Stockholm School of Economics

Department of Accounting

Bachelor Thesis in Accounting and Financial Management

May 2011

Leverage composition

– A study of the relation between financial and operating leverage in Swedish public companies

Julia Appelgren[†] *Christian Hellström*[††]

Abstract

This paper empirically examines the tradeoff hypothesis which suggests that firms should want to adapt their financial leverage depending on their operating leverage in order to maintain the overall leverage on an appropriate level. Data on 117 firms in the Swedish market during the years 2000 to 2009 was analyzed using two regression models. The findings confirm a negative relation between the two leverage components and thereby support the tradeoff hypothesis. Furthermore, the results provide evidence for that the relation between financial and operating leverage differs across industries, with manufacturing and retail companies having a more pronounced negative tradeoff compared to service companies. The study also supports earlier suggestions that the measuring of the leverage components may have a significant impact on the results, which sheds some light on previous conducted research's inability to establish a relationship between financial and operating leverage.

Keywords: Financial leverage, operating leverage, tradeoff hypothesis, sales variability, capital structure.

Tutor: Assistant Professor Henrik Andersson

Presentation: May 27th 2011, 9.00-12.00, room 348

Discussants: Martin Lindqvist (21767@live.hhs.se) and Oscar Nordling (21754@live.hhs.se)

[†] *21546@live.hhs.se* [††] *20955@live.hhs.se*

Acknowledgements: *We would like to thank our tutor Henrik Andersson for his support and constructive suggestions throughout the writing of this thesis, and Per-Olov Edlund for his never ending ability to share his valuable knowledge in the field of statistics. Last but not least, we would like to thank our fellow students providing helpful advices during the overly short seminars and wish them good luck in the future.*

Stockholm, May 16th 2011

Julia Appelgren and Christian Hellström

Table of contents

1. Introduction

1.1. Background

In 2008, a credit crunch hit the financial markets and what would later be known as the most severe financial crisis since the depression, had its beginning. The actual cause of the crisis is a much debatable subject, but most assessors agree on that it was highly linked to the overuse of leverage, both among firms in the financial industry and households (see e.g. Mihm and Roubini 2010). In the Swedish market, leverage increased substantially across all industries prior to the escalation of the crisis in late 2008 (Capacent 2009).

The association most commonly made when speaking of leverage is that to the level of debt in a firm's overall capital structure. This is referred to as *financial leverage*. However, there is also another component of leverage, namely *operating leverage*. This component can be thought of as the proportion of fixed operating costs in a firms overall cost structure (see e.g. Brigham 1995)[1]. To give an example, consider a steel producing company which has high fixed operating costs for its plants and machinery. If sales were to decline, the firm would still have to pay these costs. This kind of firm is therefore more affected by sales fluctuations than a firm with a lower proportion of fixed costs, and it is therefore said to have higher operating leverage.

The two components financial and operating leverage together capture the *overall leverage* of a firm. In order to keep the overall leverage on an appropriate level, a firm with high operating leverage should want to lower its financial leverage. This tradeoff between financial and operating leverage has come to be known as *the tradeoff hypothesis*, and it was first proposed by Van Horne (1977). The theory thus suggests a negative relation between the two leverage components, but as with many theories, it does not necessarily have to conform to reality. This is however what we intend to examine in this thesis.

1.2. Purpose and research question

The purpose of this thesis is to empirically examine the relation between financial and operating leverage. We will thereby use the tradeoff hypothesis as a theoretical basis to examine if

[1] There are several definitions of both financial and operating leverage. These will be discussed further in the sections *Theoretical framework* and *Methodology*.

companies seem to adapt their financial leverage depending on their operating leverage, or if they exhibit levels of the two leverage components independent of each other.

Empirical tests of the tradeoff hypothesis have been carried out previously, but the methodologies employed in these studies differ somewhat from the one intended to be used in this thesis[2]. Also, as the theoretical framework below will show, previous research within this field is, moderately speaking, not totally up to date and there has been an emphasis on the US market. Therefore, we found it interesting to revive this field of research, and to carry out the study in the Swedish market, which, to our knowledge, not has been done previously. Therefore, in order to empirically test the tradeoff hypothesis, we will try to answer the following question:

- *Is there a significant negative relation between financial and operating leverage among firms in the Swedish market?*

To answer this question, we will examine Swedish publicly listed companies during the years 2000 to 2009[3]. Also, there may naturally exist other factors that affect the relation between financial and operating leverage and some of those will be included in the study as control variables.

1.3. Limitations of the study

1.3.1. The purpose

The purpose of this thesis is to examine the relation between financial and operating leverage, and we do therefore *not* intend to examine optimal capital structures of firms in any way. This is an interesting field of research, but considering the practical limitations to this thesis, it would not be viable. Additionally, although the recent financial crisis has been inspiring to this study, the aim is *not* to dig deeper into probable causes of it.

1.3.2. The geographical region

We have chosen the Swedish market for our study. It would have been interesting to examine the relation between the two leverage components in other markets as well, to see if it differs between geographical regions, but the size and the time frame of this thesis do not allow us to do so.

[2] This will be discussed further in the sections *Theoretical framework* and *Methodology*.
[3] The time period chosen will be given more attention in the *Methodology* section.

1.3.3. The data

When examining the relation between the leverage components, our intention is to rely solely on accounting data which can be found in annual reports. We will thereby *not* include any external data such as market estimates of risk measures which might be connected to leverage.

1.3.4. The control variables

As mentioned above, several factors may impact the relation between financial and operating leverage, but as previous research within this field is scanty, it is not obvious which these factors are, nor in which way the relationship is affected. There is however, much research dedicated to the determinants of capital structures of firms. Some of these determinants, i.e. variables that may have an impact on the level of financial leverage of firms, will be included in the study. These are *industry belonging*, *sales variability* and *cost of debt*. Industry belonging will be given somewhat more attention and the other two variables will be included in order to examine if a potential relation between the leverage components remain when these are controlled for.

Our initial intention was to include *size* of firms as a separate variable, but the way in which our industrial classification is done and because of the properties of the Swedish market, each industry category distinguished itself by having a certain size[4]. Based on this strong relation between industry and size, which might have caused misleading results, we choose not to include the latter as a separate variable in this study.

Other variables which previous research has put forward as possible factors affecting the level of financial leverage and which we believe may have an impact on the relationship between the leverage components are *accounting principles*, *dividend policy*, *industry structure*, *management discretion* and *tax policy*[5]. These variables will however not be included as they are difficult to quantify.

[4] A brief discussion of this is presented in *Appendix C*.
[5] There are naturally many other variables which may affect financial leverage and the relation between the leverage components. The ones presented here, should only be seen as a small selection.

1.4. Disposition

In the following section, *Theoretical framework*, an overview of theories and previous empirical examinations of the relation between financial and operating leverage will be presented together with research related to each control variable. Thereafter, in the section *Methodology*, the selection process will be given more attention. The regression models as well as the variables and hypotheses used to examine the relation between the leverage components will also be explained in further detail. This section is then followed by *Results of the empirical study* which presents the data and reveals the results obtained from the regression analyses. These results will then be analyzed, using the previously presented literature, and reflected upon in the section *Analysis*. In this section, the validity and reliability of the results will also be discussed. Finally, in the section *Conclusion*, the principal findings and implications of the study will be summarized.

2. Theoretical framework

In this section, common definitions of financial and operating leverage in the literature will first be presented and followed by theories and empirical studies of the relation between financial and operating leverage. Thereafter, literature related to the control variables will be summarized. Lastly, a short presentation of the implications of previous research on this study will be discussed.

2.1. Definitions of financial and operating leverage in the literature

The majority of previous research has used the measures *degree of financial leverage* (DFL) and *degree of operating leverage* (DOL) when examining the relation between financial and operating leverage (see e.g. Mandelker and Rhee [1984], Huffman [1989] and Darrat and Mukherjee [1995])[6]. The definitions of these measures vary somewhat. Most commonly, the DFL is computed as the percentage change in net income as a proportion of the percentage change in operating income[7] (see e.g. Blazenko 1996) and the DOL is calculated as the percentage change in operating income as a proportion of the percentage change in sales[8] (see e.g. Weston and Brigham 1969).

Additional definitions of financial leverage are total debt-to-total assets (see e.g. Ferri and Jones [1979] and Remmers et al. [1974]) and total long term debt-to-total assets (see e.g. Chen 2004). Other definitions of operating leverage previously employed are fixed assets-to-total assets (see e.g. Ferri and Jones 1979) and fixed operating costs-to-total costs (see e.g. Brigham 1995).

2.2. The relation between financial and operating leverage

Below follow two sections of previous research on the relation between financial and operating leverage. The first section is about the tradeoff hypothesis which suggests a negative relationship between the leverage components and related empirical findings. The second section summarizes other views on this relationship.

[6] A table summarizing previous empirical studies of the relation between financial and operating leverage together with the definitions of the leverage components employed in each study, is presented in *Appendix A*.
[7] DFL = (Net income$_t$ / Net income$_{t-1}$ – 1) / (Operating income$_t$ / Operating income$_{t-1}$ – 1)
[8] DOL = (Operating income$_t$ / Operating income$_{t-1}$ – 1) / (Sales$_t$ / Sales$_{t-1}$ – 1)

2.2.1. A negative relation between the leverage components

The tradeoff hypothesis proposed by Van Horne (1977) and presented in the introduction of this thesis, says that a high level of operating leverage should be balanced by a lower level of financial leverage in order to maintain the overall leverage on an appropriate level. The two leverage components should therefore be negatively related to one another.

This theory has previously been tested empirically by Mandelker and Rhee (1984) among others. They examined how financial and operating leverage affected the systematic risk of common stock, and in a second phase of their study, it was found that firms with higher levels of one of the leverage components had a lower level of the other, thus supporting a negative relation between the two. Huffman (1989) later replicated their study but was not able to re-confirm the negative tradeoff between financial and operating leverage. One possible explanation for this result, he suggested stemmed from the difficulty of measuring operating leverage. Later, Lord (1996) conducted a similar study, but no relation between the leverage components was found. All three studies employed the measures DFL and DOL.

A study by Ferri and Jones (1979) divided firms into financial leverage classes based on total debt-to-total assets ratios and found that firms in higher financial leverage classes had a lower operating leverage measured as the ratio of fixed assets-to-total assets. The study also employed the DOL as a complementary variable of operating leverage, but using this did not provide as clear results.

2.2.2. Other views of the relation between the leverage components

After the introduction of the tradeoff hypothesis, other theoretical models have confirmed an interrelation between financial and operating leverage, but this relationship can at best be described as ambiguous.

Prezas (1987) suggested that operating leverage is changed when the capital structure of a firm is altered, but that this leverage component could change in the same direction as financial leverage. Huffman (1983) had earlier noted a similar effect and she also proposed that sales variability might interact with total leverage. Once again, the relation between financial and operating leverage could be either positive or negative.

Darrat and Mukherjee (1995) examined Huffman's (1983) model empirically, and found that the leverage components interacted differently across industries. They were however, only able to confirm a negative relationship within the *petroleum refining* industry.

Myers' (1977) paper provided a fundamental base for the determinants of corporate borrowing. According to this paper, firms with a higher proportion of fixed assets, i.e. firms with high operating leverage, are able to obtain long term financing at a lower cost as their fixed assets provide collateral to borrow against. These firms will therefore have higher financial leverage, and the relationship between the two components should be positive. Watts and Zimmerman (1986) even suggested that operating leverage could be used as a proxy for financial leverage and that the two leverage components should be highly positively correlated. This view was based on Lev's (1974) findings which showed a positive relationship between a firm's systematic risk and its operating leverage. However, this study did not control for financial leverage.

2.3. Factors possibly affecting the relation between the leverage components

Several factors may have an impact on the relation between financial and operating leverage, but when examining this relationship, previous research does not provide much guidance to which these are. Therefore, this study will employ some variables which have been found important as determinants of capital structures, and thereby at least affect the component financial leverage. In those cases where studies aimed at examining the relation between the leverage components exist, they will be presented.

2.3.1. Industry belonging

Based on Myers' (1977) theory discussed above, firms, at least within capital intensive industries[9], should exhibit a positive relationship between financial and operating leverage. Darrat and Mukherjee (1995) were not able to provide unison evidence for this view, but they showed that different industries exhibited different interrelations between the leverage components. Lord (1996) also examined different industries, but no significant relationships between financial and operating leverage were found in any of these.

Studies by Scott (1972) and Scott and Martin (1975) had earlier confirmed that industrial belonging is related to financial leverage. The latter showed that companies within aerospace and steel production operate with a relatively high level of financial leverage, whereas mining and drug manufacturing companies employ a relatively lower level of financial leverage. None of the papers did however control for operating leverage.

[9] Industries which are characterized by firms with relatively high proportions of fixed assets.

This view of the relation between industry belonging and financial leverage was questioned by Remmers et al. (1974) who used a larger sample of firms than Scott (1972) and covered data from five different industrialized countries[10]. They were not able to find any relationship between industry belonging and financial leverage. Stonehill and Stitzel (1969) had previously come to the same conclusion using data from several industrialized countries.

2.3.2. Sales variability

As noted above, Huffman (1983) developed a model suggesting that sales variability might be related to total leverage, but the relationship could be either positive or negative depending on the relative size of the two components. Empirical findings in the same field are also ambiguous. The paper by Ferri and Jones (1979), apart from studying the relation between the leverage components, also examined the relationship between financial leverage and sales variability[11]. However, no clear relationship could be established.

A reason for why sales variability should affect the relationship between financial and operating leverage stems from the way in which the DOL is defined, with change in sales in the denominator. This measure does therefore, to some extent, take sales variability into account. Also, as described in the introduction, firms with a higher proportion of fixed costs, and thus high operating leverage, should be more affected by sales fluctuations. Intuitively, these firms should therefore want to lower their financial leverage. This is at least partly consistent with White et al. (2003), suggesting that *operating risk* is a function of operating leverage and sales variability. Firms with a high operating risk (i.e. high operating leverage in combination with high sales variability) should want to lower their *financial risk*, which can be estimated using financial leverage. This suggests a negative relation between financial leverage and sales variability when the level of operating leverage is high.

2.3.3. Cost of debt

Exactly how the cost of debt should affect the relationship between the leverage components is not clear, as no prior research has addressed this question. However, there are theories suggesting a relation between the level of financial leverage and the cost of debt, which is also

[10] The countries included in the study were France, Japan, the Netherlands, Norway and the United States. The studies by Scott (1972) and Scott and Martin (1975) only examined firms in the United States.
[11] The study examined the relation between financial leverage and business risk, and the latter was estimated using sales variability among other measures.

intuitively compelling. One of these is the *tradeoff theory*[12], which suggests that there exists a tradeoff between the tax benefits, and the increased agency and bankruptcy costs that an increase in the level of debt brings with it. According to this theory, higher financial leverage increases the probability of default, and thus brings with it higher bankruptcy costs. Therefore, institutions providing financing should require a higher interest for lending to firms with high financial leverage. The cost of debt and financial leverage should therefore be positively related.

2.4. Summary and implications

It is clear that many studies examining the interrelation between financial and operating leverage have failed to establish a negative relation between the two components when using the measures DFL and DOL. As suggested by Huffman (1989), this might stem from the difficulty of measuring operating leverage correctly. Therefore, we will employ other definitions of both variables, and only use the DOL as a complement.

As seen above, previous research also provides guidance to possible relationships between the different variables. This will be taken into consideration when constructing the hypotheses, and further discussed in the next section.

[12] The tradeoff theory discussed here should not be confused with the earlier presented tradeoff hypothesis proposed by Van Horne (1977).

3. Methodology

In this section, a description of how the study has been conducted will be given. To start with, the selection process will be presented and is then followed by a short recapitulation of how regression analyzes are performed and an explanation of different variables. Thereafter, the variables and regression models used in this thesis will be presented in detail, accompanied by the hypotheses that will be tested. The section ends with a discussion of the validity and reliability of the study.

3.1. Selection process

3.1.1. Selection of companies

The basis when selecting the companies included in this study has been NASDAQ OMX Large, Mid and Small cap, i.e. the three largest quotation lists in Sweden. The reason for this choice has mainly been due to the relative simplicity of gathering data from larger, listed companies compared to their smaller, unlisted counterparts. Also, the need for a large enough sample for each industry category after having applied the selection criterions described below, made it necessary to include all three lists.

3.1.2. Time period

The time period from 2000 to 2009 has been used when collecting the data. A shorter period would not have captured periods of both economic up- and downturns. This might have caused misleading results, which would have had an impact on the reliability of the study. To see this, consider a period of recession. During these, firms are particularly concerned with their costs, which could lead to the altering of their cost structures. On the contrary, in periods of growth, firms sell more and are therefore likely to acquire new assets and employ more staff. It is therefore important to analyze data from several years.

A longer time period had been problematic as the sample size would have decreased, considering the fact that only companies listed during the entire period are included in the sample.

3.1.3. Source of information

The database Retriever Bolagsinfo has served as the primary source of information when collecting the necessary accounting data for each company. In order to control the quality of

the data and in cases where something was missing in the database, selected annual reports from the company in question have been used. These reports were taken from the companies' websites and/or from the database Affärsdata.

3.1.4. Selection criterions

The first criterion has been the need for a company to be listed during the entire sample period. It would otherwise have been difficult to collect the necessary data, as unlisted companies do not have to provide information to the market to the same extent as their listed counterparts. The second criterion was that a company must belong to any of the industries *manufacturing*, *service* or *retail*, as classified by the database Retriever Bolagsinfo. If a company within any of these categories was related to the financial industry, it was excluded as their cost and capital structures differ significantly from other industries. The third criterion has been the need for a company to report variable and fixed costs separately. If this criterion was not met, it would not have been possible to compute operating leverage correctly[13]. In Table 1 below, the final sample and the number of companies and observations in each industry category are presented[14].

Table 1: The number of companies and observations in each industry category

Industry	***Number of companies***	***Number of observations***[†]
Manufacturing	61	610
Service	28	280
Retail	28	280
Total	***117***	***1170***

[†] *Each company has 10 observations; one observation per year between 2000 and 2009.*

[13] The method used when constructing the variables will be further discussed below.
[14] The companies included in each category and their quotation list belonging are presented in *Appendix B*.

3.2. Presentation of statistical method

Below follows a brief and general description of the statistical method and the different variables that will be employed in this thesis.

3.2.1. The ordinary least squares regression model

We have chosen to employ *the ordinary least squares* (OLS) regression model when examining the relation between the leverage components, as it is useful when a relationship between an independent variable X and a dependent variable Y needs to be established. It describes the formula for a linear curve that fits the data in question. The model (for a population) is usually presented as $Y = \beta_0 + \beta_1 X + e$ where Y is the dependent variable, β_0 is the intercept coefficient, β_1 is the slope coefficient, X is the independent variable and e is the residual[15]. In most cases, the whole population is not available and a sample must be drawn. To reduce the risk of coming to the wrong conclusion about the true population coefficients β_i, an appropriate level of significance α is chosen. The significance level is then compared to the p-value, i.e. the probability that the population coefficient β is different from the sample coefficient $\hat{\beta}$[16]. How well the model line fits the actual data is described by the proportion of explained variation to total variation. The coefficient of determination R^2, is used to assess the goodness-of-fit of the regression model to the data. When estimating a multiple regression model, i.e. a model with several independent variables, the R^2 increases for every additional variable. This might be misleading if the additional variable does not help in explaining the variation in the dependent variable. Therefore the *adjusted-*R^2 is used to assess the goodness-of-fit of a multiple regression model (Stock and Watson 2007). In this thesis, the IBM SPSS software is used to perform the OLS estimation.

3.2.2. Variable types

Three types of variables will be used in the regression model when examining the relation between financial and operating leverage.

Continuous variables can take any value. To make the model more comprehensible, only percentage values will be used for these variables.

[15] The residual is the average variation of each observation around the regression line. It is expected to be zero and therefore excluded from the model.

[16] When performing the hypothesis tests, we will use the p-value to determine whether to reject the null hypothesis or not. When the p-value is less than 5 percent, the null hypothesis is rejected. The p-value is estimated in IBM SPSS using the Student t-distribution.

Binary variables (*dummy variables*) can take the values 0 and 1. Dummy variables are used to assess what cannot be continuously measured in units, e.g. industry belonging. When the dummy variable takes the value 1 and has a non-zero coefficient, it will move the intercept of the fitted regression line in some direction. When the coefficient equals zero, the intercept is unchanged. The dummy variables will be denoted $D_{Subscript}$.

Interaction variables can be used in several ways. In this thesis, the variable will be employed as a product of a dummy and a continuous variable and is denoted $D_{Subscript} \bullet X$. When the dummy variable is 1, the interaction variable behaves as a continuous variable and the slope of the regression line may change. When the dummy variable is 0, the slope of the regression line is determined by the other variables present in the model.

3.3. Construction of variables and the regression models

The regression analysis, in which financial leverage is the dependent variable, will be performed in two stages. In the first stage, the relationship between financial and operating leverage will be established by running a regression in which operating leverage is the independent variable. This will be referred to as *Model 1*. In the second stage, the variable operating leverage is combined with the control variables in order to examine the impact these may have on the relation between the leverage components. This will be referred to as *Model 2*.

As there are many factors which may affect financial leverage, we expect operating leverage and the control variables only to explain a fraction. The purpose of this thesis is to examine the relation between financial and operating leverage and therefore, *the signs* of the slope coefficients are of greater importance than *the explanatory power* of the model.

In the way the model is defined, each variable should be related to financial leverage in a certain way. Previous research has given some guidance to which these relations might be and they will be discussed in connection to each variable, and summarized in a table in the end of this section.

3.3.1. Stage 1

3.3.1.1. Variables included in Model 1

Below follows a description of the methodology employed when computing the dependent and independent variables.

3.3.1.1.1. Financial leverage (dependent variable)

To measure financial leverage, average total debt-to-average total assets have been used. This is a common way of measuring financial leverage and consistent with that of Remmers et al. (1974) and Ferri and Jones (1979). It is also comprehensible as it is expressed in percent.

The reason for using total debt in the numerator instead of long term debt, is due to the fact that short term debt might be interest bearing. Some companies disclosed more information than others, and therefore it has not been possible to consistently separate interest bearing from non-interest bearing liabilities. Lastly, by using average values of debt and assets (opening and closing balances), we obtain a more dynamic figure than if only using opening balances.

Financial leverage (%) = Ave. total debt / Ave. total assets

3.3.1.1.2. Operating leverage (independent variable)

The construction of this variable requires *variable*, *fixed* and *financial costs* for each company. Variable costs include the items *cost of goods sold*, *trade goods* and *inventory changes* as they are assumed to vary with the level of output. Depending on the nature of the company and its activity, it may report any of these. Fixed costs are basically all costs other than variable, financial and tax costs, i.e. operating costs such as *selling, personnel and administrative costs*, *research and development costs* and *depreciation* (*non-recurring items* are excluded as they distort the normal business activity). Total costs are the sum of variable, fixed and financial costs[17]. The variable is defined as the ratio of fixed operating costs-to-total costs, which is consistent with Brigham's (1995) definition, and it is measured in percent.

Initially, we also employed an alternative form of the DOL employed by Lord (1996), in order to test this measure[18]. However, no significant results were found[19], and therefore we chose to focus the study on the measure of operating leverage described here.

Operating leverage (%) = Fixed operating costs / Total costs

Operating leverage is an independent variable and it will be used in the regression to explain the dependent variable financial leverage. Different theoretical models and previous empiri-

[17] Tax costs are excluded as they are neither related to financial, nor operating activities.
[18] The definition employed was DOL = Gross profit / (Gross profit – Fixed costs).
[19] This will be further discussed in the section *Analysis*.

cal findings are ambiguous regarding the relationship between financial and operating leverage, but as our intention is to empirically examine the tradeoff hypothesis, there should be a negative relation between the two variables.

3.3.1.2. Model 1

The purpose of the model defined below, is to examine the relationship between the two leverage components. It will be estimated and the significance of the slope coefficient of the independent variable will be tested.

$$Financial\ leverage = \beta_0 + \beta_1 Operating\ leverage$$

3.3.1.3. Hypothesis stage 1

3.3.1.3.1. Hypothesis I: Operating leverage

Hypothesis I tests if there is a negative relation between financial and operating leverage[20].

$$I. \quad H_0: \beta_1 \geq 0;\ H_1: \beta_1 < 0;\ \alpha = 5\ \%$$

3.3.2. Stage 2

3.3.2.1. Additional control variables included in Model 2

As discussed in the first section of this thesis, we have identified three control variables which we believe may have an impact on the relationship between financial and operating leverage. These are further presented below.

3.3.2.1.1. Industry belonging (control variable)

To handle industrial classification, the companies have been sorted into one of the categories *manufacturing*, *service* or *retail*. Previous studies have mainly used *Standard Industrial Classification* (SIC) codes when sorting companies into different industries (see e.g. Ferri and Jones [1979] and Mandelker and Rhee [1984]). The initial intention was to use the Swedish equivalent, *Svenskt Näringslivs Index* (SNI) codes, but these differ greatly depending on

[20] To test if there is a negative relation between the dependent and the independent variable, a one-tailed t-test is performed by setting the coefficient β equal to or larger than zero in the null hypothesis. If the null hypothesis is rejected, there is a high probability that there is a negative relation between the two variables in the population.

which level of the company that is considered. We therefore employed the industrial classification presented in the database Retriever Bolagsinfo.

In the regression model, industry belonging will be represented by dummy variables. These take the value 1 if the company is within the category in question and 0 otherwise. The manufacturing category serves as the base and it will therefore not be given a separate variable. The dummy variables for the other two categories will be denoted $D_{Service}$ and D_{Retail}. These will not only serve as dummy variables, but also as interaction variables when combined with operating leverage, and may thereby alter the slope between the leverage components. If there is a relation between financial and operating leverage, we want to examine if this relation differs across industries, something previous empirical findings suggest (see Darrat and Mukherjee 1995).

3.3.2.1.2. Sales variability (control variable)

When measuring risk, the variance or the standard deviation of the cash flow in question is commonly used. To obtain a measure of sales variability, we first calculated the percentage change in sales each year. Thereafter, the standard deviation of these values was computed. This methodology is similar to the one employed by Titman and Wessels (1988), and it is based on the assumption of linear sales growth[21]. The implication of using this methodology is however that each company only has one observation with respect to sales variability for the entire period. The variable is measured in percent.

$$Sales\ variability^{22}\ (\%) = \sigma\ of\ (Sales_t - Sales_{t\text{-}1}) / Sales_{t\text{-}1};\ t = 2001, \ldots, 2009$$

Sales variability is a control variable and it will be used in the regression to explain the dependent variable financial leverage. We have included this variable in order to see if the relationship between financial and operating leverage holds when sales variability is controlled for. Theoretical models and empirical findings suggest that sales variability may be both positively and negatively related to financial leverage. However, firms with uncertain revenues

[21] Growth may be linear or exponential which is an important factor for the measurement of sales variability. Therefore, charts of historical sales data were studied in order to determine what the trend actually looked like. Apart from occasional extreme spikes, most companies exhibited a constant rate of sales growth, i.e. a linear growth trend. Support for the assumption of linear growth comes from the Swedish GDP statistics which shows that the GDP growth has been on average 3.2 percent per annum between 2000 and 2007, falling in 2008 to 2009 by approximately 4 percentage points (SCB 2010).

[22] Year 2000 is the base year.

and thus, a higher operating risk, should want to lower their financial leverage, and therefore, this variable should be negatively related to financial leverage.

3.3.2.1.3. Cost of debt (control variable)

To calculate the effective borrowing rate (referred to as cost of debt), the items *short* and *long term debt* (= total debt) and *financial expenses* have been used. The reason for using total debt in the denominator is that short term debt might be interest bearing. Some companies did not report long term debt, but had financial costs in their income statements, thus implying interest bearing short term debt. The variable is defined as the ratio of financial expenses-to-average total debt, consistent with Johansson's (1998) definition, and it is measured in percent.

$$\textit{Cost of debt (\%)} = \textit{Financial expenses / Ave. total debt}$$

The cost of debt is a control variable and it will be used in the regression to explain the dependent variable financial leverage. The variable has been included in order to see if the relation between the leverage components remains when the cost of debt is controlled for. According to the tradeoff theory, firms with high financial leverage are more probable to become bankrupt and this higher probability of bankruptcy should be reflected by a higher cost of borrowing. We therefore expect this variable to be positively related to financial leverage.

3.3.2.2. Model 2

In Model 2, the control variables discussed above will be added. These are the two dummy and interaction variables for industry belonging, below referred to as $D_{Industry\ type}$ and $D_{Industry\ type}$ • *Operating leverage* respectively, sales variability and cost of debt. In Table 2 below, the variables included in each model are shown.

Table 2: Variables included in Models 1 and 2

Variable	*Model 1*	*Model 2*
Constant (β_0)	×	×
Operating leverage (β_1)	×	×
$D_{Service}$ (β_2)		×
D_{Retail} (β_3)		×
$D_{Service}$ • Operating leverage (β_4)		×
D_{Retail} • Operating leverage (β_5)		×
Sales variability (β_6)		×
Cost of debt (β_7)		×

× The variable is included in the model.

When both industry belonging dummy variables take the value 0 ($D_{Service} = 0$, $D_{Retail} = 0$), the estimated model fits the data for manufacturing companies. The model thus reduces to:

$$Financial\ leverage = \beta_0 + \beta_1 Operating\ leverage + \beta_6 Sales\ variability + \beta_7 Cost\ of\ debt$$

If one of the service or retail dummy variables take the value 1 ($D_{Service} = 1$ or $D_{Retail} = 1$), we need to recalculate the constant and the independent variable. How this is done, can be seen in the table below.

Table 3: Calculations of the constant and the independent variable for the service and retail categories

Variable	*Calculation for service*[†]	*Calculation for retail*[††]
Constant (β_0)	$\beta_0 + \beta_2 = \beta_{0\text{-Service}}$	$\beta_0 + \beta_3 = \beta_{0\text{-Retail}}$
Operating leverage (β_1)	$\beta_1 + \beta_4 = \beta_{1\text{-Service}}$	$\beta_1 + \beta_5 = \beta_{1\text{-Retail}}$
Sales variability (β_6)	N/A	N/A
Cost of debt (β_7)	N/A	N/A

[†] *$D_{Service} = 1$, $D_{Retail} = 0$;* [††] *$D_{Service} = 0$, $D_{Retail} = 1$*

If an observation belongs to the service category ($D_{Service} = 1$, $D_{Retail} = 0$), the estimated model fits the data for service companies and the model thus reduces to:

$$Financial\ leverage_{Service} = \beta_{0\text{-}Service} + \beta_{1\text{-}Service} Operating\ leverage + \beta_6 Sales\ variability + \beta_7 Cost\ of\ debt$$

If the observation instead belongs to the retail category ($D_{Service} = 0$, $D_{Retail} = 1$), the estimated model fits the data for retail companies and the model reduces to:

$$Financial\ leverage_{Retail} = \beta_{0\text{-}Retail} + \beta_{1\text{-}Retail} Operating\ leverage + \beta_6 Sales\ variability + \beta_7 Cost\ of\ debt$$

3.3.2.3. Hypotheses stage 2

3.3.2.3.1. Hypotheses II-VI: Industry belonging

Hypothesis II tests whether there is a relationship between financial and operating leverage or not for all companies in the sample[23]. If the service and retail categories prove to have a significantly different relation between the leverage components, hypothesis II only tests the existence of a relationship for manufacturing firms.

$$II. \quad H_0: \beta_1 = 0;\ H_1: \beta_1 \neq 0;\ \alpha = 5\ \%$$

By adding dummy variables representing the industry categories, we intend to test if the intercept differs across industries. Hypotheses III and IV test whether there is a different intercept of the relation between the leverage components in the two industry categories.

$$III. \quad H_0: \beta_2 = 0;\ H_1: \beta_2 \neq 0;\ \alpha = 5\%\ (service\ category)$$
$$IV. \quad H_0: \beta_3 = 0;\ H_1: \beta_3 \neq 0;\ \alpha = 5\ \%\ (retail\ category)$$

Hypotheses V and VI test if there is a relation between financial and operating leverage for the categories service and retail respectively. When testing these hypotheses, we will use the recalculated coefficients which are presented in Table 3 above.

$$V. \quad H_0: \beta_{1\text{-}Service} = 0;\ H_1: \beta_{1\text{-}Service} \neq 0;\ \alpha = 5\ \%$$
$$VI. \quad H_0: \beta_{1\text{-}Retail} = 0;\ H_1: \beta_{1\text{-}Retail} \neq 0;\ \alpha = 5\ \%$$

[23] In the null hypothesis, a two-tailed test is performed and the coefficient is set to zero i.e. no relation between the variables. This has been done in order not to rule out the possibility of a positive relation between the leverage components within the different industries. If the null hypothesis is rejected, there is a high probability that there is a relation, either positive or negative.

3.3.2.3.2. Hypothesis VII: Sales variability

When adding sales variability as a control variable, we want to see if the relation between the leverage components remains when revenue fluctuations are taken into account. As noted previously, we expect sales variability to be negatively related to financial leverage and Hypothesis VII therefore tests for a negative relationship between the two variables.

$$VII. \quad H_0: \beta_6 \geq 0; H_1: \beta_6 < 0; \alpha = 5\ \%$$

3.3.2.3.3. Hypothesis VIII: Cost of debt

By adding this variable, we intend to examine if the relation between financial and operating is affected by the cost of debt. The variable should be positively related to financial leverage, which is tested by Hypothesis VIII.

$$VIII. \quad H_0: \beta_7 \leq 0; H_1: \beta_7 > 0; \alpha = 5\ \%$$

3.3.3. Expected coefficients of the variables

To facilitate the interpretation of the results which will be presented in the following section, a recapitulation of the expected slope coefficients for each variable is given in the table below. This is thereby the relation between each variable and financial leverage. Industry belonging, which is in the form of several dummy and interaction variables, may affect both the intercept between financial and operating leverage, and the slope coefficient.

Table 4: Each variable's expected slope coefficient

Variable	***Expected coefficient***
Operating leverage	Negative
Industry belonging	N/A
Sales variability	Negative
Cost of debt	Positive

3.4. Validity and reliability of the study

Validity refers to the measuring instrument and if it measures what it is intended to measure, i.e. if the methodology is relevant for examining the problem at hand. *Reliability* on the other hand, concerns the measurement *per se* and if the measurement procedure yields the same outcome on repeated trials, i.e. if the data is trustworthy (Carmines and Zeller 1979).

In order to ensure the validity of the study, we have employed a methodology and definitions of variables similar to those in previous research. However, it needs to be stressed that the intention of this study has not been to directly replicate previous studies and therefore, the methodology is not entirely consistent with those already employed. This will be discussed at length after the analysis in *The validity of the results*.

In order to ensure the reliability of the study, raw, unmodified data has been used. The selection process of companies has been explained, and the final sample is shown in the appendix. Also, by using annual reports as a complement to the database Retriever Bolagsinfo, we have verified the quality of the data. Even if some data, after controlling it, would be incorrect, we have used a large sample of companies and a time range which hopefully make existing errors neglectable. The data might however suffer from a survivorship bias, as only companies existing during the entire period have been selected in the final sample. In order to verify if the data suffers from any skewness, two robustness tests have been perfomed. This will be discussed further in *The reliability of the results* after the analysis.

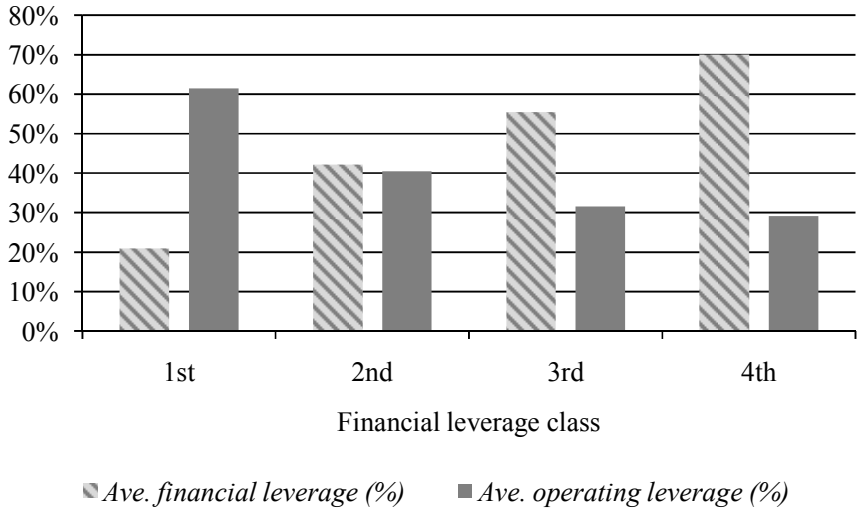
4. Results of the empirical study

In this section, the data will first be presented in more detail. Thereafter, the results of the regression analyses are given. These will be accompanied by the hypothesis tests that were described in the previous section and the outcome will be discussed and summarized.

4.1. Presentation of the data

In Chart 1 below, the whole sample has been sorted into four classes based on financial leverage. The first class represents the bottom quartile with the lowest financial leverage; the second class represents the second quartile etc. Each class' average financial and operating leverage has then been computed. As can be seen in the chart, the average level of operating leverage decreases as the average level of financial leverage increases, thus suggesting a negative relation between the two leverage components.

Chart 1: Whole sample sorted into financial leverage classes with each class' average level of financial and operating leverage



In Table 5 below, the same methodology has been employed as above, but the entire sample has been divided into the three industry categories. Each category has then been divided into the four classes based on financial leverage. From the table, it is possible to see that each industry category seems to exhibit a tradeoff between the two leverage components, with the fourth class for the retail category being an exception.

Table 5: Each industry category sorted into financial leverage classes with each class' average level of financial and operating leverage

Financial leverage class	*Manufacturing*		*Service*		*Retail*	
	Ave. fin. lev. (%)	*Ave. op. lev (%)*	*Ave. fin. lev. (%)*	*Ave. op. lev. (%)*	*Av. fin. lev. (%)*	*Ave. op. lev. (%)*
1st	18.4	61.2	22.0	68.3	26.8	49.9
2nd	42.7	31.9	37.5	60.8	46.0	29.6
3rd	55.3	26.0	51.7	58.4	58.1	28.1
4th	69.6	18.3	67.8	54.1	73.7	31.1

Below, in Table 6, the entire sample has again been sorted into the four classes based on financial leverage, but each class' average level of financial leverage is compared to its corresponding average level of sales variability and cost of debt. The table reveals a negative relation between financial leverage and sales variability, and a positive relation between financial leverage and cost of debt, although the fourth class is somewhat contradicting. These relationships do thereby conform to what we expect from each variable.

Table 6: Whole sample sorted into financial leverage classes with each class' average level of financial leverage, sales variability and cost of debt

Fin. lev. class	*Ave. fin. leverage (%)*	*Ave. sales variability (%)*	*Ave. cost of debt (%)*
1st	21.0	66.1	1.6
2nd	42.2	40.5	2.3
3rd	55.5	27.1	2.8
4th	70.1	27.9	2.5

4.2. Results of the regression analyses

The results of the regression analyses in both stages are presented below. For each stage, the accompanying model and the hypotheses are discussed in further detail.

4.2.1. Stage 1

The objective in Stage 1 is to establish if there is a statistically significant negative relation between financial and operating leverage. In Table 7 below, showing the estimated Model 1, we can see that the estimated coefficient for the variable operating leverage is negative and

significant at the 5 percent level. The null hypothesis I: H_0: $\beta_1 \geq 0$, testing if the relationship between the two components is positive, can therefore be rejected at the 5 percent level (p-value = 0.000 / 2 < 0.05)[24].

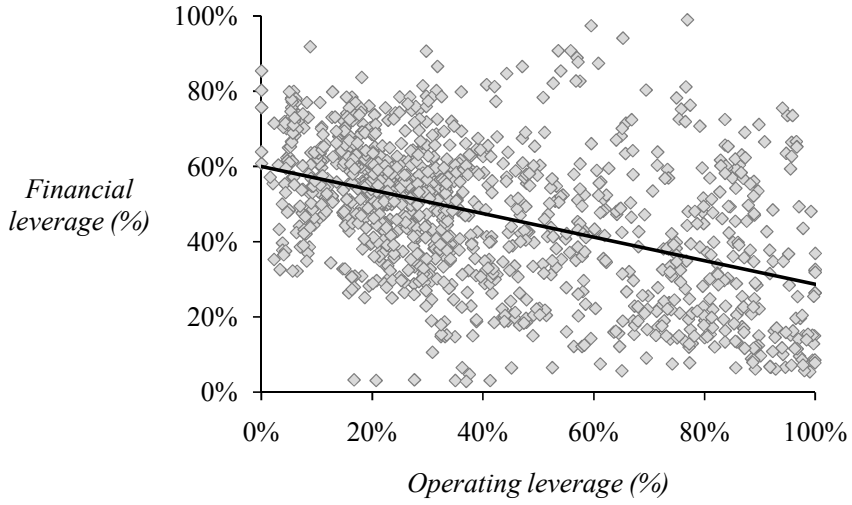
Table 7: Results of the regression analysis for Model 1

Variable	*Estimated coefficient*	*t-statistic*	*R^2 (Adj. R^2)*
Constant (β_0)	0.600*	67.216	20.3 % (20.3 %)
Operating leverage (β_1)	–0.313*	–17.268	

** Significant at the 5 percent level.*

The regression describes a downward sloping line, as seen in Chart 2 below. According to Model 1, a one percent increase in the variable operating leverage results in a 0.313 percent decrease in the variable financial leverage. Considering the fact that the model lacks control variables, it fits the data well. 20.3 percent of the variation in financial leverage in the sample is explained by the model (R^2 = 20.3).

Chart 2: The line of best fit between financial and operating leverage



[24] To obtain the p-value for a one-tailed t-test in hypothesis I, the p-value is divided by two and compared to the chosen significance level 5 percent.

4.2.2. Stage 2

Having established a statistically significant negative relationship between financial and operating leverage in Stage 1, the three control variables *industry belonging*, *sales variability* and *cost of debt* are included in Stage 2. Table 8 below summarizes the estimated Model 2 and is followed by a more thorough discussion of each of the control variables.

Table 8: Results of the regression analysis for Model 2

Variable	*Estimated coefficient*	*t-statistic*	R^2 *(Adj.* R^2*)*
Constant (β_0)	0.555*	41.317	30.8 % (30.4 %)
Operating leverage (β_1)	–0.404*	–16.212	
$D_{Service}$ (β_2)	–0.075*	–2.886	
D_{Retail} (β_3)	0.019	0.878	
$D_{Service}$ • *Operating leverage* (β_4)	0.309*	7.174	
D_{Retail} • *Operating leverage* (β_5)	0.083	1.524	
Sales variability (β_6)	–0.026*	–3.852	
Cost of debt (β_7)	2.327*	8.073	

** Significant at the 5 percent level.*

4.2.2.1. Industry belonging

Each industry category can be thought of as having its own model with a different intercept and slope. As discussed previously, the manufacturing category serves as the base in Model 2 and has therefore not been assigned a dummy variable. If an observation comes from a company within this category (i.e. $D_{Service} = 0$ and $D_{Retail} = 0$), Model 2 reduces to the one seen in Table 9 below. In order to build the same kind of model for the service and retail categories, the recalculations presented in Table 3 in the *Methodology* section are required.

For the service category, the recalculated constant is 0.480 ($\beta_0 + \beta_2 = 0.555 + [–0.075]$) and the recalculated coefficient of the independent variable operating leverage is –0.095 ($\beta_1 + \beta_4 = [–0.404] + 0.309$). As seen in Table 8 above, the coefficients of the dummy and interaction variables β_3 and β_5 for the retail category are not significant at the 5 percent level. This indicates that the retail category does not differ significantly from the base category, i.e. manufacturing. Tables 9, 10 and 11 below summarize the reduced Model 2 for each industry category[25]. These are then followed by the hypothesis tests.

[25] As the coefficient of the dummy variable for the retail category is statistically insignificant, Table 11 for the retail category becomes the same as Table 9 for the manufacturing category.

Table 9: Results of the regression analysis for Model 2 – Manufacturing†

Variable	*Estimated coefficient*	*t-statistic*	R^2 *(Adj.* R^2*)*††
Constant (β_0)	0.555*	41.317	N/A (N/A)
Operating leverage (β_1)	–0.404*	–16.212	
Sales variability (β_6)	–0.026*	–3.852	
Cost of debt (β_7)	2.327*	8.073	

**Significant at the 5 percent level.*

† $D_{Service}$ = 0, D_{Retail} = 0; †† The measures are not possible to obtain when recalculating the model.

Table 10: Results of the regression analysis for Model 2 – Service†

Variable	*Estimated coefficient*	*t-statistic*	R^2 *(Adj.* R^2*)*††
Constant ($\beta_{0\text{-}Service}$)	0.480*	N/A	N/A (N/A)
Operating leverage ($\beta_{1\text{-}Service}$)	–0.095*	N/A	
Sales variability (β_6)	–0.026*	–3.852	
Cost of debt (β_7)	2.327*	8.073	

** Significant at the 5 percent level.*

† $D_{Service}$ = 1, D_{Retail} = 0; †† The measures are not possible to obtain when recalculating the model.

Table 11: Results of the regression analysis for Model 2 – Retail†

Variable	*Estimated coefficient*	*t-statistic*	R^2 *(Adj.* R^2*)*††
Constant ($\beta_{0\text{-}Retail}$)	0.555*	41.317	N/A (N/A)
Operating leverage ($\beta_{1\text{-}Retail}$)	–0.404*	–16.212	
Sales variability (β_6)	–0.026*	–3.852	
Cost of debt (β_7)	2.327*	8.073	

** Significant at the 5 percent level.*

† $D_{Service}$ = 0, D_{Retail} = 1; †† The measures are not possible to obtain when recalculating the model.

The coefficient of operating leverage β_1, is significant and negative, as seen in Table 8. This indicates that there is a negative relation between financial and operating leverage when the control variables are included in the model. We can thus reject null hypothesis II: H_0: $\beta_1 = 0$ at the 5 percent level (p-value = 0.000 < 0.05).

The coefficient of the dummy variable for the service category β_2 is significant which implies that the intercept for this category differs significantly from the base. Therefore, the null hypothesis III: H_0: $\beta_2 = 0$ can be rejected at the 5 percent level (p-value = 0.004 < 0.05). However, the coefficient of the dummy variable for the retail category β_3 is not significant.

The retail category thereby has the same intercept as the manufacturing category and the null hypothesis IV: H_0: $\beta_3 = 0$ cannot be rejected at the 5 percent level (p-value = 0.380 > 0.05).

The recalculated coefficient of operating leverage for the service industry $\beta_{1\text{-Service}}$ shown in Table 10, is significant[26] and negative. The null hypothesis V: H_0: $\beta_{1\text{-Service}} = 0$ can therefore be rejected at the 5 percent level (p-value = 0.000 < 0.05). This indicates that there is a negative relation between the leverage components for the service category and that this relation is significantly different from that of the manufacturing category.

However, as the coefficient of the interaction variable for the retail category β_5 is not significant (p-value = 0.128 > 0.05), the recalculated coefficient for this industry category becomes insignificant as well, and the null hypothesis VI: H_0: $\beta_{1\text{-Retail}} = 0$ can therefore not be rejected at the 5 percent level (p-value = 0.128[27] > 0.05). This indicates, as mentioned above, that there is a significant relation between the leverage components for both the retail and manufacturing categories, but that the relation does not differ significantly between the two.

4.2.2.2. Sales variability

As can be seen in Table 8, the coefficient of the variable sales variability is significant and negatively related to financial leverage. Thus, the the null hypothesis VII: H_0: $\beta_6 \geq 0$ can be rejected at the 5 percent level (p-value = 0.000 / 2 < 0.05).

4.2.2.3. Cost of debt

The estimated coefficient of cost of debt is significant and positively related to financial leverage (see Table 8). The null hypothesis VIII H_0: $\beta_7 \leq 0$ can thereby be rejected at the 5 percent level (p-value = 0.000 / 2 < 0.05).

4.2.2.4. Summary of the hypothesis tests in stage 2

Regarding industry belonging, the findings above show that each category has a negative relation between the leverage components, but that the intercepts and slopes of these relations differ. The manufacturing and retail categories both have the same intercepts, namely 0.555 (see Tables 9 and 11). The intercept is only significantly different for the service industry, for

[26] As the coefficient of the interaction variable for the service category β_4 is significant, the recalculated coefficient for this category is significant as well.

[27] Note that this is the p-value for the interaction variable D_{Retail} • Operating leverage which thereby is insignificant. However, the p-value for the independent variable Operating leverage is still 0.000 and the variable is thus significant.

which it is 0.480 (see Table 10). This indicates that the line of best fit between financial and operating leverage starts from a somewhat lower level for the service category.

The slope coefficient of operating leverage for both the manufacturing and retail categories is –0.404 (see Tables 9 and 11) and it is therefore steeper than the slope coefficient of operating leverage within the service category, which is 0.095 (see Table 10). This implies that the tradeoff between financial and operating leverage is more pronounced for companies within the manufacturing and retail categories than for those within the retail category. The probability of getting this discrepancy in estimates, if the true population coefficients are equal, is very small[28]. It is therefore possible to conclude that the characteristics of the relation between financial and operating leverage differ across industries.

Sales variability is negatively related to financial leverage while the relation between the latter and cost of debt showed to be positive. We can see in Table 8 that the negative relation between the leverage components remains significant when the control variables are included. Not suprisingly, the explanatory power of the model increases when other factors are controlled for, from 20.3 percent in Model 1, to 30.4 percent in Model 2 (adjusted R^2 = 30.4). These findings will be analyzed in the next section.

[28] A t-test which compares two population means was performed and the null hypothesis that their means are equal, could be rejected at the 5 percent level.

5. Analysis

In this section, the empirical findings presented in the previous section are analyzed, starting with the relation between financial and operating leverage. Thereafter, findings related to each control variable are discussed and analyzed. The section ends with a discussion of the validity and reliability of the results.

5.1. The relation between financial and operating leverage

The purpose of this thesis is to empirically examine the relation between financial and operating leverage. In the first stage of the analysis, the independent variable operating leverage was used to explain financial leverage, the dependent variable. A significant relationship was found and it proved to be negative. The explanatory power of this model was 20.3 percent. In the second stage, the control variables were included and the relationship between financial and operating leverage remained significantly negative. In this stage, the explanatory power of the model increased to 30.4 percent.

These results suggest that there exists a significant negative relationship between financial and operating leverage among firms in the Swedish market included in the sample, thus supporting the tradeoff hypothesis proposed by Van Horne (1977). Also, earlier empirical findings by Mandelker and Rhee (1984) and Ferri and Jones (1979) are re-confirmed in our study. To draw a conclusion whether the results are consistent with the models proposed by Huffman (1983) and Prezas (1987) or not, is not as easy as their models predict various outcomes. This would require a more detailed examination of each company in the sample, and how operating leverage is affected by an alternation of financial leverage. However, the findings suggest that the firms included in this study seem to take their operating leverage into account when choosing the level of financial leverage.

What is interesting to note, is the impact that some of the control variables have on the relation between financial and operating leverage. This will discussed below.

5.1.1. Industry belonging

Myers' (1977) theory which suggests a positive relationship between the leverage components cannot be supported in our study. However, the theory makes a distinction between firms whose value is based on their assets in place, and those whose value is derived from future growth opportunities. Our categorization of companies does not make this distinction,

but as the results show, all three industries included in the study have a significant and negative relationship between financial and operating leverage. This can thereby be seen as a contradiction of Myers' theory.

It is interesting to note that the manufacturing and retail categories have a more pronounced tradeoff between the leverage components than the service category. This finding is consistent with the tradeoff hypothesis regarding the manufacturing category, as these firms with their relatively higher proportions of fixed assets and thereby higher levels of operating leverage, should want to adapt their level of financial leverage more actively than other firms. Regarding the retail category, it is not obvious why these firms have the same relationship between financial and operating leverage as the manufacturing category, and previous research does not provide much guidance. Darrat and Mukherjee (1995) confirmed that the interrelation between the leverage components differs across industries, but their classification of industries differs from ours and their results are ambiguous.

Several studies have examined the relationship between capital structures and industry belonging, among others Scott (1972) and Scott and Martin (1975). Their findings do not however, help us to understand the ways in which the relationship between the leverage components differs across industries. A possible explanation to why manufacturing and retail companies exhibit the same tradeoff might be that the latter take operating leverage into account to the same extent as the former when making financial leverage decisions. This conclusion could however be questioned, as financial leverage certainly is connected to many factors, and also may vary over time and across countries.

5.1.2. Sales variability

Our results show that sales variability is significantly and negatively related to financial leverage and that the negative relation between the leverage components remains when this variable is included. These findings are to some extent consistent with the model proposed by Huffman (1983), which suggests that sales variability is related to financial leverage. However, according to the model, the relationship could be either positive or negative depending on the relative size of these two variables. The results of the study by Ferri and Jones (1979) are ambiguous with regards to the relation between financial leverage and sales variability, and do thereby not help in explaining our findings. Therefore, the concept of operating risk defined as a function of operating leverage and sales variability (White et al. 2003), might provide a better explanation. A firm with high operating risk, i.e. a firm with a high level of

operating leverage in combination with high sales variability, should want to lower its financial risk, provided that these firms want to maintain their overall risk on an appropriate level. As our findings show, both operating leverage and sales variability are negatively related to financial leverage which suggests that the firms in the sample seem to adapt their level of financial leverage depending on their level of operating risk.

5.1.2.1. The definition of operating leverage

As discussed in the *Theoretical framework* section, the degree of financial leverage (DFL) and the degree of operating leverage (DOL) are commonly used in previous research when examining the relation between the leverage components[29]. The studies by Huffman (1989) and Lord (1996) both employed these measures and none were able to confirm a relationship between financial and operating leverage. Earlier, Ferri and Jones (1979) used several definitions of operating leverage when studying the determinants of capital structures. They were able to confirm a negative relationship between the leverage components when operating leverage was measured as fixed assets-to-total assets, but the relationship was not as clear when using the DOL. This suggests that the DOL might be considered a vague measure of operating leverage, a conclusion also put forward by Huffman (1989).

To test this, we also employed an alternative form of the DOL[30]. However, we were unable to find a significant relationship between this measure of operating leverage and financial leverage[31]. This provides further evidence for the vagueness of the DOL as a measure of operating leverage, and suggests that Brigham's (1995) definition, namely fixed operating costs-to-total costs, might be seen as a stronger measure.

A possible explanation for this, although not confirmed in our study, may be that operating leverage and sales variability, which are to some extent both accounted for in the DOL, might affect financial leverage in different ways[32]. In other words, if operating leverage is negatively related to financial leverage but sales variability happen to be positively related to the same, their combined relation to financial leverage should be less obvious.

[29] See the section *Theoretical framework* and *Appendix A* for the definitions of the variables.
[30] This was discussed in the *Methodology* section.
[31] This approach was a sidetrack to our actual study and as the results were insignificant, we decided not to include the regression analysis in this thesis.
[32] Recall that the model by Huffman (1983) suggests that sales variability may be both positively and negatively related to financial leverage.

5.1.3. Cost of debt

The tradeoff theory[33] suggests that firms with higher financial leverage are more probable to become financially distressed, and therefore borrow at a higher cost. Our findings reveal a positive relationship between cost of debt and financial leverage among the firms in the sample, and the results are therefore consistent with the theory.

As the model is defined, it may seem that firms borrow more when the effective borrowing rate is high. This causality is, if not completely, then partly reversed. Firms with high financial leverage will be perceived as more risky by lenders and this risk should be reflected in a higher interest rate. Whether the cost of debt directly affects the relationship between financial and operating leverage, is however, not as easy to say. We can only conclude that the relation between the leverage components remains, when this variable is included.

A possible way in which the cost of debt might affect the relationship, is that firms with low borrowing costs and thereby initially low levels of financial leverage, may tend to increase their financial leverage further without considering operating leverage. For these firms, the negative relation between the leverage components should diminish over time. This suggestion is however not verified in our study.

5.2. The validity of the results

We have identified three possible areas which may have a negative impact on the validity of the results of this study. These are *an incorrect model*, *incorrect definitions of variables* and *omitted control variables*. Each of these areas will be discussed below.

5.2.1. An incorrect model

The model employed in this study has been used in previous research. However, as it is defined with financial leverage being the dependent variable, it is normally employed when examining the determinants of capital structures. Other studies aimed at examining the relation between the leverage components have mainly employed a measure of total risk as the dependent variable, such as market betas. As our intention was to rely solely on accounting data, we chose not to employ this methodology. This choice may have had a negative impact on the validity of the study. However, as discussed previously, the intention has never been to

[33] Recall that *the tradeoff theory* is not the same as *the tradeoff hypothesis.* The tradeoff theory suggests that there exists a tradeoff between the tax benefits, and the increased agency and bankruptcy costs that an increase in the level of debt brings with it.

replicate prior studies and therefore, we find the model appropriate for the purpose of this thesis. The model is also comprehensive and provides easily interpretable results when studying the relation between the leverage components.

5.2.2. Incorrect definitions of variables

The first question which comes to mind when comparing the results of this study with those obtained in some of the previous ones, is why we are able to identify a negative relation between the leverage components. It is obvious that the definitions of the variables are important. Although this study has employed somewhat different measures of the leverage components than previous ones, the definitions used are obtained from the literature and should therefore be appropriate measures. Also, by using a different definition of operating leverage as a sidetrack to the actual study, we were able to test the robustness of each measure. This test provided further evidence for that the result depends on the measurement of the variables. Based on the above reasoning, we consider the results valid, but the comparability to previous studies, depends on which definition that is being used.

Another point which needs to be stressed regarding the variables, is the potential existence of multicollinearity, i.e. high correlations between the independent and control variables[34]. When interaction variables are used in an OLS regression model, they will automatically have high correlations to the variables they originate from. Having examined the correlations between the independent and control variables in Model 2 (see *Appendix D*), we can conclude that multicollinearity is present and it might have affected the industry belonging variables. However, these results were expected, so the conclusions regarding industry belonging might be considered less reliable. The classification of industries may also be questioned, but as briefly discussed, each categorization method has its weaknesses.

Regarding sales variability, the results may be misleading as each company had solely one observation with regards to this variable over the entire period. It can also be questioned if the measurement of the variable captures revenue fluctuations in the way it is supposed to. Nevertheless, there is still a significant negative relation between the leverage components in the presence of other variables and multicollinearity, despite potential fallacies.

[34] In the presence of multicollinearity, the OLS estimators β_i have large confidence intervals, which leads to lower t-values. Therefore the null hypotheses are more difficult to reject and the results are invalid for individual variables (Stock and Watson 2007).

5.2.3. Omitted control variables

If our model lacks control variables is not as easy to tell. As mentioned in the introduction, there are a number of possible factors which may have an impact on financial leverage. However, the purpose of the study has not been to explain financial leverage levels, but to examine the relation between financial and operating leverage. The high value of R^2 in Model 1 indicates a very strong explanatory power of the variable operating leverage. Some may argue that it is too high. Others may question if a tradeoff really exists or if the variables just happen to be correlated because of some external factors which we have not been able to capture. This is however out of the scope of this thesis to provide an answer to.

5.3. The reliability of the results

Whether the results are reliable or not, depends on the trustworthiness of the data. As discussed in the *Methodology* section, we have taken proper measures to verify that the data is correct. However, we have identified one possible area which may have a negative impact of the reliability of the results and this concerns the possible existence of skewness in the data.

5.3.1. Skewness in the data

In order to test for skewness, two robustness tests have been performed. In the first test, a random subsample of 70 percent of the observations has been drawn from the entire sample. In the second test, the entire sample has been divided into two groups with the first group covering the period from 2000 to 2004 and the second group covering the period from 2005 to 2009. Model 2 has then been estimated for each test.

By performing the first test, we have been able to confirm that the relation between financial and operating leverage holds for a smaller, random sample of observations. With the second test, we have been able to verify if the relationship is robust over time. This is important as companies are affected by factors such as business cycles and changed accounting standards (e.g. the introduction of IFRS in 2005) among others.

The most important observation from both tests is that the negative relation between the leverage components remains[35]. However, the significance of the other variables changes somewhat and the explanatory power of the model decreases between the first and the second period in the second test, but we still conclude that the results seem to be overall reliable.

[35] The results of the robustness tests can be seen in *Appendix E*.

6. Conclusion

The findings of our study confirm that there is a significant negative relationship between financial and operating leverage among firms in the Swedish market. These results thereby support the tradeoff hypothesis proposed by Van Horne (1977).

Moreover, our results show that the nature of the relation between financial and operating leverage differs across industries, with manufacturing and retail companies having a more pronounced negative relationship than service companies. Our study does however not reveal why this is the case, nor why manufacturing and retail firms seem to exhibit a similar relation between the leverage components. This is therefore a possible entry for future research.

The study has also been able to establish a negative relationship between sales variability and financial leverage. If defining operating risk as a function of operating leverage and sales variability, our findings thereby suggest that the firms included in the sample take this risk into account when making financial leverage decisions. In addition, our study reveals that the results are sensitive to which definition of operating leverage that is being employed, which is consistent with Huffman's (1989) suggestion. By defining operating leverage as fixed operating costs-to-total costs, we have shown that this definition provides a stronger measure of operating leverage compared to the normally employed degree of operating leverage. This may therefore be a possible explanation to why some of the previous research in this field has been unable to establish a relation between the leverage components.

Lastly, the study confirms a positive relationship between financial leverage and the cost of debt, but how the latter affect the relation between the leverage components, is left for future research to examine in more detail.

References

Blazenko, G.W. (1996), "Corporate leverage and the distribution of equity returns", *Journal of Business Finance and Accounting* 23(8), 1097-1120.

Brigham, E.F. (1995), *Fundamentals of financial management*. Fort Worth: Dryden Press.

Capacent (2009), "Ökad skuldsättning och finansieringsoro i svenska företag". Press release, 10 June.

Carmines, E.G. and Zeller, R.A. (1979), *Reliability and validity assessment*. Beverly Hills: Sage Publications.

Chen, J.J. (2004), "Determinants of capital structure of Chinese-listed companies", *Journal of Business Research* 57(12), 1341-1351.

Darrat, A.F. and Mukherjee, T.K. (1995), "Inter-industry differences and the impact of operating and financial leverages on equity risk", *Review of Financial Economics* 4(2), 141-155.

Ferri, M.G. and Jones, W.H. (1979), "Determinants of financial structure: A new methodological approach", *The Journal of Finance* 34(3), 631-644.

Huffman, L. (1983), "Operating leverage, financial leverage, and equity risk", *Journal of Banking and Finance* 7(2), 197-212.

Huffman, S.P. (1989), "The impact of the degrees of operating and financial leverage on the systematic risk of common stocks: Another look", *Quarterly Journal of Business and Economics* 28(1), 83-100.

Johansson, S.E. (1998), *The profitability, financing, and growth of the firm*. Lund: Studentlitteratur.

Lev, B. (1974), "On the association between operating leverage and risk", *Journal of Financial and Quantitative Analysis* 9(4), 627-641.

Lord, R.A. (1996), "The impact of operating and financial risk on equity risk", *Journal of Economics and Finance* 20(3), 27-38.

Mandelker, G.N. and Rhee, S.G. (1984), "The impact of the degrees of operating and financial leverage on systematic risk of common stock", *Journal of Financial and Quantitative Analysis* 19(1), 45-57.

Mihm, S. and Roubini, N. (2010), *Crisis economics: A crash course in the future of finance*. London: Penguin Press.

Myers, S.C. (1977), "Determinants of corporate borrowing", *Journal of Financial Economics* 5(2), 147-175.

Prezas, A.P. (1987), "Effects of debt on the degrees of operating and financial leverage", *Financial Management* 16(2), 39-44.

Remmers, L., Stonehill, A., Wright, R. and Beekhuisen, T. (1974), "Industry and size as debt ratio determinants in manufacturing internationally", *Financial Management* 3(2), 24-32.

SCB (2010), *Sveriges ekonomi – Bruttonationalprodukten*. Stockholm: Statistiska Centralbyrån. Available [online]: http://www.scb.se/Pages/TableAndChart____75431.aspx [2011-04-11].

Scott Jr., D.F. (1972), "Evidence on the importance of financial structure", *Financial Management* 1(2), 45-50.

Scott Jr., D.F. and Martin, J. D. (1975), "Industry influence on financial structure", *Financial Management* 4(1), 67-73.

Shalit, S.S. and Sankar, U. (1977), "The measurement of firm size", *Review of Economics and Statistics* 59(3), 290-298.

Stock, J.H. and Watson, M.W. (2007), *Introduction to econometrics*. New Jersey: Pearson Higher Education.

Stonehill, A. and Stitzel, T. (1969), "Financial structure and multinational corporations", *California Management Review* 12(1), 91-95.

Titman, S. and Wessels, R. (1988), "The determinants of capital structure choice", *Journal of Finance* 43(1), 1-19.

Van Horne, J.C. (1977), *Financial management and policy.* New Jersey: Prentice Hall.

Watts, R.L. and Zimmerman, J.L. (1986), *Positive accounting theory*. New Jersey: Prentice Hall.

Weston, J.F. and Brigham E.F. (1969), *Managerial finance*. New York: Holt, Rinehart and Winston.

White, G.I., Sondhi, A.C. and Fried, D. (2003), *The analysis and use of financial statements*. New Jersey: John Wiley and Sons.

Annual reports

A-Com (2002, 2003, 2008, 2009)
ABB (2001, 2006, 2007, 2009)
Addnode (2001, 2002)
Anoto Group (2003, 2005, 2007, 2008)
Artimplant (2001, 2005)
Aspiro (2004, 2006)
AstraZeneca (2007)
Autoliv (2006)
Axfood (2001)
B&B Tools (2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009)
Betsson (2000, 2003, 2005, 2007, 2009)
Billerud (2000)
Boliden (2002)
Electrolux (2002, 2004, 2006, 2007, 2009)
Enea (2009)
Fagerhult (2004)
Feelgood (2002)
Hexagon (2000, 2002, 2005, 2007, 2009)
Holmen (2000, 2004, 2008)
Husqvarna (2000, 2002, 2004, 2006, 2008)
Intellecta (2006)
Know IT (2000, 2001, 2005, 2008)
Meda (2007)
Modul 1 Data (2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007)
MTG (2005, 2006)
NCC (2006)
New Wave Group (2005, 2007, 2009)
Nolato (2009)
PEAB (2002, 2003)
SAAB (2000, 2002, 2005, 2006, 2008, 2009)
Sandvik (2004)
SCA (2005)
Scania (2006)
Securitas (2000)
Semcon (2000, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009)
Sigma (2000, 2005)
SKF (2002)
Swedish Match (2005)

Appendix A

Summary of literature

Table A1: Previous empirical studies of the relation between financial and operating leverage

Author(s)	*Definition(s) of: Financial leverage (FL)*	*Operating leverage (OL)*	*Methodology*	*Study period (country)*	*Comments*	*Results*[†]
Ferri and Jones (1979)	Total debt-to-total assets	DOL[i]; fixed assets-to-total assets[ii]	Non-parametric ranking test[1]	1969 to 1974; 1971 to 1976 (USA)	The study examined determinants of capital structures. Industry belonging, size and business risk[2] were included as separate variables.	A negative relation between FL and OL was found[3]; no clear relation between FL and business risk (sales variability) was found.
Mandelker and Rhee (1984)	DFL[iii]	DOL[i]	Multiple regression[4]	1957 to 1976 (USA)	The study examined solely manufacturing firms.	A negative relation between FL and OL was found.
Huffman (1989)	DFL[iii]	DOL[i]	Multiple regression[4]	1966 to 1985 (USA)	A replication of the study by Mandelker and Rhee (1984).	No relation between FL and OL was found.
Darrat and Mukherjee (1995)	DFL[iii]	DOL[i]	Multiple regression[4]	1975 to 1987 (USA)	The study examined six different industries.	A negative relation between FL and OL was found within the *petroleum refining* industry.
Lord (1996)	DFL[iv]	DOL[v]	Multiple regression[5]	1963 to 1988 (USA)	The study examined three different industries.	No relation between FL and OL was found.

[†] *Only results relevant to our study will be summarized.*

[i] *DOL = (Operating income$_t$ / Operating income$_{t-1}$ – 1) / (Sales$_t$ / Sales$_{t-1}$ – 1);* [ii] *A measure of average fixed assets-to-total assets over four years was also employed.*

[iii] *DFL = (Net income$_t$ / Net income$_{t-1}$ – 1) / (Operating income$_t$ / Operating income$_{t-1}$ – 1);* [iv] *DFL = Operating income / (Operating income – Financial expenses)*

[v] *DOL = Gross profit / (Gross profit – Fixed costs)*

[1] *Firms was divided into financial leverage classes based on total debt-to-total assets and ranking tests were performed.*

[2] *The measure was calculated both as sales and pre-tax income variability.*

[3] *A negative relation was found when employing fixed assets-to-total assets as a measure of operating leverage. Using the DOL provided ambiguous results.*

[4] *Market betas were used as the dependent variable and the two leverage components were employed as independent variables.*

[5] *Risk measures such as the variability of unit output among others were used as dependent variables in different regression models, and combinations of the leverage components were employed as independent variables.*

Appendix B

Companies included in the sample

Table B1: Companies and their respective quotation list included in the manufacturing category

Company	*Quotation list*	*Company*	*Quotation list*
ABB	Large cap	*Nibe Industrier*	Mid cap
Alfa Laval	Large cap	*Nolato*	Mid cap
Artimplant	Small cap	*NovaCast Technologies*	Small cap
Assa Abloy	Large cap	*Opcon*	Small cap
AstraZeneca	Large cap	*Ortivus*	Small cap
Atlas Copco	Large cap	*PA Resources*	Mid cap
Autoliv	Large cap	*PartnerTech*	Small cap
Billerud	Mid cap	*PEAB*	Large cap
BioGaia	Small cap	*Precise Biometrics*	Small cap
Biolin Scientific	Small cap	*Pricer*	Small cap
Biotage	Small cap	*Probi*	Small cap
Boliden	Large cap	*ProfilGruppen*	Small cap
Cardo	Mid cap	*Q-Med*	Mid cap
CellaVision	Small cap	*Rottneros*	Small cap
Digital Vision	Small cap	*Rörvik Timber*	Small cap
Elanders	Small cap	*SAAB*	Large cap
Electrolux	Large cap	*Sandvik*	Large cap
Elekta	Large cap	*SCA*	Large cap
Elos	Small cap	*Scania*	Large cap
Ericsson	Large cap	*Seco Tools*	Large cap
Fagerhult	Mid cap	*SinterCast*	Small cap
Geveko	Small cap	*Skanska*	Large cap
Haldex	Mid cap	*SKF*	Large cap
Holmen	Large cap	*SSAB*	Large cap
Husqvarna	Large cap	*Svedbergs*	Small cap
Höganäs	Mid cap	*Swedish Match*	Large cap
Intellecta	Small cap	*Trelleborg*	Large cap
JM	Mid cap	*VBG Group*	Small cap
Lammhults Design Group	Small cap	*Volvo*	Large cap
Metro International	Small cap	*Xano*	Small cap
NCC	Large cap		

Table B2: Companies and their respective quotation list included in the service category

Company	*Quotation list*	*Company*	*Quotation list*
A-Com	Small cap	*MultiQ*	Small cap
Addnode	Small cap	*Novotek*	Small cap
Anoto Group	Small cap	*Phonera*	Small cap
Aspiro	Small cap	*Proact*	Small cap
Betsson	Mid cap	*RaySearch Laboratories*	Small cap
Cybercom Group	Small cap	*Sectra*	Small cap
Duroc	Small cap	*Securitas*	Large cap
Enea	Small cap	*Semcon*	Small cap
Feelgood	Small cap	*Sensys Traffic*	Small cap
Gunnebo	Mid cap	*Sigma*	Small cap
Intoi	Small cap	*SkiStar*	Mid cap
Know IT	Small cap	*Softronic*	Small cap
Modul 1 Data	Small cap	*Studsvik*	Small cap
MTG	Large cap	*Tele2*	Large cap

Table B3: Companies and their respective quotation list included in the retail category

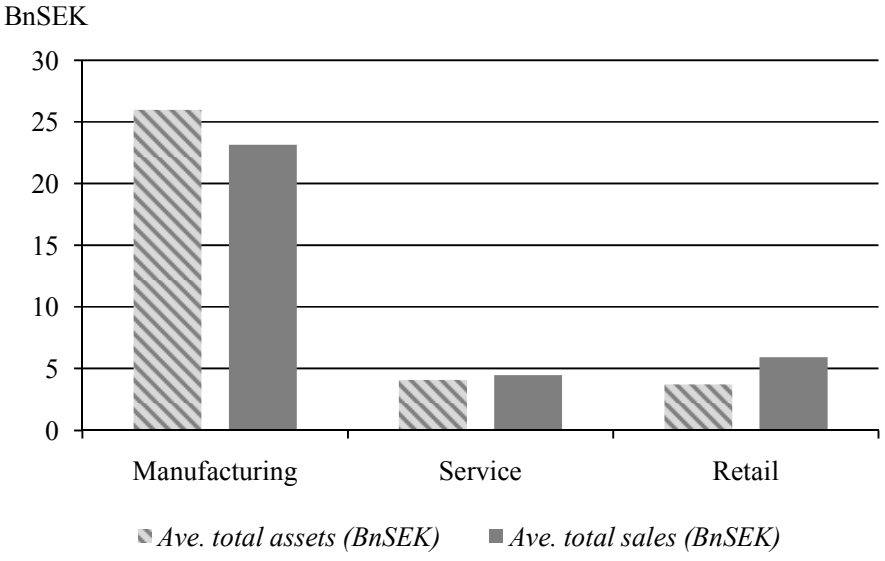
Company	*Quotation list*	*Company*	*Quotation list*
Axfood	Large cap	*Hemtex*	Small cap
B&B Tools	Mid cap	*Hennes & Mauritz*	Large cap
Beijer	Mid cap	*Hexagon*	Large cap
Beijer Alma	Mid cap	*Kabe*	Small cap
Bergs Timber	Small cap	*Lagercrantz Group*	Small cap
Bilia	Mid cap	*Malmbergs Elektriska*	Small cap
Bong Ljungdahl	Small cap	*Meda*	Large cap
Clas Ohlson	Mid cap	*Midsona*	Small cap
Consilium	Small cap	*Net Insight*	Mid cap
Diamyd Medical	Mid cap	*NetOnNet*	Small cap
Electra Gruppen	Small cap	*New Wave Group*	Mid cap
ElektronikGruppen	Small cap	*OEM International*	Small cap
Fenix Outdoor	Mid cap	*Oriflame*	Large cap
Getinge	Large cap	*Venue Retail Group*	Small cap

Appendix C

Industry categories and size

There are several common size definitions with assets and sales size being most commonly employed[36]. We sorted companies into portfolios based on both measures[37] and found that the manufacturing category distinguished itself from the other two categories based on both assets and sales. This is partly related to the Swedish market which is characterized by many large manufacturing and industrial companies while service and retail companies, with a few exceptions, are smaller. Also, manufacturing companies are normally more capital intensive, which in most cases brings with it a larger asset base for this category.

Chart C1: Industry categories and their respective levels of average total assets and average total sales



[36] Depending on the context of the study, market capitalization may also be used. However, when studying accounting variables, accounting based measures of size should be applied. Different size proxies may also be used interchangeably if they are strongly correlated (Shalit and Sankar 1977).

[37] The conventional way to measure size would be to take the logarithm of the nominal values (a method employed by Chen [2004] and Titman and Wessels [1988] among others) and use these values in the model. However, as size was to be used as a dummy variable, we created portfolios based on the two measures instead.

Appendix D
Correlations

Table D1: Correlations between the variables employed

	Financial leverage	***Operating leverage***	***$D_{Service}$***	***D_{Retail}***	***$D_{Service}$ • Op. leverage***	***D_{Retail} • Op. leverage***	***Sales variability***	***Cost of debt***
Financial leverage	1.00	–0.451**	–0.072*	0.114**	–0.103**	–0.012	–0.220**	0.277**
Operating leverage		1.00	0.401**	–0.121**	0.575**	0.090**	0.290**	–0.215**
$D_{Service}$			1.00	–0.315**	0.890**	–0.263**	0.207**	–0.163**
D_{Retail}				1.00	–0.280**	0.837**	–0.122**	0.016
$D_{Service}$ • *Op. leverage*					1.00	–0.234**	0.217**	–0.172**
D_{Retail} • *Op. leverage*						1.00	–0.036	–0.048
Sales variability							1.00	–0.054
Cost of debt								1.00

** Significant at the 5 percent level. ** Significant at the 1 percent level.*

Appendix E
Robustness tests

Table E1: Model 2 – Random subsample of 70 percent of the entire sample

Variable	*Estimated coefficient*	*t-statistic*	R^2 *(Adj.* R^2*)*
Constant (β_0)	0.545*	33.907	32.3 % (31.7 %)
Operating leverage (β_1)	–0.399*	–13.402	
$D_{Service}$ (β_2)	–0.075*	–2.539	
D_{Retail} (β_3)	0.015	0.563	
$D_{Service}$ • *Operating leverage* (β_4)	0.302*	6.152	
D_{Retail} • *Operating leverage* (β_5)	0.054	0.832	
Sales variability (β_6)	–0.026*	–3.389	
Cost of debt (β_7)	2.815*	8.156	

** Significant at the 5 percent level.*

Table E2a: Model 2 – Entire sample covering the period from 2000 to 2004

Variable	*Estimated coefficient*	*t-statistic*	R^2 *(Adj.* R^2*)*
Constant (β_0)	0.528*	27.910	37.4 % (36.6 %)
Operating leverage (β_1)	–0.391*	–12.177	
$D_{Service}$ (β_2)	–0.069*	–1.962	
D_{Retail} (β_3)	0.039	1.349	
$D_{Service}$ • *Operating leverage* (β_4)	0.354*	6.268	
D_{Retail} • *Operating leverage* (β_5)	0.059	0.821	
Sales variability (β_6)	–0.053*	–4.479	
Cost of debt (β_7)	2.510*	6.599	

** Significant at the 5 percent level.*

Table E2b: Model 2 – Entire sample covering the period from 2005 to 2009

Variable	*Estimated coefficient*	*t-statistic*	R^2 *(Adj.* R^2*)*
Constant (β_0)	0.564*	29.432	26.9 % (26.0 %)
Operating leverage (β_1)	–0.387*	–9.946	
$D_{Service}$ (β_2)	–0.066	–1.754	
D_{Retail} (β_3)	0.004	0.111	
$D_{Service}$ • *Operating leverage* (β_4)	0.241*	3.711	
D_{Retail} • *Operating leverage* (β_5)	0.094	1.161	
Sales variability (β_6)	–0.017*	–2.016	
Cost of debt (β_7)	2.654*	5.884	

** Significant at the 5 percent level.*