1988, p. 4) and Mac an Bhaird and Lucey (2007, p. 8). This method was based on the research and development (R&D) expenditures. Another aspect of the proxy that appeared was the choice to average the variable over a number of years or to take the value for one year. Each of the methods that the authors used has their benefits. The benefits of the asset based method of proxying the growth of the firm is that it shows the actual growth in assets that the firm has and a reasonable expected growth for the future can be derived by looking at its past growth. Meanwhile, the sales growth gives an indication of the increase in the value that the firm is able to generate and includes effects of efficiency of the work force and utilization of the assets. The sales method is however sensitive to changes in the market prices. In the industry that we examine in this study, the utilization of the assets to its full capacity is a lesser factor as the assets in the firm have a production that is close to their maximum capacity at an early stage after its acquisition. The third alternative
method of basing the growth on the capital expenditures on intangible assets has the benefit of producing a growth figure that is anchored in the strategic choices of the firm, which can vary from year to year. This method of using the R&D investment as a base for the proxy arguably not applicable to our examined industry. This is due to farms not investing in R&D as a means to gain competitive advantage and growth. Moreover, they do not invest in intangible assets outside the necessary requirements to be able to deliver to the dairies.

Since the variable used as proxy for size is total assets the logical proxy for growth would also be total assets in order to gain comparable numbers. In order to proxy the growth of the firms we have used the percentage increase in assets from the previous year. The benefit of using the percentage increase rather than a nominal increase in assets is that it adjusts the growth rate to the size of the firm and therefore makes the task of comparing growth between firms of different sizes easier. The reasoning behind using the assets as the base for the growth proxy is based on the same ideas as the size proxy. That is, there were market effects that influenced the apparent size of the firm and made the firm appear to have shrunk while the assets had increased.

Growth = Percentage change in total assets

4.2.5. Risk
As discussed earlier, the operational risk of the firm has been found to affect the capital structure of firms. This variable has in the studies we read been proxied in a similar manner across multiple examined studies. A common way of finding a proxy of the riskiness of the firm is by looking at the coefficient of variation, of a set value or ratio. The coefficient of variation is the standard deviation for the observed values for the firm over the mean of the observed values in the sample. Jordan et al. (1998, p. 24) made their risk proxy with this method and based it on EBIT. In a similar manner, Michaelas et al. (1999, p. 118) used the coefficient of variation of their profitability ratio EBIT over total assets. The benefit of using the profitability ratio in comparison to using the value of the EBIT in the proxy is that it scales the independent variable to the size of the firm and therefore makes it easier to compare the results to firms of different sizes. Alternatively, instead of using the coefficient of variation, one can use the absolute coefficient of variation as was done by Cassar and Holmes (2003, p. 132). The absolute coefficient of variation is given by the standard deviation of the observed values of the firm over the mean of the values in the sample times 100. This gives a percentage characteristic to the variable. As with the proxy in Michaelas et al.’s (1999) paper, Cassar and Holmes (2003, p. 132) also based the operational risk variable on EBIT over total assets, which they used to proxy profitability.

The positive characteristic of the absolute coefficient method is that it measures the standard deviation in relationship to the population. Therefore, it gives a picture of how risky the firm is in relation to the market. This positive characteristic does however provide a problem when examining firms within only one industry. As the measurement show the variation of the standard variation in relation to the market, it misses the risks inherent in the market. Therefore, a risky firm may not appear to be risky if the mean risk of the market, which in this case would be the industry, is high.

Based on the pitfall of using the coefficient of variation that we described, we opted for using the standard variation of our profitability proxy, as was done by Wu et al. (2014,
p. 122) (Operational ROA) to proxy the operational risks of the firms in our sample. As such, we include the industry specific risks of the firms. If we were to examine the risks of the firms in comparison to those of other industries we would have used the coefficient of variation so that the risk that is being examined is the relationship between the whole markets risk and the firm’s operational risk.

Risk = STD(Operating ROA)

4.2.6. Non-debt tax benefit
As has been mentioned, there are more than one way to reduce the tax burden on the firm. In order to measure the benefit of the non-debt tax shield effect one has to create a proxy for the variable, as with all the rest of the variables we have discussed here. In the literature we noticed one predominant way of making this proxy variable, which was to look at the depreciation charges. Michaelas et al. (1999, p. 118) used depreciation over the total assets, as did Titman and Wessels (1988, p. 3). Although, Titman and Wessels (1988) used two additional methods to proxy the non-debt tax benefits. These were the investment tax credits over total assets and an estimation of the non-debt tax shield over total assets. They derived the non-debt tax shield using the operating income minus the interest payment minus the federal income tax over the corporate tax rate. The benefits of looking at the depreciation in relation to the assets is that it scales the figure to the size of the firm, hence making it more relatable when comparing firms of different sizes.

Another way to proxy the non-debt tax shield is to take the depreciation to total costs as was done by Van der Wijst and Thurik (1993, p. 59). With this method you get the portion of the costs related to the operations that comes from the depreciation. As such you can compare which firms has the higher portion of depreciation in the costs of the firms.

Due to the nature of the firms that we examine, there are no tax credits for the firms. We have chosen to proxy the non-debt tax shield with the depreciation charges over the total assets. As explained, this will allow us to examine the firms in relation to their size and since we have firms of various sizes in our sample we saw this as the best solution. The reason why we do not use the depreciation over the costs is that we see the depreciation over total assets as a better scaling than to look at the portion of costs that depreciation makes in the firms.

NDT = Depreciation/total assets

4.2.7. Summary of the variables
Size = Ln(total assets)
Profitability = Operating ROA
Asset structure = Fixed assets/total assets
Growth = Percentage change in total assets
Risk = STD(Operating ROA)
NDT = Depreciation/total assets
4.3. Data collection
The first criteria is the industry orientation. We decided to only look at dairy farms since, as previously discussed, they are most likely to make investments generally, and in precision agriculture equipment especially. Dairy farms also on average have a higher turnover, enabling them to have an investment strategy. To find our population and data we used Retriever business that is a financial database which grants access to financial reporting from all Swedish companies for the last 15 years. The database provides compiled financial information for the selected companies ten last annual reports but since our study extends further that that we had to manually input data from the earliest five years for all companies. This data was then verified through calculations in order to eliminate input errors.

The first step in our data collection was to filter the available firms so that only those that follow certain criteria. The whole population consists of 6,296 dairy farms. Our first criteria was that the firms should have been a limited company during the whole examined period. This is due to the fact that Swedish limited companies are obligated to create and publish an annual report according to the Law on Accounting (Sw.: Bokföringslag) (SFS 1999:1078, 1-2§, ch. 6). This guaranteed us that we would find the required data to conduct our tests from these firms. Without this criteria there is a likelihood that our sample would include firms that we would not be able to gain financial data on and as such the randomized firm would not be present in the analysis. This criteria reduces our sample population to 593 dairy farms.

Secondly, the firms should be listed before the time period 1st of January 2000. This criteria gave us the firms that has been active through the whole time period that we intend to investigate and reduced the sample population to 428 dairy farms. A third required criteria was that the firm should have at least one million SEK in revenue. This criteria aim to filter out very small firms that we consider unable to qualify as a full time farm since these are our main target population. It also excludes companies that might be too small to be able to have an investment strategy, which means that they are not suitable to analyze through pecking order theory and static trade-off theory. These filters gave us a total of 367 firms in the population that we sorted by name.

When taking a sample of a population there are various methods that one can employ in order to successfully collect a representative sample. One of these ways is the simple random sample. The simple random sample method is conducted by randomly picking observations from the entire population with the use a form of RNG system (Moore et al., 2009, p. 181). Through this method, all observed firms in the population has the same chance to be picked and therefore the sample can be seen as representative if the sample is large enough. Another way of sampling a population is by dividing it into stratas based on certain characteristics of the firms in the population and then randomly select firms within the stratas (Moore et al., 2009, p. 184). This method can be more useful than the simple random sample if the intent of the study is to examine differences between firms and their connection to these characteristics. The stratified method can also be a better choice than the simple random sample if the sample size is small as it guarantees that a set of firms with the different characteristics are included in the sample.

The chosen data collection method does however put us in a dilemma. Since the process of collecting the data for the study would require extensive work we had to focus on
either collecting data with a longer time horizon or to collect a larger sample. There is a trade-off with both choices. A longer sample will make it easier to see trends and gives a better picture of how the variables affect the capital structure. A larger sample does on the other hand provide more reliability to the results of the study. We opted for collecting a sample with a longer time horizon because we see this data as being superior in terms of providing material for answering our research question.

As we investigate one industry, the usefulness of the stratified sampling method diminishes in value in comparison to the simple random sample method. Moreover, the geographical difference that the firms have are counteracted by the fact that there will be a natural weight in the sample on the areas in which there are more firms. This is due to our large sample, relative to the population size.

In order to comply with the simple random sample method for collection of data, we randomly picked 100 numbers between 1 and 367 and corresponded these numbers with a company in our target population through the use of Retriever Business and categorizing the firms after firm name. By picking a relatively large sample in comparison to the population of the firms that fit the predetermined characteristics we ensure that the sample will be representative of the population.

4.4. Implications of our choice of sample method

In the data collection process for this study, we risk having a bias data collection method. The first is a survivors bias since we excluded companies that have not been active during the whole time period. The other is a selection bias due to our selection criteria, that affects the population that we drew our sample from. We firstly excluded all companies that had not been a limited company during the whole time period. As described this criteria is vital for the data collection as we will be unable to collect sufficient data from other forms of businesses. This does however lower the amount of firms that fulfill the other criteria from 2372 firms to 367 when used as the final sorting criteria and was the criteria that had the single largest impact on our sample population. This would generally mean that the firms in our sample cannot be representative for these firms that has a different structure. We would however argue that the firms in our sample is more representative than one would normally assume a limited liability firm to be for a private firm. This is due to the nature of how the firms are structured even though they are limited liability firms. In the Swedish farming industry the outside equity investments are rare, hence they do not differ severely from the private firms in other forms than the financial reporting requirements. With this information in mind, we intend to use the results of the study to make generalisations of the Swedish dairy industry as a whole.

When examining the selected companies we concluded that nine of them did not comply with our selection criteria. These companies were excluded from our sample since they were not part of our target population. To get our random sample of 100 companies within our target population we then randomly selected nine new companies to complete the sample. We then excluded all companies with less than one million SEK in turnover and all non-dairy farms. We also have a selection bias due to our elimination and replacement of nine companies in our first sample selection. These biases might mean that our selected population is not representative of the whole population. But since we take a large sample from our selected population and all
selections were randomized with all companies having an equal chance of being selected, our sample can be seen as fairly representative of the whole population and enables us to draw generalizable conclusions.

4.5. Analytical method

In order to gain the results from our data we will have to use statistical programs in order to make statistical analysis. The programs used for this study were primarily Stata 13 for regression analysis and Minitab 17 for descriptive statistics. This meant that some choices had to be made when picking which statistical methods we intended to use. When conducting an analysis with one or more independent variables the most common method is an ordinary least squares regression (OLS regression). However, when examining time series data or panel data there are two forms of models that one can use in the analysis which are preferable to the OLS regression. These are the fixed effects and random effects model. The fixed effect model assumes that the omitted effects in the model are correlated with the variable that are included in the model. The fixed effect model is specified as follows:

\[ y_{it} = x_{it} \beta + a_i + \epsilon_{it} \]

Source: Greene, 2008, p. 194

According to Greene (2008, p. 194), the implication of the fixed effect model is that the differences between observations can be attributed to the difference in the constant term \( a_i \) across the various groups. This inclusion of the unobserved effects variable (\( a_i \)) means that the models can control for unobserved heterogeneity.

The random effects model on the other hand does not allow for the omitted effect to be correlated with the independent variable (Greene, 2008, p. 200). They therefore fall under the condition that the covariance of the independent variables and the unobserved effects are equal to zero.

\[ \text{Cov}(x_{it}, a_i) = 0 \]

The idea of the random effect model is that if there is a belief that the unobserved difference between the different individuals in the sample that affect the dependent variable, then the random effect model shall be used over the fixed effect model. The random effects model can be specified as:

\[ y_{it} = x_{it} \beta + (a+u_{it}) + \epsilon_{it} \]

Source: Greene 2008, p. 201

As it is likely that the unobserved effects that, among other factors would include the risk taking of the manager of the firms, we assume that the model that should be used is the random effects model. However, in order to be sure about which model we should use in the testing of the data, we put our assumption to the test. In order to determine which of these to regression models we should use in the analysis of our data material we conducted a Hausman test. According to Greene (2008, p. 208) we use the Hausman test in order to test for orthogonality, meaning it test for perpendicularity of the lines between the common effects and the regressors. In essence it tests if the unobserved effects are correlated with the independent variables. The Hausman test null hypothesis
is that there is no misspecification of the model (Hausman, 1978, p. 1270), meaning that there is no significant correlation between the random effects and the independent variables (Greene, 2008, p. 209).

4.6. Summary of Models

**Model 1:** Tests for the independent variable DEF effect on the dependent variable change in long term debt.

\[ \Delta D_{it} = \beta_{DEF_{it}} + a_i + \epsilon_{it} \]

**Model 2:** Tests for the independent variable Z effect on the dependent variable change in long term debt.

\[ \Delta D_{it} = \beta_{Z_{it}} + a_i + \epsilon_{it} \]

**Model 3:** Tests for the independent variables DEF and Z effect on the dependent variable change in long term debt.

\[ \Delta D_{it} = \beta_{1 DEF_{it}} + \beta_{2 Z_{it}} + a_i + \epsilon_{it} \]

**Model 4:** Test for the independent variables effects on the dependent variable total debt over total assets.

\[ TD_{it}/TA_{it} = \beta_{1 \text{Size}_{it}} + \beta_{2 \text{Profit}_{it}} + \beta_{3 \text{Grow}_{it}} + \beta_{4 \text{Risk}_{it}} + \beta_{5 \text{NDT}_{it}} + \beta_{6 \text{Asset structure}_{it}} + (a + u_{it}) + \epsilon_{it} \]

**Model 5:** Test for the independent variables effects on the dependent variable long term debt over total assets.

\[ LD_{it}/TA_{it} = \beta_{1 \text{Size}_{it}} + \beta_{2 \text{Profit}_{it}} + \beta_{3 \text{Grow}_{it}} + \beta_{4 \text{Risk}_{it}} + \beta_{5 \text{NDT}_{it}} + \beta_{6 \text{Asset structure}_{it}} + (a + u_{it}) + \epsilon_{it} \]

**Model 6:** Test for the independent variables effects on the dependent variable short term debt over total assets.

\[ SD_{it}/TA_{it} = \beta_{1 \text{Size}_{it}} + \beta_{2 \text{Profit}_{it}} + \beta_{3 \text{Grow}_{it}} + \beta_{4 \text{Risk}_{it}} + \beta_{5 \text{NDT}_{it}} + \beta_{6 \text{Asset structure}_{it}} + (a + u_{it}) + \epsilon_{it} \]
5. Analysis and discussion

This chapter contains the analysis of the data collected and a discussion of the results. This discussion is made in conjunction to the analysis in order to create a flowing argument that develops as the analysis of the data gets more intricate. The chapter begins with a description of the data collected that transitions to analysis of the main models and finally the analysis of the chosen indicator variables in this study. This form of combined analysis and discussion chapter is used in order to create a higher degree of understanding of the underlying forces that drive the capital structure in the industry.

5.1. Initial analysis

The first step when analysing data should be to get to know your collected data material. Therefore our first step in the analysis was to see if we can visually discern anything from our data material.

The first thing we noticed was that some companies had no long-term debt at all and other paid off all debt during the examined period. This is in line with the pecking order theory but also has a few implications for our further studies. The companies with no debt will negatively influence the explanatory power of all our regression models since change in debt is the dependent variable and those companies have no change in debt, reducing the effect of the explanatory variables. This also means that while the companies have no debt regardless of equity, which definitely favours pecking order theory, it will favour static trade-off in our regression model. This is because the static trade-off model uses the level of debt in relation to their target debt level as explanatory variable. Since we use the average of debt levels during the years examined as a proxy for the target debt level, it will have the effect that these companies will have a target debt level of 0 and an actual debt level for all years of 0. This will strongly favor the static trade-off despite the fact that it instead is a strong indication of pecking order. Also, some of the companies that have zero long term debt instead have a high degree of short term debt. Since short term debt is considered less risky according to the pecking order theory, these firms can be considered risk aversive since they use short term debt as a financing option.

Another thing we noticed is that almost all companies used debt to finance investments in fixed assets. This was confirmed by the fact that the long-term debt and fixed assets had a linear relationship with a correlation of 80.4%. This indicates that most companies increase debt to invest in fixed assets and when reducing the fixed assets with depreciation they also make mortgage payments on the debt. This speaks against static trade-off theory since it says that companies should aim for, and keep, a constant target debt ratio meaning that companies should only pay off debt if equity reduces which they do not seem to abide by in this case.

The last thing that can be determined in the initial phase is that dividends seem to be far less “sticky”, meaning that they vary between years in contrast to bigger companies with external investors that demand a certain level of dividends. This is in line with what is expected from a small privately owned company. In our sample the lagged dividend, i.e. last years dividend, only have an explanatory power ($R^2$) of 5.4% for determining the current years dividend, provided that the companies paid any dividend at all. The largest determinant of the dividend level is instead net income that has an explanatory power of 63.3%. This is a probable cause and effect relationship in smaller
companies and a major difference compared to larger companies and established economic investment theory that apply to larger companies. The non-sticky dividends also have the implication that it lowers the significance level of the pecking order theory since dividends are a part of the pecking order regression model and a randomness in dividends decreases the correlation to the change in long-term debt.

5.2. Descriptive statistics

This section expands the previous section by producing descriptive statistics to find general trends. Graphs showing trends and spread within the sample for all variables discussed in this subchapter are available in appendix A.

In Table 2 we can see the summation of the variables used in the regression test for the firms over the whole period. This shows the ranges of the data material that we have worked with.

Table 2: Indicator variable summary for all years

<table>
<thead>
<tr>
<th>Variable</th>
<th>Min</th>
<th>Max</th>
<th>Mean</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leverage ratio</td>
<td>.021</td>
<td>1.153</td>
<td>.497</td>
</tr>
<tr>
<td>Long term debt ratio</td>
<td>0</td>
<td>1.06</td>
<td>.281</td>
</tr>
<tr>
<td>Short term debt ratio</td>
<td>.02</td>
<td>.8</td>
<td>.216</td>
</tr>
<tr>
<td>Size (Ln of TA)</td>
<td>6.94</td>
<td>11.622</td>
<td>8.436</td>
</tr>
<tr>
<td>Profit (ROA)</td>
<td>-.236</td>
<td>.552</td>
<td>.056</td>
</tr>
<tr>
<td>Asset structure ratio</td>
<td>.066</td>
<td>.905</td>
<td>.549</td>
</tr>
<tr>
<td>Growth (%)</td>
<td>-.523</td>
<td>3.889</td>
<td>.0796</td>
</tr>
<tr>
<td>Risk (STD of ROA)</td>
<td>.015</td>
<td>.155</td>
<td>.065</td>
</tr>
<tr>
<td>NDT</td>
<td>0</td>
<td>.381</td>
<td>.086</td>
</tr>
</tbody>
</table>

The average turnover for each year has had a steadily increasing trend in our examined period that can be seen in Figure A3. In 2001 the mean turnover was 3,5 M Skr and in 2013 it was 6,16 M Skr, an increase with 76%. This is in line with what was expected since, as mentioned before, the market consists of fewer and bigger companies. The only years that differ from this trend is 2009 and 2012. These years the price that the dairy farmers received for the milk dropped significantly due to overproduction of milk on the global market and a reduction of the demand for dairy products on the Swedish market according to Arla (2009; 2015). This drop in prices also affected the profitability. The average EBIT and net income that can be seen in Figure A4 and A5 follows a similar pattern that was fairly stable between 2001 and 2006. Starting with 2007 we can see an increase in profits that is abruptly interrupted in 2009 and 2012 with dips due to the decreased milk price.

The leverage can be seen in Figure A6 and was highest in 2002 with a mean ratio of 0,53 and declined in a steady manner until 2007 when it hit 0,48. Since then the mean leverage has increased steadily until the end of our examined period in 2013 when the mean leverage hit 0,51. All years had a similar spread within the years with no significant differences. This roughly corresponds with the interest rates in Sweden that was quite high during the period 2001-2007 (Sveriges Riksbank, n.d.), reducing debt levels, and quickly decreased after the credit crunch in 2008 increasing debt levels.
again. This confirms the reasoning in the introduction that the agricultural sector is interest-sensitive and has a smoothing effect on the economic cycles in the nation.

When looking at the main components of leverage, i.e. the long-term debt and equity we can further explain the development. The mean long-term debt trend, in Figure A7, starts off fairly stable during the years 2001-2004 around 1.5M skr. It then jumps up slightly to hit a new level at approximately 1.9M skr during the period 2005-2007 and taking off in a strong positive trend that peaks in 2011 at 2.9M skr. This big increase can only be explained by the much lower interest rate that followed the 2008 recession, further strengthening the argument that the sector is sensitive to interest rates. In the equity we find that the sample mean, that can be seen in Figure A8, has a positively increasing trend with an increase of 97% in the examined period, ending in 2013 at 2.9M skr. During the years 2003-2006 however, the equity stood still indicating that the companies faced increasing interest payments on their debt which affected the net income negatively since the long-term debt was fairly stable during the period and the interests were fairly high.

The capital expenditures is a measure of the investments made in fixed assets and a good indicator of the development in the market. In our sample the mean capital expenditures in Figure A9 was stable at 0.55M skr between 2001 and 2006 with just a dip in 2003 as the only exception. In 2007 the capital expenditures started to increase reaching a new higher level at approximately 0.81M skr between 2008 and 2013. During 2012 though there was a major decrease in capital expenditures at only half the numbers of both recent years and the following. The general development is expected due to the changes in interest rates. Following that reasoning, the fact that during a period where investment capital is hard to come by and/or expensive, investments tend to be kept to a minimum or postponed to a later time can explain the general development.

The substantive drop in capital expenditures during 2012 coincides with the drop in milk price that was previously mentioned, but there was only a minor decrease in 2009 and 2010 when the milk price had its first dip. The exact reason for these different reactions to similar situations is not possible to find within the boundaries of this study, but a possible explanation is that the market had postponed investments for a long period of time and when investment capital became cheaper the need for investments were high enough to motivate execution even though the turnover decreased. Another possible explanation is the perceived market risk, since when the first drop in the price for milk came in 2009, the prices had been relatively stable for a long time causing the sector to see this as an exception to an otherwise stable market situation. On the other hand, in 2012, when the dairy farms faced a second drop in milk price in a short period of time the risk due to price volatility made the sector much more careful with spending money. These two possible reasons in combination makes a plausible market reaction, however further research might be able to explain the different reactions better.

The internal liquid assets in the sample companies is a possible source of investment capital and according to the pecking-order theory this capital is the primary capital used in investments and only when the internal capital is insufficient you seek investment capital externally. In our sample the trend for cash and bank assets can be seen in Figure A10 and has been increasing steadily between 2001 and 2011 with a decline during the last two years of the study. The increase during the first 11 years represents a doubling
of liquid asset, from an average of 270K skr to 530K skr. The increase of internal capital during the period 2008-2011 speaks against the pecking-order theory since this period coincides with a period of heavy investing. This implies that when making investments during this period, the companies financed the whole investment with external capital, circumventing the internal capital. Since the leverage previous to this period had declined to a rather low level, the static trade-off theory can better explain this situation. This is because the debt level might have been lower than the target number for most companies, due to high interest rates, which reduced profitability. When the interest rates dropped again, the sector aimed to get closer to their optimal leverage level by increasing debt instead of using internal capital. That is a plausible explanation to situation observed in the sample.

Total assets in Figure A11 showed a steady increase throughout the examined time-period. This increase means that the mean total assets in the sample increased from 3.6M sek in 2001 to 8.2M sek in 2013. Noteworthy was that as the mean increased so did the spread of the sample, indicating progressively bigger differences between large and small companies. Since the best way to increase production is to buy farmland and increase the production buildings to house more cows, the higher spread can depend on the fact that bigger companies have more investment capital available to be able to buy smaller farms that goes out of business and therefore grows at a faster rate than smaller farms that would face a, relative to size, bigger investment and change in production if they bought a farm that went out of business. The higher risk is not only financial but also operational since a bigger farm can buy a smaller amount of farmland and seamlessly incorporate it in the existing operation because the amount bought is a low percentage increase. A smaller farm probably have a harder time utilizing even a small amount of extra farmland without also making changes in the operation that require further investments. The conclusion is that the risk involved in buying more farmland is higher in a small farm than in a bigger farm, making it a less attractive investment since the investment has a higher probability of resulting in further investments which entails both higher financial costs and a higher bankruptcy cost than in a bigger farm making the same investment.

All profit measurements (EBIT, Net Income and Earnings before taxes) can be found in Figures A12-A14 and show the same development over time. The sample mean has a slight positive trend but with significant drops during 2009 and 2012-2013. The general trend of increasing profits seem to be connected to size since investments in fixed assets can be assumed to have a positive effect on profits. But since there are so big reductions of profits during the years where, as previously mentioned, dairy farms faced a serious reduction in milk prices the most significant predictor of profits does not seem to be size but instead milk price. It is not illogical that the milk price which is the main source of income is the best predictor of the profit but it raises some questions about the profitability of investments in dairy farms.

This leads us to the Return on assets (ROA) where the change over time shows an interesting trend. In our examined time period the mean ROA in Figure A15 started out with a slightly increasing trend at a reasonably good level (7.5-8%) during the period 2001-2003. This was followed by a big drop to 4.6% in 2004 and a new trend upwards that peaked during 2008 at 8.3%. That peak predated a new drop during 2009 that landed on 3.7% followed by yet another upwards trend that lasted until 2011. At this point it is unsurprising that there was yet another drop during 2012 to a new all time low at 1.1%, barely beaten by the 1.6% during 2013. This forms a zigzag pattern with
alternating positive trends and big drops at the points in time when the milk price dropped. The spread for each year are quite tight, indicating that the variation of the sample is small and that the companies in our sample faced similar circumstances during the time period. The overall standard deviation on the ROA is 6.5% meaning that the volatility of the ROA in the market over time is fairly high and indicating a risky market situation. The development of the ROA was surprising since we expected the return on assets to increase with time since the size of the companies increase and there should be opportunities to take advantage of economy of scale. Since profitability on assets have instead declined the only assumption that we can draw is that the overall profitability of the market sector has declined, with lower milk prices as the most prominent indication of a more competitive market that has negatively affected the effectiveness of investments in fixed assets.

This negative effect can also be seen in the asset turnover (Figure A16). The mean asset turnover has steadily declined during the examined time period, from 0.88 in 2001 to 0.75 in 2013. This decline shows that the profitability of investments are low since the investments in these years, especially in the last years, were relatively high. The low profitability on investments and declining profitability overall can explain the high number of dairy farms that has disappeared in the last few years.

The cash flow in Figure A17 shows a similar story where the inflow of cash is basically unchanged during this period. Only during the middle period is the mean cash flow well above zero, but the spread in the sample is very large, indicating many outliers. This is confirmed by a box plot (Figure A18) that showed a tight spread close to zero every year with several big outliers, both positive and negative. The conclusion that can be drawn by this is that a majority of dairy farms have around zero cash flow on average while some firms are very profitable, and the other way around. The overall average cash flow substantiates this, since all companies during all examined years have an average yearly cash flow of 209 sek. That is a very low figure indeed, further confirming the low profitability in the industry.

The change in working capital can be seen in Figure A19 and shows a similar situation, where the trend is a mean that is stable around zero or just above for most years, only 2013 is well below zero. This substantiates that investments in fixed assets are less profitable since there was a lot of investments made during the last few years. Not even when looking at the largest companies in the sample (total assets >9M sek) could we find better change in working capital or cash flow. Within the biggest companies in the sample shown in Figure A20, the mean change in working capital fluctuated somewhat more but otherwise showed similar development as in the whole sample while the cash flow for the biggest companies was stable around or just over zero.

This leads to the conclusion that the market as a whole has low profitability. The rather surprising part is that even the bigger farms are struggling to make profitable investments. A noteworthy fact is that this sample is taken among the companies that has survived, implicating that these companies are the ones that has the best investment strategy and profitability among the companies active through the examined time period. Since the whole business sector is having problems making profitable investments and finding profitability at all, despite low interest rates the only reason that we can see that can have this big impact is the price the farmer gets paid for the milk produced.
The dividends, as mentioned earlier, is not sticky and since equity investments are scarce, the dividends are small when companies pay dividends at all. In our sample there were so few dividends that in most cases any dividends at all are considered an outlier, meaning that statistically the dairy farm business does not pay dividends. But we can also see in Figure A21 that a few companies pay substantial dividends a few years, driving up the mean and making the mean non-reliable. When excluding the worst outliers in Figure A22, the mean gets more reliable for drawing conclusions and a trend can be found. In this case the mean dividend in our sample is starting out low, around 10K sek annually, during the first few years. Starting in 2005 there is an upwards trend culminating in 2010 at 40K sek, followed by a drop during the last years.

Since dividends are optional in companies that are debt financed, contrary to most equity financed firms, the dividends paid can be seen as a proxy for the firm's view on the economic future. If the future looks bright it is not as important to keep excess money in the firm and they can pay out dividends to the owners instead. In the case where a firm sees dark clouds on the economic horizon the need to retain money in the firm in order to weather the storm. Therefore we can draw the conclusion that the Swedish dairy farms were optimistic about the future during the period 2005-2010 with dividends increasing in size. But this optimism changed to caution during 2011 when dividend payouts became lower.

In this study the dividends are a better indicator of the perceived economic future than, for example, capital expenditures since most of the larger agricultural investments made are either machinery or buildings. Many buildings take a long time to plan and build, meaning that if the future looks bright when in the process of building a new agricultural production building and then the economy takes a hit, the building will be finished anyway and it will look like if the firm made an investment decision during the period of poor economy. When investing in machinery oftentimes the new machine is a replacement for an older machine, and therefore a necessity for continued operation instead of an investment to increase profitability. Because of these factors the investments seen in the capital expenditures can be misleading as an indicator of the view on the economic future.

According to DeAngelo and Masulis (1980, p. 4) the non-debt tax shield is a substitute for the interest tax shield. This means that in order to reduce taxes the net benefit of the interest tax shield is lower if the company has a lot of fixed assets that can be depreciated, especially if the operational income is low. This makes the non-debt tax shield very relevant for this study since the agricultural sector has very much fixed assets available for depreciation and also quite low net income available to utilize the tax shield fully. In our sample the non-debt tax shield is measured as the rate of depreciation and it showed an interesting development over time. The overall trend seen in Figure A23 is decreasing which means that the companies in the sample decreased the percentage of fixed assets that was depreciated annually. In the beginning of the examined period the mean non-debt tax shield was between 9,5% and 10% until 2005. The mean depreciation rate dropped rapidly between 2006 and 2008 and then stabilized just below 8% for the rest of the examined period with just a slightly decreasing trend after 2008.
The big drop in depreciation rate coincides with the period of heavy investing that started in 2007 and the development in the sample are opposite to each other. When the capital expenditures increase the depreciation rate decreases and they have a negative relationship to each other, as can be seen in Figure A24, with a t value of 6.38 (p=0.000) but the $R^2$ are very low at 1.59%. The low explanatory power can be explained by the fact that many companies in the sample had no capital expenditures during many years but still made depreciations, reducing the effectiveness of the statistical test. The development of these is almost perfectly mirrored to each other, which can be seen in Figures A9 and A23, except for the year 2012. This relationship can have multiple explanations and one is that when investments are made using long-term debt, the interest tax shield uses most or all of the available tax shield reducing the value of the tax benefit from depreciation. We have previously concluded that debt is the primary source of investment capital which substantiates this reasoning. Another explanation is the possibility that when agricultural firms are in a period of heavy investments, a higher portion of the investments are production buildings that have a much slower depreciation rate than for example machinery, reducing the average depreciation rate. Also when making investments in farmland, the average depreciation rate of the firm automatically decreases since land is not depreciated at all.

5.3. Hypothesis testing

In this part we will test whether our stated hypotheses hold true and discuss the results in the context of this study in order to be able to answer our research question. We will also compare these results to previous research in the area.

When making statistical testing in general and regression testing specifically it is important that the data material is normally distributed since this is required by the test method. In our sample we have discovered some skewness in the tested variables that can be seen in Figures A25-A27. Skewness can have a big impact on the result of the test in small sample sizes. In this study we use a large sample size (n=100) that enables us to apply the Central Limit Theorem (CLT). The CLT states that when sample sizes are large enough, the mean of the sample is approximately normally distributed regardless of the distribution of the population (Moore et al., 2009, pp. 270-274). Since we make a longitudinal study and analyze the data in a panel data setting, the different years all constitutes of a sample (13 samples of n=100) with a mean for each year that is approximately normally distributed. This enables us to use ordinary regression to analyze our data material despite the fact that the sample is skewed and comes from a population that probably follows another distribution than the normal distribution.

In order to determine what statistical test was most suitable a Hausman test was conducted. The results of the Hausman test were in our case insignificant for the models with dependent variable leverage, short- and long-term debt ratio. This mean that we cannot reject the null hypothesis and should therefore use the random effects model in our testing of these models.

The results for the pecking order model, which examine variable DEF against the change in debt was on the other hand highly significant, which means we cannot reject the null hypothesis and must therefore use the fixed effect model in the testing of this model. The result of the static trade-off model was highly significant as well. Lastly the
combined model presented by Atiyet (2012) had a highly significant Hausman test result.

Table 3: Pecking order, Static trade-off and combined model regression results.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEF</td>
<td>.42</td>
<td>.355</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.016)</td>
<td>(.0158)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>26.24</td>
<td>22.55</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[.000]</td>
<td>[.000]</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>.408</td>
<td>.267</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(.023)</td>
<td>(.02)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>17.92</td>
<td>13.27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>[.000]</td>
<td>[.000]</td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>-.230.933</td>
<td>94.81</td>
<td>-193.305</td>
</tr>
<tr>
<td></td>
<td>(30.633)</td>
<td>(30.731)</td>
<td>(28.754)</td>
</tr>
<tr>
<td></td>
<td>-.754</td>
<td>3.09</td>
<td>-6.72</td>
</tr>
<tr>
<td></td>
<td>[.000]</td>
<td>[.002]</td>
<td>[.000]</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>.287</td>
<td>.193</td>
<td>.380</td>
</tr>
<tr>
<td>F</td>
<td>688.79</td>
<td>321.21</td>
<td>482.79</td>
</tr>
</tbody>
</table>

Variable coefficient is given in plain text, (standard error) in parentheses, \( t \)-values in italics and \([p\text{-value}]\) in hook brackets.

5.4. Pecking order model

The test of the pecking order theory model provided by Shyam-Sunder and Myers (1999) show that the DEF variable was highly significant in the explanation of the change in debt of the firms. As can be seen in Table 3 the \( t \)-value that the regression provided was 26.24, which means that the variable has a positive effect on the change in debt \( (\Delta D_{it}) \) dependent variable. It should be noted that the \( R^2 \) of 0.2871 in our test is smaller than what Shyam-Sunder and Myers (1999, p. 230) and Atiyet (2012, p. 7) had in their test results. The \( R^2 \) tells us how much of the dependent variable that can be explained by the tested independent variables. In our case this tells us that our independent variable explain roughly 29% of the the behavior of the dependent variable \( \Delta D_{it} \). One should keep in mind that the difference can stem from the omitted current portion of long term debt that the mentioned authors included in the DEF calculation.

From the results that we have presented we can say that the pecking order theory does in fact have explanatory power in the determination of the capital structure though the model can not explain a large portion of the dependent variable. While the \( R^2 \) in our test is much lower, the results of the significance test are in line with the results of Shyam-Sunder and Myers (1999, p. 242) and Atiyet (2012, p. 9) that found the pecking order theory to be a good predictor of the capital structure of the firms.

With the results of the regression and its implications, we too would say that the pecking order theory is a good predictor of the capital structure of the firms in our examined industry, although not as good of a predictor of the entirety of the capital structure as had been found by the authors of the previous studies. These results provide evidence that there is a difference in how the structure is determined for Swedish farms and how other firms are structured. One should keep in mind that the firms in this study are small and that the difference in the explanatory power of the model can stem from
differences between small firm structure and large firm structure and therefore not an industry related difference.

5.5. Static trade-off model
Testing the static trade-off model that Shyam-Sunder and Myers (1999) presented is found in Table 3 and gave a $R^2$ of 0.1930. This is not a large figure and the difference between this result and that of Atiyet (2012, p. 7) who had an adjusted $R^2$ of 0.59. Granted there is a difference between the $R^2$ and the adjusted $R^2$ that aim to adjust for increases in the $R^2$ stemming from the addition of explanatory variables. In this test there is however only one explanatory variable and one unseen effect adjustment. From this result we can see that the results show that the change in debt cannot be explained to the same degree by the static trade-off in our sample as it was in Atiyet (2012) study. The t-statistic in our test was a 17.92. This mean that the static trade-off variable (Z) in this model is highly significant in the explanation of the change in debt.

The significance may be inflated by the capital structure of a set of eleven firms that has had a constant debt of zero, during at least most of the years, resulting in a current debt that exactly matches the target debt level. In this model, this leads to zero difference between the debt level and the target debt level creating a perfect match to the change in debt and also to static trade-off when in fact the implication of a constant debt level of zero strongly contradicts the presence of any effect from static trade-off theory on these companies This makes the significance of the static trade-off model unreliable as a predictor for the examined population in this study. Also the explanatory power of 19.3% is not reliable for the same reasons as the significance.

This effect might have been discovered if we had done a pilot study, enabling us to construct a more suitable model. But even though there is enough companies to be considered to disrupt the effect of the model, there is not so many (11%) that the probability of selecting one or more company with this characteristic in a random sample is not very high when making a pilot study with a small sample size. Another way to circumvent this problem would be if had excluded zero debt firms when making the random sampling or to exclude these firms from the current sample for the analysis of the static trade-off model. But this would have led to a sample that is not representative of the population we intend to examine since it is probable that the population contains a similar portion of firms that follows this behaviour. Also, from a statistical point of view it would be desplicable to exclude a portion of the sample just because it does not fit the stated model when in fact it is the model that is unsuitable. The model used for estimating the effect of static trade-off is established and used by many researchers in the area for a long time but our findings are that it is not suitable for populations with a high degree of companies without long term debt. We recommend that future researchers construct a model with a higher degree of credibility when examining this type of populations. One alternative when constructing such a model is to include the short term debt in the variable Z. That way the model would capture the firms that utilize a higher degree short term debt as a source of financing.

5.6. Combined Pecking order and Static trade-off
Result of the combined model regression showed that both of the variables were statistically relevant with DEF being the more relevant. DEF had a t-value of 22.55 and
the t-value for variable Z was 13.27. This means that both were statistically relevant at the 1% level. We can also note that the $R^2$ rose when combining the two models to 0.3802. Meaning that this model explain approximately 38% of the change in debt. Since this model is a combination of the two previous models and the static trade-off model are less reliable for this study, the reliability of this model also suffers from the same reasons. The pecking order model however had a higher degree of significance in this combined model, making the results less sensitive to the inaccuracy of the static trade-off model and giving it a higher degree of credibility.

5.7. Indicator variables

Table 4: Indicator variable regression results.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Model 4 LEV</th>
<th>Model 5 LONG</th>
<th>Model 6 SHORT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>.062 (.01)</td>
<td>.056 (.010)</td>
<td>.007 (.007)</td>
</tr>
<tr>
<td></td>
<td>5.93 [0.000]</td>
<td>5.37 [0.000]</td>
<td>0.98 [0.328]</td>
</tr>
<tr>
<td>Profit</td>
<td>-.303 (.046)</td>
<td>-.193 (.046)</td>
<td>-.117 (.034)</td>
</tr>
<tr>
<td></td>
<td>-6.59 [0.000]</td>
<td>-4.20 [0.000]</td>
<td>-3.43 [0.001]</td>
</tr>
<tr>
<td>Asset Structure</td>
<td>.149 (.033)</td>
<td>.248 (.033)</td>
<td>-.098 (.024)</td>
</tr>
<tr>
<td></td>
<td>4.51 [0.000]</td>
<td>7.52 [0.000]</td>
<td>-4.04 [0.000]</td>
</tr>
<tr>
<td>Growth</td>
<td>.089 (.013)</td>
<td>.035 (.014)</td>
<td>.055 (.01)</td>
</tr>
<tr>
<td></td>
<td>6.64 [0.000]</td>
<td>2.62 [0.000]</td>
<td>5.45 [0.000]</td>
</tr>
<tr>
<td>Risk</td>
<td>-1.344 (.697)</td>
<td>-1.932 (.626)</td>
<td>.598 (.376)</td>
</tr>
<tr>
<td></td>
<td>-1.93 [0.054]</td>
<td>-3.09 [0.002]</td>
<td>1.59 [0.112]</td>
</tr>
<tr>
<td>NDT</td>
<td>.374 (.131)</td>
<td>.413 (.131)</td>
<td>-.034 (.096)</td>
</tr>
<tr>
<td></td>
<td>2.85 [0.004]</td>
<td>3.15 [0.002]</td>
<td>-0.36 [0.719]</td>
</tr>
<tr>
<td>Constant</td>
<td>-.043 (.107)</td>
<td>-.226 (.104)</td>
<td>.175 (.072)</td>
</tr>
<tr>
<td></td>
<td>-.40 [0.688]</td>
<td>-2.18 [0.030]</td>
<td>2.41 [0.016]</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.172</td>
<td>0.23</td>
<td>0.065</td>
</tr>
<tr>
<td>Wald Chi²</td>
<td>205.34</td>
<td>193.06</td>
<td>60.04</td>
</tr>
</tbody>
</table>

Variable coefficient is given in plain text, (standard error) in parentheses, $t$-values in italics and [p-value] in hook brackets.
5.7.1. Size

As can be seen in Table 4 the size of the firm has a t-value of 5.93 and a p-value of 0.000 against the variable LEV. This means that the natural logarithm of total assets does have a statistically relevant positive effect on the leverage ratio at the 1% level and that we can reject the null hypothesis and accept the predicted alternative $H_1$: Size has a positive relation to leverage ratio. Hence, the results of this regression show that the pecking order theory was right in its prediction that the firm size should have a positive relation with the relative amount of capital that is gained through debt finance. This result is in line with the results of Michaelas et al. (1999, p. 122) who found the leverage to have a positive relationship with size that was significant at the 5% level, as well as Cassar and Holmes (2003, p. 137) who found a significant effect on the 1% level. Our results goes against those of Wu et al. (2014, p. 125) who found that size only was statistically relevant in determining the leverage ratio of the farms for one quantile. As well as the results of Mac an Bhaird and Lucey (2007, p. 11) that showed no significant effect of size on the leverage ratio. A reason as to why our results differentiate from those of Wu et al. (2014) can be that their sample included farms from various European countries whereas our sample exclusively consists of Swedish farms. As has been discussed previously, farms in Sweden follow a different rule set than farms in other European countries. Differences in the rules that affect the operations can influence the strategical choices of the firms and thereby result in a variation of results when comparing the firms. A difference that exist between our study and that of Mac an Bhaird and Lucey (2007, p. 8) apart from the industry of the firms is that they used a proxy for size based on the turnover, while we, as well as Michaelas et al. (1999, p. 118) and Cassar and Holmes (2003, p. 132) based the proxy variable on total assets. The differences in the base of the proxy variable can be a contributing factor to the results that we have attained.

When examining the effects on the dependent variable LONG we can see that the t-value is 5.37 and the p-value is 0.000 which mean that the size of the firm is a significant variable in determining the long term debt of the firm. As with the regression against the dependent variable LEV, we can reject the second size related null hypothesis in favour of the predicted $H_2$: Size has a positive relation to long term debt ratio. These results are in line with the results of Cassar and Holmes (2003, p. 137), Michaelas et al. (1999, p. 120) and Wald (1999, p. 174). As in the studies of Cassar and Holmes (2003) and Michaelas et al (1999), Wald (1999, p. 173), we based the proxy variable on total assets, which may be a contributing factor to the similarity of the results in our studies.

However, when looking at the effect that size has on short term debt (SHORT) we can see that it has a z-score of 0.98 which translates to a p-value of 0.328. We can therefore not reject the third null hypothesis regarding the size effect, meaning that the results are against the expected $H_3$: Size has a positive relation to short term debt ratio, as the test was not significant on the 5% level. These results are in contradiction to what has been found in some of the previous studies, such as Chittenden et al. (1996, p. 64) and Michaelas et al. (1999, p.122) who found a negative relationship between the size of the firm and its capital structure. There are two differences between our data material and that of Chittenden et al. (1996) and Michaelas et al. (1999). One is the industry examined and the other one is country. It is however in line with the results of Van der Wijst and Thurik (1993, p. 61) and Mac an Bhaird and Lucey (2007, p. 11). From the results we can now see that the size of the firm has an effect on the maturity of the debt.
finance. In the previous research conducted in capital structures, Michaelas et al. (1999, pp. 126-127) found a link between the debt maturity and the size of the firms. However, in comparison to their results, ours did not show that size had a negative effect on the short term debt financing and is therefore not as strong a predictor of debt maturity.

Although the test showed that the size has no significant effect on the short term debt of the firms we can with our results say that the results support the pecking order theory to some degree. However, the pecking order would assume a more frequent use of the short term debt as the firm becomes larger in size. This is due to the cost of using short term debt in comparison to long term debt. The pecking order theory implies that the firm will utilize the financing means that infer the lowest costs to the firm. Therefore, a firm should utilize the short term debt to greater extent than the long term debt alternative if it is provided with said alternatives. According to the pecking order theory, a larger firm will have a lower information asymmetry towards outside actors and as such should be able to have more alternatives in gaining capital, such as distributors trusting the firm’s capabilities in paying the credit payments when negotiation payment methods. With this reasoning the results should be that there is a higher degree of short term debt in larger firms, as is not represented in our results. This can depend on the fact that agricultural firms have a higher degree of fixed assets that negates some of the information asymmetry that is associated with being a smaller company. As previously stated, our results provide some evidence for the pecking order theory in determining the debt ratio of the firm. The counteraction that the size provides towards information asymmetry of the firm should make the firm more able to gain capital via creditors and as such, the pecking order suggest that a larger firm should be able to gain more long term debt than the smaller firm.

In addition to the pecking order relationship to the size characteristic of the firm, the static trade-off theory would assume a higher degree of debt finances as the firms grows and are able to withstand more debt capital as it carries with it an interest cost. Our results that show that the firms size has a positive relation to the debt ratio of the firm would therefore be in line with what is predicted by the static trade-off theory.

An explanation as to why the long term debt ratio is more affected by the size of the firm is that a large firm in this industry would translate to a large barn. This is an investment that is not possible to finance through short term debt as the firm would be unable to repay a figure of that magnitude within the time frame that signifies the short term debt.

5.7.2. Profitability

By viewing the results of the regression we can see that the t-value of ROA in connection to the dependent variable leverage (LEV) is at -6.59. This means that the ROA is 6.59 negative standard variations from the mean and is therefore a significant predictor in determining the leverage ratio of the firms. Therefore we can reject the null hypothesis in favour of the expected \( H4: \text{Profitability has a negative relation to leverage ratio} \). Moreover, this result is in line with the result of Michaelas et al. (1999, p.120) and Chittenden et al. (1996, p. 64) who found the negative effect of the profitability to be highly significant in determining the total debt of the firms. While the significance decreased when examining its effect on long term debt (LONG) it remained significant at the 1% level. As such, we can reject the second null hypothesis regarding the profitability of the firm in favour of our predicted \( H5: \text{Profitability has a negative} \)
The long term debt regression result are in contradiction to those of Swinnen et al. (2005, p. 23) Least significant was the profitability effect on short term debt (SHORT), though the negative effect was significant at the 5% level. This result means that we can reject the third null hypothesis regarding the firms’ profitability in favour of $H6$: Profitability has a negative relation to short term debt ratio. Our result is in line with the Cassar and Holmes (2003, p. 137) and Michaelas et al. (1999, p.120) studies.

From these results we can conclude that the profitability of the firm has a negative relationship with the leverage ratio. This find is in line with what we assumed when viewing the problem from the perspective of the pecking order theory that stated that firms prefer to use internally generated funds and therefore a more profitable firm that can cover a larger part of their capital requirements with the retained earnings will have a lower ratio of short and/or long term debt. These findings are also in line with the results of Wu et al. (2014, p. 126) and Michaelas et al. (1999, p. 120). The findings does however somewhat contradict the static trade-off theory which does not consider a higher profitability to be relevant in diminishing the debt ratio of the firm but instead focus on the value maximization of the firm. Seen from the perspective of the static trade-off theory, the profitable firm would be able to carry a larger portion of interest payments and as such should be able to have a larger debt level by which it will be able to increase the firm value.

An explanation as to why the firm in this industry seek to keep the debt levels lower than what the static trade-off implies they should can stem from the uncertainty of the international market effects in the coming years.

5.7.3. Asset Structure

According to the pecking order theory, one would assume that a firm with a higher ratio of fixed assets to total assets would have a lower information asymmetry. A lower information asymmetry would lead to the firm being able to borrow capital to a lower cost. With debt being less costly, the pecking order would assume a greater use of debt finance in its operations. Our results show that the asset structure of the firm had a positive effect on the leverage ratio that was significant at the 1% level. This means that we reject the null hypothesis in favour of our predicted $H7$: The asset structure has a positive relation to leverage ratio. The results of the regression contradict those of Wu et al. (2014, p. 125). As previously explained, the difference in the results can stem from country specific factors. Moreover, the result goes against the result that was found by Van der Wijst and Thurik (1993, p. 62) and Chittenden et al. (1996 p. 64). As we used the same proxy variable for the asset structure, we can with this result say that there is a difference in the asset structure effect on leverage ratio between the industry and/or countries. With the result of Wu et al (2014) being different than our results while examining the same industry, the evidence provided by the comparison with the results of Van der Wijst and Thurik (1993) are in favour of there being a country-specific factor that affects the capital structure of the firm.

When we examine the long term debt we can see that the asset structure effect is a highly significant factor. The t-value of the asset structure effect on the long term debt was 7.52. As such we can reject the null hypothesis in favour of $H8$: The asset structure has a positive relation to long term debt ratio, as we expected. Contrary to their results regarding the asset structure effect on the leverage ratio, Van der Wijst and Thurik (1993, p. 62) found a positive relation between the long term debt and the asset
structure. In addition to this study, our results are in line with the those of Chittenden et al. (1996, p. 64), Michaelas et al. (1999, p. 120) and Swinnen et al. (2005, p. 23). Our results show that there is evidence for the pecking order reasoning that a firm with a larger amount of fixed assets should be able to gain more capital through debt finance as it decreases the firm’s information asymmetry. This is an expected result since, as previously mentioned, agricultural firms have a high degree of fixed assets that can be used as collateral and therefore they have lower information asymmetry.

As the short term debt is considered the less costly debt finance, a firm should according to the pecking order theory utilize this financing method to a larger degree than the long term debt alternative. In our data we found that the degree to which a firm had fixed assets to total assets was negatively significant in determining the short term debt ratio. The t-test showed a value of -4.04. While being a significant factor in determining the short term debt ratio, we cannot accept the alternative hypothesis $H_9$: The asset structure has a positive relation to short term debt ratio, as the result was significant in the opposite direction of the expected result. By examining the results of previous studies we can see that this result is similar to that of Van der Wijst and Thurik (1993, p. 62). Interestingly, we note that the results of the individual examinations of the two debt maturities has yielded results that are in line with Van der Wijst and Thurik (1993, p. 62) and Chittenden et al. (1996 p. 64). From this we find that the difference in the leverage ratio examination therefore is a difference in the net effect of the results. This suggests that the country-specific factor may not be as strong as we previously thought. Comparatively, the results of the short term debt regression goes against those of Michaelas et al. (1999, p. 120).

From these results we would argue that the pecking order theory does provide a partial explanation to the debt ratios in the firms. The reason that we only consider the pecking order theory to provide a partial explanation is that it fails to describe why the fixed assets would have a negative effect on the amount of short term debt that the firm use in the finance of the operations. This is however an area where the static trade-off theory becomes relevant. The static trade-off theory would assume that a firm that can use interest bearing debt to a lower price would utilize this possibility to gain a tax shield.

5.7.4. Growth

The growth of the firm should according to the pecking order theory mean that the firm takes on a larger portion of short-term debt in order to further finance said growth as the retained earnings from operations may not be able to carry the full weight of the capital requirements. In our sample we can see that the growth of the firm has a positive significant effect on leverage (LEV) with a t-value of 6.64 making the growth statistically relevant at the 1% level. Therefore we reject the null hypothesis in favour of $H_{10}$: Firm growth will have a positive relation to leverage ratio. The results are in line with those of Cassar and Holmes (2003, p. 137) as well as Wu et al. (2014, p. 125) who found that the growth had a positive significant effect on the leverage of the farms for a majority of the quantiles. In comparison with other studies, the results contradict the findings of Chittenden et al. (1996, p. 66) to some degree. This is due to them not finding growth to be significant for the leverage ratio on its own, while finding the growth in combination with not having access to equity markets to be positively statistically significant for the leverage ratio.
The effects on long term debt (LONG) was least significant at t-value 2.62. The regression therefore show that the growth effect on long term debt level is significant at the 1% level. This means that we reject the null hypothesis and instead accept the alternative **H11: Firm growth will have a positive relation to long term debt ratio.** These results contradict those of Cassar and Holmes (2003, p. 137) who found no significant effect of the growth on the long term debt.

Additionally, the effects on short term debt (SHORT) had a t-value of 5.45, meaning that the growth of the firm is significant at the 1% level in determining the short term debt ratio of the firms. The result of the regression mean that we must reject the null hypothesis in favour of the alternative **H12: Firm growth will have a positive relation to short term debt ratio.** This finding is in line with the results of Michaelas et al. (1999, p. 120) who found the growth to have a significant positive effect on the short term debt levels. Our results imply that the pecking order was right in its predictions of the growth effects on the leverage, short- and long-term debt ratios for the firms. Furthermore, the results of the regression show that the the effects are more significant for short term debt than long term debt, which is in line with the reasoning that the firms should use the less risky financing means first, as provided by the pecking order theory.

### 5.7.5. Risk

According to the static-trade off theory, the risk of a firm should have a negative relationship with its leverage ratio as the relative cost of default is higher for a riskier firm at the same debt level as a less risky firm. We can in Table 4 see that the t-value of our risk proxy variable is -1.93 when plotted against leverage (LEV) and has a p-value of 0.54. This means that the the risk of the firm is not statistically significant for determining the leverage ratio of the firm at the 5% level. This result mean that we can not reject the null hypothesis in favour of the expected alternative **H13: Operational risk has a negative relation to leverage ratio.** This result goes against the static trade-off theory as the risky firm should have lower debt ratio than the less risky firms. The result of this test is however in line with the result of Michaelas et al. (1999, p. 120) who found no significant effect on leverage, as well as Cassar and Holmes (2003, p. 139) who found that risk was not a significant variable for small firms.

The risk effect on the long term debt (LONG) in our sample was however higher at t-value -3.09, making it statistically relevant at the 1% level. This result show that we can reject the second risk null hypothesis in favour of **H14: Operational risk has a negative relation to long term debt ratio.** When comparing this result with those of previous studies we can see that our results are in contradiction to the results of Michaelas et al. (1999, p. 120) whose coefficient was positive for the long term debt risk relation. As well as the results of Wu et al. (2014, p. 125) who did not find risk to be statistically relevant. The effects that risk had on short term debt (SHORT) was however not statistically relevant at t-value 1.59. We can therefore not reject the third null hypothesis regarding the risk effects and must reject the alternative expected **H15: Operational risk has a negative relation to short term debt ratio.** Moreover, we noted that the risk coefficient against short term debt was positive. Contrary to the results of the short term debt regression, the result from the long term debt regression show that there is evidence for a static trade-off explanation to the debt levels, as the long term debt infers a larger risk to the firm. With the higher risk, the firm takes on less interest bearing debt from creditors, which can result in the event of bankruptcy should the firm be unable to
carry the interest payments. We can also note that the results show that the risk of the firm has an effect on the maturity of the debt finance.

The results show support for the claims that the static-trade off implies as it show that riskier firms take on less debt finance that can jeopardize the future of the business. Moreover, we would argue that the results support what the pecking order would predict. This is due to the pecking orders hierarchical structure that places the different financing means on different levels based on their costs. The short term debt is a less costly means of gaining capital than that of the long term debt. This means that the firm rather utilize short term debt than long term debt to finance its operations. As the risk increases, so should the relative costs of using long term debt and it would therefore make the long term debt less attractive when viewed from the pecking order perspective.

5.7.6. Non-debt tax benefit
As argued by DeAngelo and Masulis (1980, p. 4) the leverage ratio should have a negative relation to the firm’s non-debt tax benefit, as it is considered a substitute for the interest tax shield. We have in our study found evidence that goes against this reasoning. The non-debt tax shield effect on the leverage in our study had a positive t-value of 2.85 in contrary to our expected negative relationship. Therefore we must reject the expected H16: Non-debt tax benefits has a negative relation to leverage ratio. In comparison to Michaelas et al.’s (1999, p. 120) results we notice a difference where they did not find that non-debt tax benefit effect on leverage was significantly different from zero. As they used the same proxy variable for the non-debt tax benefit we can say that there is a difference between the countries and/or industries when examining the effects on the leverage ratio. As we have already established, a larger farm in Sweden has a higher leverage ratio and further more, a farm with a large degree of fixed assets have more debt finance. The results the we have which tells us that a farm with a high depreciation expense to total assets can stem from the fixed assets normally being depreciated. As such, the depreciation charges should scale with the amount of fixed assets in the firm. Another study that did not find that the depreciation expense effect on leverage ratio was significantly different from zero was Van der Wijst and Thurik, (1993, p. 62). This provides evidence for the statement that there is a difference between the non-debt tax benefit effect on the leverage ratio between industries.

When we look at the results from the long term debt regression we can see that the non-debt tax benefit has a positive statistically relevant effect on the debt ratio with a t-statistic at 3.15. As with the hypothesis regarding the leverage we must reject the expected H17: Non-debt tax benefits has a negative relation to long term debt ratio. Our results differ from those of the previously mentioned authors Michaelas et al.’s (1999, p. 120) and Van der Wijst and Thurik, (1993, p. 62), as well as Wald (1999, p. 174) who found that the non-debt tax benefit had a statistically relevant negative effect on the 5% level on the long term debt ratio. Titman and Wessels (1988, p. 13) on the other hand did not find the negative coefficient to be statistically relevant in determining the long term debt ratio. These results strengthen our argument that there is a difference between the industries. A firm within the agricultural industry in Sweden are normally operating with a high degree of fixed assets and therefore also has a high degree of depreciation charges.
The only relationship that was not statistically significant for the non-debt tax benefit was that on the short term debt ratio. An interesting note is that the coefficient of the proxy variable was negative in determining the this ratio. As such the relationship that was to be expected from the tax based theory can only be hinted at regarding this debt ratio. However, since the t-statistic was at -0.36 we must reject the expected $H_{18}$: Non-debt tax benefits has a negative relation to short term debt ratio. As with all the results of Van der Wijst and Thurik, (1993, p. 62) and Michaelas et al.’s (1999, p. 120) regarding this variable, our results does not align with these authors’ results. We did however get similar results as Titman and Wessels (1988, p. 13), who found a negative coefficient that was not statistically relevant.

With these results in hand, we can conclude that there appear to be a distinct difference between the industries in which the firms operate.

Table 5. Summary of hypothesis testing results

<table>
<thead>
<tr>
<th>Variable</th>
<th>Hypothesis</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>H1: Size has a positive relation to leverage ratio.</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H2: Size has a positive relation to long term debt ratio.</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H3: Size has a positive relation to short term debt ratio.</td>
<td>Not supported</td>
</tr>
<tr>
<td>Profitability</td>
<td>H4: Profitability has a negative relation to leverage ratio.</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H5: Profitability has a negative relation to long term debt ratio.</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H6: Profitability has a negative relation to short term debt ratio.</td>
<td>Supported</td>
</tr>
<tr>
<td>Asset structure</td>
<td>H7: The asset structure has a positive relation to leverage ratio.</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H8: The asset structure has a positive relation to long term debt ratio.</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H9: The asset structure has a positive relation to short term debt ratio.</td>
<td>Not supported</td>
</tr>
<tr>
<td>Growth</td>
<td>H10: Firm growth will have a positive relation to leverage ratio.</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H11: Firm growth will have a positive relation to long term debt ratio.</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H12: Firm growth will have a positive relation to short term debt ratio.</td>
<td>Supported</td>
</tr>
<tr>
<td>Risk</td>
<td>H13: Operational risk has a negative relation to leverage ratio.</td>
<td>Not supported</td>
</tr>
<tr>
<td></td>
<td>H14: Operational risk has a negative relation to long term debt ratio.</td>
<td>Supported</td>
</tr>
<tr>
<td></td>
<td>H15: Operational risk has a negative relation to short term debt ratio.</td>
<td>Not supported</td>
</tr>
<tr>
<td>Non-debt tax benefit</td>
<td>H16: Non-debt tax benefits has a negative relation to leverage ratio.</td>
<td>Not supported</td>
</tr>
<tr>
<td></td>
<td>H17: Non-debt tax benefits has a negative relation to long term debt ratio.</td>
<td>Not supported</td>
</tr>
<tr>
<td></td>
<td>H18: Non-debt tax benefits has a negative relation to short term debt ratio.</td>
<td>Not supported</td>
</tr>
</tbody>
</table>
6. Conclusion

In this chapter we will present the conclusion of this study which analysed the capital structure of Swedish dairy farms during the period 2001-2013. The stated research question will be answered with the use of descriptive statistics and regression analysis that had been presented in the analysis chapter.

We have in this paper discussed the difference between the Swedish dairy farm industry and generic businesses, as well as examined and analyzed the financial situation of the firms operating within the industry. In order to answer our research question we have collected financial data with the use of Retriever Business. Our research question was stated as follows:

How can a change in debt level for firms in the Swedish dairy farm industry be explained by financial investment theory and financial variables?

With the use of a model created by Shyam-Sunder and Myers (1999) we have tested the explanatory power and significance of the static trade-off model, as well as conducted the same test for the pecking order theory with the use of a modified version of a model provided by the same authors. In addition to these models we have tested the effects of indicator variables in the form of industry characteristics on the leverage, short and long term debt levels of the firm in order to examine the expected outcomes of these characteristics when viewed from the perspective of the static trade-off and pecking order theory.

From the results of the regressions that were performed we can conclude that the static trade-off model that Shyam-Sunder and Myers (1999) used in their test is not applicable in an examination of the static trade-off theory’s explanation of the capital structures in the Swedish dairy farming industry. We were however able to conclude that the pecking order theory has explanatory power and is statistically significant in its explanation of the the capital structures. This mean that we agree with Shyam-Sunder & Myers (1999) that the pecking order theory is a good predictor of the capital structure of firms, even though the explanatory power was not as high within our sample.

The size of the firm, its asset structure and growth was found to be positively related to the debt levels, while the profitability was found to be negatively related to all debt variables that we analysed. The risk of the firm was only significantly negative for long term debt and leverage ratio. These results of these variables mainly follow the reasoning provided by the pecking order and static trade-off theory, while the non-debt tax benefit were in contradiction to the expected negative relationship. The results of the of the characteristics regressions therefore showed that the expectations from the pecking order theory often held true when put to the test, further strengthening the view of pecking order as a good theory when attempting to explain the capital structure of the firms.

In comparison to previous findings in agricultural capital structure research we can see that the Swedish dairy farms differ from those in the U.S. as they have decreased in overall leverage while the U.S. dairy farms have increased in leverage (Ifft et al., 2014, p. 8). We can also note that the profitability of the U.S. farms has increased (Harris et al., 2009, p. 29) while the profitability in the Swedish farms has decreased. Another finding that differed between our study of Swedish dairy farms and that of Zhao et al.
(2008) was the profitability effect on debt. Our results showed a negative effect of profitability on short term debt while they found a positive effect (Zhao et al., 2008, p. 814). We can however note a likeness between the Swedish dairy farms and the farming industry in the U.S. when it comes to cash flow effects on leverage. Both our results and those of Barry et al. (2000, p. 931) found that an increase of cash has a negative effect on debt. We have also found differences in the effects of the firm characteristics effect on leverage ratio between our study and that of Wu et al. (2014). Our study have contradicting results for the size, asset structure and risk variable. This indicate a difference between the studied areas and that the results of their study is not generalizable four the geographical area of Sweden.

6.1. Theoretical contributions
This study has been able to provide supporting evidence for the pecking order theory being a good predictor in the explanation of the capital structure of firms in a niche market. This we would argue further strengthen the credibility of Myers’ (1984) pecking order theory as a whole. In addition, we can show that the target debt level model for analysing the static trade-off theory explanatory power for the capital structure of firms has weaknesses that render it less applicable to niche markets. We have also been able to find evidence that support the static trade-off reasoning when examining and analysing the maturity of the debt levels.

Through these contributions we have been able to fill the gap that we set out to cover with our study, as we saw a theoretical absence in the explanation of the capital structures of the Swedish dairy farm industry.

6.2. Practical contributions
The descriptive statistics show that the industry is not a profitable one, as can bee seen by a decline in the profitability of the firms. This is relevant information for the stakeholders that operate within and around the industry. The comparison with the study of Wu et al. (2014, p. 125) show that the Swedish farms are affected to another degree by certain characteristic factors than what the firms in their sample are. This is of interest to the stakeholders as it shows that there is a country specific difference that affect the debt levels of the farms. We can also show that the Swedish dairy industry is sensitive to macroeconomic events such as changes interest rates and global markets. This is useful information for policymakers that deal with the Swedish agricultural industry and something that they should take into grave consideration when deciding upon policies that affect the operations of the firms.

We can also show that firms that the firms in our sample, which is suffering from a survival bias, has grown in size through the years. This indicates that the growth of the farm can be an important factor to its survival. Moreover, we can show that the surviving farms in this sample reduced the investments in troubling times, advising other actors in the industry to consider the macroeconomic effects in the decision making process. In addition to these contributions, our study show how a Swedish dairy farm operate financially during a period of global financial distress. We would argue that the information regarding the financial well being of the farms in the industry can be useful information for actors that operate within, aim to gain entrance to the market or for policy makers that dictate the rules that the market operates under.
6.3. Ethical considerations
This study has exclusively used publicly available information regarding the firms that has been included in the sample of the population. The study is therefore less sensitive to ethical problems that can arise from mishandling of the data material. Because the sample consist of publicly available information, there is no requirement of consent which one has to take into consideration when conducting research. Since the sample was randomly selected, each firm has the same chance to be in the sample and the results are therefore not segregated by authors to show a picture suitable to our expectations. The results from the analysis has been handled in a way in which no firm is identifiable for the reader and no firm has been pointed out in any way.

Since the area of agriculture involves politically complicated aspects, it has been important for us to remain objective in the analysis of the financial situation of these firms so as not to influence the results of the study.

6.4. Societal implications
While writing a thesis it is important to consider the societal implications that the study can have. This study examines an area that is strongly tied to various societal effects. Agriculture has historically always been an important aspect of society and while other industries have grown stronger economically, the agriculture industry remain important to society due to a number of factors. One of which is that the agriculture of tomorrow is dependent on the existence of agriculture today. The societal implications of a failing agricultural sector can mean grave consequences for the future as it diminish the country’s self sustainability. Another implication being that the agricultural activities keep the rural areas open from brushwood and other property value diminishing effects. The societal effects of a disappearing agricultural sector would also mean that many work opportunities in the rural areas are lost, both in the agricultural businesses and in other industries that are dependent on the investments or products that derive from the agricultural sector.

As we have described, the profitability of the Swedish dairy farming industry is low. The implications of this finding could strengthen the argumentations from actors in society that abdicate for changes in the economic environment that the Swedish farmers operate. As such, it could mean that the study becomes part of political debate. Moreover, the information regarding the financial structures of the firms in this industry and how it changes may dissuade new actors from entering the industry, despite the differences between the individual firms ability to control their financial figures.

6.5. Recommendations for future studies
For future studies we could recommend a cross sectional study that examines the differences in countries within this industry. Such as study could find important differences that stem from either climate or policies that affect each firm between the countries and can therefore be useful for several actors within the market.

Another recommendation based on our finding that the target adjustment model that aimed to show how the static trade-off theory explains the capital structure was not able
to provide a reliable answer to the theory’s expected effect on the debt ratios. Our suggestion is that the model could be revised in order to make it less sensitive to firms within the industry that does not have any debt. Such a model would be more applicable than the current version that was suggested by Shyam-Sunder and Myers (1999, p. 226) and could therefore give a more reliable result when testing the theory on niche industries, or industries with where one expects to find a number of firms without debt. Another suggestion for study is to examine the farmers investment strategy, if they have one and why it looks like it does.

In addition to these suggestions, a study that could be of interest in this area is an analysis of the bankruptcies. Can a bankruptcy breaking point be identified and do the firms in the industry differ from other industries when estimating which firms that will go into bankruptcy.
7. Truth criteria

7.1. Reliability

The reliability of the study does according to Bryman and Bell (2011, p. 41) concern the consistency of the measures of the study and that it is an important aspect of the quantitative research. The method used for the analysis of this study has been used by several other authors in the field and is therefore evidently repeatable. Furthermore, the sample is taken from publicly available annual reports through a trusted third party which all interested parties would be able to gain access to. With this data material we have concluded that the variables that are tested would be the same regardless of the author if the data consisted of the same firms and the same period in time. We have therefore deemed the data material to be reliable. Regarding the statistical analysis, the program \textit{STATA 13} is a reliable statistical tool when analysing panel data and our results from the program reliable. Moreover, the result of the statistical analysis would give the same results regardless of the author if they use the same inputs. We can therefore conclude that the analysis of the data material is reliable.

7.2. Validity

According to Bryman and Bell (2011, p. 42) the validity criterion is considered the most important of the criterion in evaluation of business research. The essence of the validity criterion is the validity of the conclusions that the authors has presented in the research. Bryman and Bell (2011, pp. 42-43) lists a set of types of validity that are of relevance to our research. These are \textit{measurement validity}, \textit{internal validity} and \textit{external validity}. The \textit{measurement validity} is also known as \textit{construct validity} and deals with the question of whether the measurement used actually does measure what you intend it to do (Bryman and Bell, 2011, p. 42). According to these authors, the \textit{measurement validity} applies primarily for the quantitative research, which is the method that this study has been using. The \textit{internal validity} is described by Bryman and Bell (2011, p. 42) as whether the conclusions which incorporates a causal link between variables holds up to the test or not. Because of the analysis method that has been used in this study, this type of validity is of high importance to the study. The \textit{external validity} is the generalisability of the results and conclusions found in the research towards those actors not in the sample (Bryman and Bell, 2011, p. 43).

In our study we have used models that had been presented by leading researchers within the field, as examined several proxy methods for the characteristics and discussed their fit to our sample in order to establish a measurement validity of the independent variables. The data was collected with the use of \textit{Retriver Business} and through annual reports. Both of these sources should be seen as reliable regarding the validity of the information found within. Regarding the internal validity, we have with the use of \textit{STATA 13} been able to run the relevant regressions that test for the unobserved effects as to establish a link between the independent and dependent variables that hold true. With the use of the simple random sampling method and a large sample we have been able to ensure that the sample is representative for the industry in the selected geographical area. The sample is probably not representative for firms in the industry outside of this geographical area and we have never claimed that it is. While a limited amount of the firms are limited liability companies, the firms in the sample should be more representative of the whole population of Swedish dairy farms based on their homogenous operations. We therefore argue that the study upholds a high degree of external validity.
8. Reference list


SFS 1999:1078. Bokföringslag. Stockholm: Justitiedepartementet (Department of Justice)


Appendix A

Figure A1. Size ln total assets mean development and confidence intervals

![Interval Plot of Size (ln of total assets) 95% CI for the Mean](image1)

*Individual standard deviations were used to calculate the intervals.*

Figure A2. Size ln turnover mean development and confidence intervals

![Interval Plot of Size(Ln of turnover) 95% CI for the Mean](image2)

*Individual standard deviations were used to calculate the intervals.*
Figure A3. Turnover mean development and confidence intervals (k SEK)

Figure A4. Ebit mean development and confidence intervals (k SEK)
Figure A5. Net income mean development and confidence intervals (k SEK)

Figure A6. Leverage ratio mean development and confidence intervals (%)
Figure A7. Long-term debt mean development and confidence intervals (k SEK)

Figure A8. Equity mean development and confidence intervals (k SEK)
Figure A9. Capital expenditures mean development and confidence intervals (k SEK)

Figure A10. Cash and bank mean development and confidence intervals (k SEK)
Figure A11. Total assets mean development and confidence intervals (k SEK)

Figure A12. EBIT mean development and confidence intervals (k SEK)
Figure A13. Net income mean development and confidence intervals (k SEK)

Individual standard deviations were used to calculate the intervals.

Figure A14. Earnings before taxes mean development and confidence intervals (k SEK)

Individual standard deviations were used to calculate the intervals.
Figure A15. Return on assets ratio mean development and confidence intervals

Figure A16. Asset turnover ratio mean development and confidence intervals
Figure A17. Cash flow mean development and confidence intervals (k SEK)

Figure A18. Cash flow boxplot (k SEK). * represents statistical outliers.
Figure A19. Change in working capital mean development and confidence intervals (k SEK)

Figure A20. Change in working capital for the biggest companies, mean development and confidence intervals (k SEK)
Figure A21. Boxplot of dividends (k SEK). * represents statistical outliers.

Figure A22. Dividends mean development and confidence intervals (k SEK). Excluding worst outliers.

*Individual standard deviations were used to calculate the intervals.*
Figure A23. Non-debt tax shield mean development and confidence intervals (k SEK)

Individual standard deviations were used to calculate the intervals.

Figure A24. Scatterplot with regression line for non-debt tax shield vs capital expenditures
Figure A25. Probability plot testing normal distribution for leverage ratio (D/TD)

Figure A26. Probability plot testing normal distribution for long-term debt ratio (ID/TD)
Figure A27. Probability plot testing normal distribution for short-term leverage ratio (sD/TD)