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Does target firm risk differ depending on the gender of the acquiring firm's CEO?

A statistical study of mergers and acquisitions and risk associated with target firms

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Abstract

This study aims to examine the relationship between the gender of the CEO and target firm risk in mergers and acquisitions (M&A) in Sweden. Previous research has shown that there may be differences in risk attitudes and behavior between men and women, which could affect their decision-making processes in M&A transactions. However, little research has focused on the relationship between CEO gender and target firm risk in M&A. The study aims to answer the question: Does target firm risk differ depending on the gender of the acquiring firm's CEO? The study found that female CEOs acquire companies with lower default risk, as indicated by higher Altman Z-scores, while male CEOs acquire companies with higher solvency and cash ratios. These conflicting results suggest that it is unclear whether female CEOs are more risk-averse than male CEOs when comparing risk-taking incentives associated with M&A transactions. The study contributes to the existing literature by providing a new perspective on the relationship between CEO gender and target firm risk within M&A transactions.

Keywords: Chief Executive Officer, Gender, Mergers and Acquisitions, Risk aversion

Acknowledgements

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1 Introduction

During the last two decades, females represented as Chief Executive Officer in Sweden have more than doubled. Today, the share of female executives with companies that are members of the Confederation of Swedish Enterprise corresponds to 41% of all CEO positions (Svenskt Näringsliv, 2022). With the increase of female executives, literature has continued to explore the implication of a more diverse business industry. Whether or not there are differences between male and female leaders is yet a question to be answered. Research has shown disparities in male and female attitudes toward risk, with some studies finding that men are more risk tolerant than women and others finding that variables such as marital status and opportunity set play a role in risk-taking behavior. Recent research has also explored the impact of gender on risk-taking within corporate governance and found that, in contrast to the general population, female board members are more prone to taking risks than their male counterparts. It has also been observed that a diverse board does not necessarily lead to increased risk aversion within a company.

There is always a certain level of risk involved when buying a company. As the corporation's primary decision-maker, the CEO is closely associated with the risk taken in the acquisition. Despite previous studies aimed to identify common characteristics among male and female leaders, the results vary. In addition, there is a lack of research on the topic of gender and risk aversion in the context of mergers and acquisitions. Given the continuously growing number of female CEOs, it is of interest to examine gender-related risk aversion in relation to corporate M&A transactions.

A growing body of research suggests that men and women may exhibit different risk attitudes and behavior, which could affect their decision-making processes in mergers and acquisitions. By examining the relationship between CEO gender and target firm risk in M&A transactions in Sweden, this study investigates whether the degree of risk aversion differs between male and female CEOs. The study tries to answer the question:

Does target firm risk differ depending on the gender of the acquiring firm's CEO?

The study found that female CEOs tend to acquire companies with lower default risk, as indicated by higher Altman Z-scores. On the other hand, male CEOs tend to acquire companies with higher solvency and cash ratios. These conflicting results suggest that it is unclear whether female CEOs are more risk-averse than male CEOs when comparing risk-taking incentives associated with M&A transactions.

Previous research on risk aversion between the sexes within businesses has primarily focused on structural differences in corporate governance and the valuation of companies. Furthermore, prior research has investigated the relationship between risk within a company and the gender of its CEO. To our knowledge, no previous work has examined the relationship between the gender of the CEO and the risk associated with the company acquired. This paper will examine differences in risk aversion between genders in the CEO role based on business acquisitions - specifically, measuring risk in the target company. This field of study has a broad previous research background; however, this paper explores a new perspective. Thus, this study aims to contribute with a new viewpoint of risk aversion between the sexes in the corporate world.

Furthermore, this study will be delimited geographically, temporally, and with data. The geographical demarcation takes place in that it will focus on acquisitions of companies in Sweden. The temporal delimitation exists for a given period. Additionally, this study excludes M&A transactions where the acquiring company acquires less than a 100% stake, and companies without sufficient financial data.

The study will initially introduce the reader to the subject area and present the essay's purpose, question, research contribution, and scope. The reader is then introduced to the theory and previous research that forms the basis of the study and makes it possible to compare and evaluate differences and similarities, respectively. Then a regression analysis will be carried out. The econometric study will test various regressions based on risk variables. The results from the regressions will be presented, and the hypothesis will be tested. This is presented in tables and diagrams and then analysed and discussed in the following section using the theoretical framework and previous research. Finally, the study will present the analysis and conclusions that emerged from the results. The paper will then conclude with a presentation of approaches to improve the study and present suggestions for future research.

2 Theory and early research

2.1 Risk Aversion

Risk aversion is an economic agent's preference for certainty over uncertainty and the tendency to avoid risk. Regarding investments, the term risk-averse describes an investor who prefers the preservation of capital over the potential of a higher return. Therefore, an investor tolerating more risk is less risk averse.

2.2 Merger and Acquisitions

Mergers and acquisitions (M&A) allow companies to explore new markets or product spaces (Marks & Mirvis, 2011). Another reason for doing M&A is to pursue a new strategy that otherwise could be seen as too risky, costly, or technologically advanced. Furthermore, these kinds of deals could also be opportunistic where, for example, a competitor struggles and seeks a savior. According to the authors, the reason behind an M&A deal could also be to protect market shares in a declining industry (Marks & Mirvis, 2011). Overall, the main reason for pursuing an M&A transaction is to achieve strategic goals quickly and advantageously compared to when a company is acting solely (Haspeslagh & Jamison, 1991).

When buying a company, the acquirer must account for strategy, scouting, assessing and selecting a partner, deal-making, and eventually preparing for a combination of these (Marks & Mirvis, 2011). Usually, the acquirers' approach toward a deal is too focused on the financial aspect of the deal. The acquiring company is primarily concerned with the target company's value, the deal's structure, and the premium to pay for the target company. According to Marks and Mirvis, successful M&A transactions also consider the financial aspect and add careful attention to questions regarding the fitness of the target company.

2.3 Role of the CEO

The Chief Executive Officer (CEO) has the highest executive role in a company. The primary activity of the CEO is to decide on major corporate decisions and overall managing of the company and its resources. The CEO is also responsible for communicating with the company's board of directors and corporate operations.

A frequently discussed topic in previous research is whether the CEO or the CFO controls mergers and acquisitions. According to Graham et al. (2013), the principal corporate decision-maker is the CEO. Additionally, in earlier research conducted by the authors, they refer to the CEO as the most influential regarding M&A and capital structure (Graham et al., 2013). Furthermore, the authors

present that more risk-tolerant CEOs initiate more M&A transactions than less risk-tolerant ones. They also found evidence that optimistic CEOs use more short-term debt than less optimistic CEOs. In addition, Graham et al. (2013) found that firms with high historical or future growth rates tend to be run by risk-tolerant and younger CEOs. Conclusively, the authors further found a significant relationship between the company's actions and the characteristics of the CEO.

In a later study by Graham et al. (2015), the authors investigated to which degree CEOs delegate financial decisions. They researched five areas regarding corporate decisions, whereas mergers and acquisitions were one of them. In the study, the authors found that CEOs are least likely to delegate the decision-making of M&A. In contrast, the CEO is more likely to delegate minor investment decisions, and capital allocation since the CEO needs internal informational input. Additionally, the CEO of firms that recently have completed multiple M&A deals is more presumably to delegate decisions concerning capital allocation to others. Research conducted by others also provides similar results. For example, Harris and Raviv (2005) argue that the CEO has a dominant role in acquisitions and should not delegate the acquisition decision to lower-level managers. Furthermore, Aghion and Tirole (1997) assert that long-term projects with external effects, such as mergers and acquisitions, are less likely to be delegated.

2.4 Early Research

Research on differences in risk attitudes between men and women has been conducted regarding individual economic decision-making and decisions in groups and organisations. For example, Barsky et al. (1997) constructed a survey to measure risk aversion involving gambles over a lifetime of income. The Authors aimed to specify differences between different sample populations and estimate their respective risk tolerance, the elasticity of intertemporal substitution, and time preference. The survey was measured by a set of questions, ranking people into four risk-preference categories. The report concludes that there is a statistically significant difference in risk tolerance by sex. Males are reported to tolerate more risk than females; however, the authors point out that the most significant difference is that males tend to choose the riskiest option among the questions. The line of questioning in this survey was asked to understand how much compensation an individual would need to switch to an equally satisfying job. However, since it might be hard for individuals to interpret such a question correctly and reasonably, weighting in social costs, the results from this survey might only partially represent risk aversion, as the authors desired. The tendency to value not changing jobs, i.e., status quo bias in this context, could appear among the sample. Consequently, the established results might not accurately represent risk aversion

compared between the sexes since other factors than risk are considered when answering the author's questions.

In a similar study, Sundén and Surette (1998) researched risk preferences associated with gender. Unlike Barsky et al. (1997), risk aversion in this context was measured by looking at pension savings data. The results, however, are similar, and the authors likewise claim that there is a relationship between gender and risk aversion. The authors also highlight that this relationship is more complex than they thought. For example, marital status substantially affects an individual's degree of risk aversion. Previous research has shown that the level of education affects an individual's risk-taking behavior; see Bernheim and Garrett (1996). Sundén and Surette controlled their regression with the educational level of individuals within the sample; regardless, the authors argue that marital status severely affects risk aversion. To further investigate risk aversion in the context of gender-specific preferences, Schubert et al. (1999) concluded the lack of gender-specific differences in risk aversion when controlling for individuals' opportunity set. The authors believe that gender-specific observations from previous research could be due to structural differences between men and women. With these variables controlled, they could not find a significant difference in risk proclivity between men and women.

In addition to investigating general differences in risk attitudes between men and women, research on gender-specific risk preferences has also explored whether men and women exhibit different behavior when working in groups. This line of inquiry aims to understand better how gender may influence risk-related decision-making in group settings. For instance, Ertac and Gurdal (2012) sought to determine how risk propensity between men and women is connected to a group. The results displayed how female leaders within the sample took an equal amount of risk when deciding for the group instead for themselves. On the other hand, male leaders in the sample took more risks on the group's behalf than when making decisions for themselves. The study was conducted by first asking questions about individual preferences. Then participants were asked if they could make new decisions on behalf of the group. The authors present how 86% of the men within the study are willing to make decisions for the group, while only 55% of women could imagine doing the same. Following this result, the authors present a possible criticism of their results. Self-selection bias could lead to skewed results; thus, the main point that males who lead a group take on more risk on behalf of the group might need to be revised. Also, the authors point out how the sample of women is not large enough to make accurate statements about personality traits and leadership.

A different view of risk aversion in the context of groups is considered by Adams and Funk (2012). Unlike Ertac and Gurdal (2012), the authors investigated male and female risk propensities within corporate boards. The authors conducted a survey targeted at Swedish governing boards. They argued that Sweden was an ideal country to investigate since there are many similarities with, for example, American, British, and German governing boards. The survey consisted of questions aimed at measuring values as in Schwartz (1992): security, power, benevolence, et cetera. Consistent with previous research, it is observed how female leaders are generally more benevolent and less power-oriented; see also Barnett and Karson (1989). It is also presented how systematic core values and risk propensity differ between men and women on company boards. However, the results do not reflect observations from the general population. Female board members are observed to be more risk-loving than their male counterparts. According to Adams and Funk, this result is new and surprising. The authors then continue the paper by presenting the potential pitfalls of the study. For example, they note how the demographics within the sample differ between men and women. The possible problems are then controlled in an additional regression with variables such as age, board size, family composition, and more. Still, the authors claim that their results are statistically significant and suggest that female board members are less risk-averse than male coequals.

A more specific field of study conducted by Faccio et al. (2016) aimed to examine structural risk differences between male and female CEOs. The authors investigated the relationship between CEO gender and corporate risk-taking choices. The authors conducted a statistical regression on private and publicly traded European companies. Furthermore, the study performed by the authors found a significant relationship between risk-taking and the CEO's gender. For instance, the authors found that companies run by a female CEO tend to carry lower leverage than male CEOs. Also, the authors found that companies with a female CEO tend to have a lower probability of default than companies supervised by male CEOs.

2.5 Hypothesis

This study aims to measure the relationship between CEO gender and risk associated with the target company in M&A transactions. To investigate this relationship, we will use the following working hypothesis:

M&A target company risk does not depend on the CEO gender of the acquiring company.

3 Data

3.1 Data collection

The data have primarily been collected from the databases Zephyr and Retriever Business (Retriever-info.com, 2022; Bvdinfo.com, 2022). Zephyr is a globally comprehensive database offering detailed company information, where Mergers and acquisitions transactions are the primary focus. In the paper, Zephyr has been used to collect data on M&A deals for Swedish companies.

Accordingly, the data were categorized into Swedish companies that made a complete acquisition from 2015 through 2022. The categorization implies that both the target- and acquiring companies are registered in Sweden. The data was narrowed only to include acquisitions where the acquiring company bought 100% of the target company. This was done to ensure that all observations had similar conditions. The data from Zephyr contain both public and private companies. Furthermore, the database was used to obtain the organization number for the companies. It provided the paper with the necessary data regarding the M&A transactions made by the companies during the period. In order to verify the accuracy of the data from Zephyr regarding Swedish companies and transactions, it was necessary to compare it to the data from Retriever Business, a database maintained by Retriever that contains information on both public and private companies over the past 20 years.

The database Retriever Business provided the majority of the data used in this paper. As mentioned, data was collected from 2015 to 2022 and included information about the acquiring company's CEO, financial data on the target company, and the names of the acquiring and target companies. The CEO data included the appointment date, gender, and name, but the gender information was not always accurate. To ensure the accuracy of the CEO gender data, we had to review each company manually and gather missing information from annual reports and articles. This manual process, along with the incomplete gender data provided by Retriever, resulted in a more extensive and accurate sample size.

Furthermore, Retriever Business provided the financial data for calculating risk parameters such as liquidity, debt, and cash holdings. This data was collected for the target company in the year the transaction took place and was used to create "scores" that reflect the riskiness of acquisitions made by CEOs of different genders. By combining the financial data of the target company and the gender of the CEO of the acquiring company, we can analyse the impact of gender on the riskiness of acquisitions. This approach allows us to determine whether acquisitions made by male or female CEOs differ in riskiness and to what extent these differences may correlate to gender. By analysing

the data, we can better understand the role that gender plays in the decision-making process of CEOs in M&A transactions. This will allow us to determine how corporate decisions may be influenced by gender. By studying this relationship, we can understand how gender may impact the risk aversion associated with M&A transactions.

Furthermore, we had to exclude data from companies that lacked the necessary information regarding the risk proxies we analysed. As an example, a number of target companies lacked data on certain balance sheet items that were necessary to analyse risk within the transaction. Also, some companies were not identifiable in Retriever by their organization number. Additionally, we delimited the study only to include observations representative of the population we are trying to measure. The population we want to study consists of CEOs in "normal" companies, which we define as companies that sell products or services and operate independently. However, some company groups have complex relationships between their parent company and subsidiary, with the subsidiary often selling products while the parent company holds assets. If a parent company were to acquire its subsidiary, our data would include observations, not representative of the population we are studying, making it difficult to make statements about the question of interest accurately. As a result of all delimitations in the data-collecting process, the number of observations was reduced from 1153 to 857.

This study aims to compare the risk aversion of female and male CEOs using an econometric test called Ordinary Least Squares (OLS) regression. We will measure risk by analysing M&A transactions and measuring risk in the target company. We are interested in looking at the risk involved in the acquiring company's M&A transactions. Since our data is cross-sectional, we will use linear regression to test our hypothesis. To measure risk, we will use proxies such as Altman's Z-score, solvency ratio, and cash ratio.

3.2 Proxy for Risk

3.2.1 Solvency Ratio

Financial ratios and their risk association is a subject frequently emphasized to be of great importance by financial literature (Robinson, 2020). According to Robinson, five categories are essential when evaluating the likelihood of financial distress in a company: activity, profitability, solvency, valuation, and liquidity. The solvency ratio can measure company risk and describes a company's ability to meet long-term obligations (Robinson, 2020). The solvency ratio can also be interpreted as a company's long-term debt ratio.

According to Faccio et al. (2016), the riskiness of a company's financing can be measured by leverage, where high leverage would imply a low solvency ratio. The authors argue that firms with a lower solvency ratio would have a more considerable negative impact on the company's net profitability from a negative shock in a firm's underlying business compared to a company with higher solvency levels. Furthermore, a shock's enlarged negative impact contributes to an increased probability of default.

Traczynski (2017) conducted a study where 15 different parameters were used to predict companies' default risk. Of 15 risk measurements, only two parameters were significant, whereas one was leverage. Since leverage and solvency are negatively correlated, the solvency ratio could be used to predict default risk. Additionally, Ohlson (1980) showed that increased leverage levels remarkably affect the possibility of firm bankruptcy. Cathcart et al. (2020) showed similar results as Ohlson, a negative correlation between the solvency ratio and the probability of default. In line with previous research, the solvency ratio is defined as:

$$Solvency\ ratio\ = \frac{Total\ Equity}{Total\ Assets}$$

3.2.2 Cash Ratio

Robinson (2020) define the cash ratio as a liquidity measurement. The purpose of a liquidity ratio is to measure whether a company can meet its short-term obligations. Furthermore, the cash ratio is a reliable measure of an entity's liquidity overall, especially in a crisis. The ratio of cash over current liabilities is a measurement and indicator of company risk frequently used in prior research (Tosun et al., 2022; Liu & Mauer, 2011; Chava & Purnanandam, 2010).

Tosun et al. (2022) studied the relationship between lower cash holding levels and a CEO's attitude toward risk. The authors found that overconfident CEOs tend to retain lower cash holdings, which implies a higher company risk due to the lower level of liquidity. Moreover, Tosun et al. (2022) argue that the cash ratio is closely related to a company's bankruptcy risk, where more extensive cash holdings reduce risk.

Liu and Mauer (2011) found that Vega[1] positively affects a firm's cash holdings. In other words, the positive relationship between the two refers to companies with risk-increasing compensation inducements for the firm's CEO to affect the firm's cash holding positively. The increased risk

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[1] Measure of CEO risk taking incentives

caused by Vega could generate higher external funding costs for the firm. According to the authors, the increased funding costs give the company incentives to hedge for future funding needs, which could explain the positive relationship between cash and risk since firms with higher risk might hold more excess cash. On the contrary, another perspective on incentives for CEOs is shown by Chava and Purnanandam (2010). The authors present an opposite relationship compared to the previous article. The foundation in the two articles is similar, where both studies describe an ability to reduce risk with cash. However, Chava and Purnanandam (2010) found that risk-decreasing CEO incentives increase cash holdings. According to the authors, enlarged cash holdings reduce risk, a consequence of direct incentives imposed to reduce risk. Based on prior research, the cash ratio will be defined as follows:

$$Cash\ ratio\ = \frac{Cash + Cash\ equivalents}{Current\ liabilities}$$

3.2.3 Altman Z-score

In the late 1960s, Altman (1968) introduces a new formula to predict a firm's default probability. Altman defined the Z-score as a linear combination, a customization of Fishers' (1936) discriminant analysis technique, of five financial ratios weighted by coefficients. The financial ratios are multiples from the income statement and the balance sheet, where the formula weights a company's activity, profitability, liquidity, solvency, and leverage. Altman Z-score is defined as:

$$Z\ =\ 1.2X_1\ +\ 1.4X_2\ +\ 3.3X_3\ +\ 0.6X_4\ +\ X_5$$

Note: Variables of Altman Z-score; X_1 = Working Capital/ Total assets, X_2 = Retained Earnings / Total Assets, X_3 = EBIT[2]/ Total Assets, X_4 = Market Value of Equity / Total Assets, X_5= Sales / Total Assets

Altman (1968) classified three different zones, which were "safe," "grey," and "distress," where the "safe" zone indicated a Z-score over 2.99, the distress zone was under 1.81, and the "grey" zone is in-between the other two. In other words, a higher Z-score indicates a lower probability of default, thus, lower risk. In the paper, the Z-score will use the book value of equity instead of market value of equity. Using the book value- instead of the market value of equity is essential since our dataset contains privately owned companies; thus, market values do not exist. For this reason, we used the

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[2] Earnings Before Interest and Taxes

book value to give private and public companies a variable. The variables that will be used in this paper are summarised in the table below:

Table 3.1	List of Variables	
Variables	Definition	Source
Altman Z-Score	A score of five financial ratios with total assets in the denominator and other financial measurements in the nominator	Retriever
Solvency	Ratio of total equity over total assets	Retriever
Cash	Ratio of cash and cash equivalents over current liabilities	Retriever
Female dummy	Dummy variable that equals 1 for Female CEO and 0 otherwise	Retriever
LN(Sales)	Natural logarithm of total Sales (SEK)	Retriever
ROA	Ratio of total equity over total assets	Retriever
Year	Dummy variable that indicates the year of the transaction for the period 2015-2022	Retriever
Industry	Dummy variable that indicates a specific industry for six different industries	Retriever

4 Methodology

4.1 Statistical regression

An econometric test using Ordinary Least Squares (OLS) regression will investigate the difference in risk aversion between female and male CEOs, where the level of risk aversion is measured by the risk associated with the acquired company. The hypothesis will be examined and tested with a linear regression since the data is cross-sectional. Proxies such as Altman's Z-score, solvency ratio, and cash ratio will be examined to measure risk. These proxies were selected to provide a comprehensive risk assessment between the two groups. Explanatory variables will be used to identify the factors affecting the dependent variable, risk.

The risk proxies are used to measure risk in the target company. In order to examine whether there are differences in risk aversion between male and female CEOs, we constructed a dummy variable for the acquiring company's gender CEO. In this model, we will assign a value of one to female CEOs and a value of zero to male CEOs in order to investigate the relationship between the CEO's gender and risk aversion. If the female dummy variable positively affects the dependent variable, i.e., Altman Z-score, Solvency- and Cash ratio, it suggests that female CEOs are more risk-averse than male CEOs.

It is necessary to control for other variables affecting a company's risk. Company size plays a role in determining a company's risk profile. Traditionally, total assets have been used as a measure of company size in research. However, a recent study by Yulianto (2022) has found that total sales may be a more accurate proxy for company size. In this model, we will use the natural logarithm of sales as a proxy for the acquired company's size to better understand the relationship between size and risk. Aligned with Faccio et al. (2016), controlling for size is essential when conducting a regression examining risk associated with a company.

The regression will also include a measurement of profitability as an explanatory variable since a company's profitability plays an important role when determining the risk associated with a company. In this study, Return on Assets will be used to measure the acquired company's profitability. Faccio et al. (2016) conducted a study where they examined if a CEO's gender impacted the risk-taking in a company. They found that Return on Assets (ROA) significantly affects companies' risk. Therefore, it is essential to describe the risk associated with the target company with a profitability measurement such as ROA.

The industry in which a company operates could also be an unobserved factor influencing the company's risk-taking behavior and the gender of its CEO. It could be challenging to disentangle these effects without controlling for the industry in the analysis. It will be critical to evaluate the potential influence of industry and other confounding variables when analysing the relationship between CEO gender and risk-taking to accurately assess the relationship between these two variables. We will also include the year of the transaction as a dummy variable in the regression. These variables will be used to control for the specific industry for the target company and the year the transaction took place. To control the industry in our analysis, we use SNI codes assigned to every company in Sweden and allowing us to categorize our sample into six different industries (see table A.1). Decisively, the final regressions to be used are the following, where risk will be replaced with the three different risk proxies:

$$Risk = \beta + \beta(ROA) + \beta(LN(SALES)) + \beta(GENDER) + \beta(INDUSTRY) + \beta(YEAR)$$

To ensure that appropriate standard errors are used in the regression, we conducted a Breush-Pagan test to check for heteroskedasticity (see table A.2). The test showed that there was heteroskedasticity present in two of the regressions, Solvency- and Cash ratio. Because of this, we were required to run these regressions with robust standard errors. Robust standard errors are an alternative to standard errors designed to provide correct inference. They can help ensure that our results are more reliable and accurate. Furthermore, the regressions were tested to investigate the degree of multicollinearity associated with the model. If the explanatory variables have a high correlation, this will indicate the presence of multicollinearity in the model. Multicollinearity in the regression will show high values of the R-squared, high values of the standard errors, and low t-values. To account for this, we performed an informal VIF test to see the extent of multicollinearity in our model. The rule of thumb is that VIF values below 10 refer to an unproblematic level of multicollinearity (Verbeek, 2017). The test results are reported in the appendix (see table A.3).

5 Results

5.1 Descriptive statistics

Table over descriptive statistics for the observations. The table includes the number of observations (No. obs.), mean (Mean), Standard deviation (Std. dev.), minimum value (Min), maximum value (Max), and the median (Median). The first section shows statistics for male CEOs, the second for female CEOs, and the last section shows the total statistics for the sample. Variables are defined in table 3.1.

Table 5.1	Descriptive statistics						
Gender	Variable	Mean	No. obs.	Std. dev.	Min	Max	Median
	Altman	4.17	789	1.82	-0.621	12.1	4.07
	Solvency ratio	0.518	789	0.213	0.009	0.99	0.518
Male	Cash ratio	3.03	789	4.87	0.014	56.7	1.87
	LN(Sales)	17.2	789	1.44	8.29	21.8	17.3
	ROA	27.1	789	21	-12.4	99.4	23.3
	Altman	4.91	68	2.51	-0.945	13	4.98
	Solvency ratio	0.49	68	0.249	0.015	0.94	0.526
Female	Cash ratio	2.75	68	2.72	0.057	15.8	1.92
	LN(Sales)	16.5	68	1.82	12.3	22.3	16.3
	ROA	31.3	68	28.4	-12	126	29.5
	Altman	4.23	857	1.9	-0.945	13	4.25
	Solvency ratio	0.516	857	0.216	0.009	0.99	0.512
Total	Cash ratio	3.01	857	4.73	0.014	56.7	1.85
	LN(Sales)	17.1	857	1.49	8.29	22.3	17.3
	ROA	27.5	857	21.7	-12.4	126	25.9

Table 5.1[3] presents descriptive statistics for the variables used in the regressions. The table shows a total of 857 M&A transactions, whereas 68 (7.9%) are represented by female CEOs. The total observations had an average Altman score of 4.23, and the mean value for the Solvency ratio was 0.516. Furthermore, the mean of the Cash ratio was 3.01. When comparing Altman Z-score between genders, there is a difference indicating that female CEOs acquire companies with higher Z-scores on average. The reported mean for female CEOs was 4.91, whereas the mean for male CEOs was 4.17, which stipulates a higher mean Z-score of 18 % for female CEOs. A T-test was conducted to compare the means of the Altman scores between males and females, and the results show that females have significantly higher Altman scores than males (see table A.4).

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[3] Stata is used as the statistical software in this paper

On the contrary, the data shows that male CEOs, on average acquired companies with higher mean Solvency- and Cash ratios than female CEOs. The mean Solvency ratio associated with male CEOs was 0.518, while the average for female CEOs was 0.49. The difference between the two indicates that male CEOs acquire companies with solvency ratios that are higher. A T-test was conducted to compare the means between males and females, but the results did not reveal a significant difference between the two genders. This suggests no statistically significant difference in the measured variable between males and females (see table A.4).

About the Cash ratio, male CEOs are associated with higher values on average than female CEOs. The mean cash ratio for males was 3.03, while females acquired companies with an average cash ratio of 2.75. Again, a T-test suggests no significant difference between the two genders.

The observations belong to six different industry categories (table A.1). The most prominent industry is Construction and Manufacturing, with 280 observations, corresponding to a share of 32.7% of total observations. The least represented industry is Real estate and Property management, with 60 observations corresponding to 7% of total observations. When comparing the different industries, the highest share of female CEOs can be seen in Business services which corresponds to 25 women and a share of 15.4 % of the total observations within the industry. The industry with the lowest number of female CEOs is Real estate and property management, where the number of females is 3. The industry with the lowest share of female CEOs is Construction and Manufacturing, where female CEOs correspond to 3.9% of the total observations.

5.2 Main regression

Table 5.2	Main regression		
Variables	Altman	Solvency ratio	Cash Ratio
	(1)	(2)	(3)
LN(Sales)	0.0922***	-0.0329***	-0.781***
	(0.0342)	(0.00548)	(0.203)
ROA	0.0565***	0.00384***	0.0189***
	(0.00232)	(0.000317)	(0.00715)
Female dummy	0.617***	-0.0575*	-1.076**
	(0.185)	(0.0294)	(0.508)
2016	-0.0595	0.00721	0.504
	(0.187)	(0.0271)	(0.680)
2017	0.0118	-0.0198	0.0132
	(0.182)	(0.0259)	(0.645)
2018	0.0646	0.00161	-0.155
	(0.186)	(0.0269)	(0.573)
2019	0.129	0.0253	-0.287
	(0.201)	(0.0283)	(0.559)
2020	-0.136	0.00582	0.0471
	(0.226)	(0.0316)	(0.791)
2021	-0.00753	0.0436	0.488
	(0.199)	(0.0271)	(0.699)
2022	-0.112	0.0723**	-0.305
	(0.267)	(0.0347)	(0.599)
Industry (2)	0.477***	0.0287	-0.778
	(0.145)	(0.0188)	(0.522)
Industry (3)	0.515***	0.00144	-0.434
	(0.173)	(0.0232)	(0.663)
Industry (4)	-0.188	-0.0425*	-1.057
	(0.178)	(0.0244)	(0.645)
Industry (5)	-0.493**	-0.0431	-0.282
	(0.218)	(0.0354)	(0.988)
Industry (6)	0.380**	0.0616**	-0.282
	(0.172)	(0.0242)	(0.621)
Constant	0.822	0.957***	16.39***
	(0.616)	(0.102)	(3.912)
Observations	857	857	857
R-squared	0.452	0.234	0.083

Note: The table shows the results from the three main regressions. The table presents the coefficients and the standard errors, where the standard errors can be seen with parentheses. The standard errors for regressions 2 and 3 are robust due to the heteroscedasticity indicated by the Breusch-Pagan-Test. There were no signs of heteroscedasticity in the first regression, and the standard errors remained normal.

*** Significance on 1%-level, ** significance on 5%-level, * significance on 10%-level.

In order to test the hypothesis, it was necessary to conduct three regressions (Table 5.2). The regressions had Altman Z-score, Solvency ratio, and Cash ratio as dependent variables. The dependent variables were run with LN(Sales), ROA, Female dummy, Industry (dummy) and Year (dummy) as independent variables. The first regression ran Altman Z-score on the controlling variables.

The coefficient for the female group was 0.617, significant on a 1%-level. The regression indicates that companies acquired by female CEOs have an Altman Z-score 0.617 larger than target companies acquired by male CEOs. With a p-value of 0.1%, the data demonstrate that female CEOs acquire companies with higher Altman Z-scores than male CEOs. Furthermore, this result suggests that female CEOs tend to acquire companies with lower default risk, as indicated by the Altman score. According to this result, female CEOs are more risk-averse than male CEOs regarding Altman Z-score. This result contradicts research conducted by Adams and Funk (2012). The authors found results suggesting that female CEOs take more risks than males in the same role. However, previous research by Barsky et al. (1997) showed that females tend to be more risk-averse, which is consistent with the result if the Altman Z-score is interpreted as a measure of risk aversion. Additionally, the result from the regression is supported by the study conducted by Faccio et al. (2016), where the authors suggest that companies with female CEOs tend to have a lower probability of default.

In the second regression, the dependent variable Solvency ratio is run with the controlling variables. The regression yielded a contradictory result compared to the first regression, which showed a coefficient of -0.058 and a P-value of 5.1%. The results imply that male CEOs acquire companies with higher solvency ratios, suggesting that male CEOs are more risk-averse than female CEOs. The data imply that females are more risk tolerant according to the Solvency ratio than their male counterparts. The result from the regression is in line with previous research since this test implies similar results as Adams and Funk (2012), where the authors argue that female tends to be more risk loving. Sundén and Surette (1998) found a difference between the two genders: females are more risk-averse than males. Aligned with Sundén and Surette (1998), Faccio et al. (2016) also provide support contrary to the results of the regression. The authors found that companies run by male CEOs have higher leverage ratios than females, implying lower solvency ratios.

Lastly, the third regression tested the dependent variable Cash ratio on the controlling variables. Equivalent to the second regression, the results indicated that male CEOs tend to be more risk-averse when running a regression on the Cash ratio. The regression reported a coefficient of -1.076 and a p-value of 3.4%. Our data suggest a difference between the genders where male CEOs tend

to acquire companies with higher cash ratios compared to females. Accordingly, the results show that male CEOs are more risk-averse than females in this context. Similar to the second regression, this result demonstrates similarities and disparities to previous research conducted by Sundén and Surette (1998) and Adams and Funk (2012).

5.3 Analysis

To answer the question of interest, we conclude that gender affects the target company risk associated with mergers and acquisitions. Nevertheless, we cannot make an upfront statement on whether female CEOs are more risk-averse than their male counterparts. This is because our data shows that females are more risk-averse when evaluated using a Altman Z-score, while males are more risk-averse when evaluated using Solvency- and Cash ratio as dependent variables.

However, compelling findings can still provide valuable insights into the risk differences between male and female CEOs. To understand why the Altman Z-score is higher for female CEOs, it is helpful to analyse the structural parts of the measurement and see what differs between the two groups (see table A.5). The financial measurement of Sales to Assets, also called asset turnover ratio, has a coefficient of 0.745*** for the female group. This suggests that females tend to acquire companies with a higher asset turnover ratio, which portrays a company's efficiency in using its assets to generate revenue.

Consistent with previous research, our study provides similar conclusions to Faccio et al. (2016). They found that companies with female CEOs have a lower risk of bankruptcy. Our study supports these findings as the Altman Z-score, used to measure a company's risk of default at a specific point in time, aligns with previous findings. It is worth noting that Faccio et al. arrived at their conclusions after analysing different companies' financial performance over five years, thus making their results more robust.

Previous literature has also looked at risk behavior associated with females in Swedish corporate boards. Adams and Funk (2012) conclude that females in Swedish corporate boards are more risk-loving than their male counterparts. This statement aligns with our findings if we assume that solvency- and cash ratio define enterprise risk. However, it might be optimistic to draw these conclusions. First, the mean value of the Solvency ratio of acquired companies differs between male and female CEOs; however, it must be noted how slight the difference is. Even though a significant coefficient, the difference in Solvency ratio associated with male and female CEOs might be too small to provide information on whether there are differences in risk aversion

between genders. Secondly, a solvency ratio between 0.4 and 0.6 is generally considered good. There is no further point to be made about general risk aversion when the difference between male and female CEOs associated with the Solvency ratio in the data is this small. The same reasoning can be pointed out about the Cash ratio. A cash ratio above one means that a company has sufficient cash to pay its short-term debt; thus, anything above this is generally considered good. Since male and female CEOs in our dataset are associated with Cash ratios close to three on average, it is not apparent if this can provide information to the question of interest (see also t-tests in table A.4).

In this study, there are potential areas for improvement. Specifically, better data would improve the statistical analysis, and more precise conclusions could be made to the question of interest. Firstly, even though data is collected between 2015 and 2022, our sample only provides 68 female CEOs. We initially hypothesized that only acquisitions of 100% would be suitable for measuring risk aversion. We believed that acquisitions smaller than 100% might not accurately reflect risk aversion because the acquiring company may not prioritize risk similarly to 100% acquisitions. This approach differed from previous research, which typically considered acquisitions of 50% or more as valid data. We continue to believe that acquisitions of 100% provide a more thorough understanding of risk aversion. However, to increase the size of our data set for female CEOs, it could have been more beneficial to include acquisitions of smaller stakes.

The small sample size of female CEOs made it difficult for us to track the performance of companies over time. In a number of acquisitions, the CEO had only been working for the company a year before- and after the transaction. Therefore, we could not examine the impact of the acquisition over a more extended period. Ideally, we would like to include different volatility measurements associated with a company. This limitation was also because the data was too small to track values over time. Furthermore, we would like to conduct a regression with panel data by tracking firm-specific risk over time, potentially improving the accuracy of our regression.

Our data may also contain unrepresentative observations due to complex ownership structures in certain company groups (as discussed in section 3.1). These observations make it difficult to accurately make statements about the population of CEOs in "normal" companies that sell products or services and operate independently. While we attempted to exclude these data points, we cannot guarantee with certainty that there are no such observations remaining in the data.

Also, our model may be affected by endogeneity, which refers to the potential influence of unobserved factors on the relationship between a company's CEO gender and the risk the company

takes. Endogeneity can lead to biased and inconsistent results in statistical models, and various factors could contribute to endogeneity in this context such as the risk-taking culture of a company or the industry in which it operates. For example, companies with a higher tendency to take risks might be more likely to hire male CEOs, often perceived as more risk prone. There may also be selection bias in our sample. Since we are only examining transactions that have occurred, we have no information about transactions that did not occur. As a result, we can only make statements about transactions that have occurred, and the risk associated with the target company.

6. Conclusion

6.1 Summary

The study investigated the risk behavior of male and female CEOs by analysing data from Swedish M&A transactions in the period 2015-2022. The approach was to identify an acquiring company's CEO gender and the target company's risk associated with the acquisition. The papers research question was the following:

Does target firm risk differ depending on the gender of the acquiring firm's CEO?

Since risk is difficult to measure as a concept, defining and developing proxies for risk is essential. Altman's Z-score, Solvency ratio, and Cash ratio were used as proxy measures of the target company's risk. If female CEOs are more risk-averse than their male counterparts, this would indicate higher Altman Z-scores, higher Solvency ratios, and higher Cash ratios.

The Altman Z-score is designed to measure a company's credit risk, with higher values indicating a lower probability of default. The solvency ratio is a long-term measurement that provides an understanding of a company's equity in relation to its assets. This indicates how much of a company's assets are financed by equity, and a low solvency ratio would indicate that most of the company's assets are financed by debt. The cash ratio is a short-term measurement that puts cash over short-term debt. This ratio provides information on whether a company is liquid to meet its short-term obligations.

This study intended to understand whether female CEOs acquire companies with lower levels of risk. Since the study aimed to understand whether female CEOs are more risk averse than their male counterparts, we worked with the following hypothesis to address the research question:

M&A target company risk does not depend on the CEO gender of the acquiring company.

To answer the research question, our data suggest that female CEOs acquire companies with higher Altman Z-scores than their male counterparts. This finding is interesting from a risk perspective since higher Altman's Z-scores indicate lower levels of risk. Thus, with this information alone, one could argue that the study answers the overviewing question – the level of risk associated with target firms in M&A transactions is impacted by the gender of the CEO of the acquiring firm.

However, the study also presents that male CEOs acquire companies with higher solvency- and cash ratios than female CEOs, which contradicts the conclusion that female CEOs are more risk-averse than their male counterparts. Conclusively, our study suggests that the gender of an acquiring firm's CEO affects the level of risk associated with target companies in M&A transactions. However, due to the contradicting results in our regressions, we are careful to say anything about whether female- or male CEOs are more risk averse.

6.1 Future research

In this study, we aimed to understand the risk behavior of female- and male CEOs in a broad context. We used industry dummy variables to differentiate between companies. It could be of interest to narrow the analysis further for future research. As an example, it would be interesting to narrow the sample by focusing on companies with specific sales volumes. This would allow researchers to examine the relationship between male and female CEOs' risk behavior within different sizes of companies. This would give the study more robustness when making a statement about risk aversion since there could be a relationship between the size of a firm and its risk. Even though we control firm size in our study, analysing female and male CEOs working for similar companies would give a better understanding of general risk aversion.

Also, it would be of interest to delve deeper into the Altman Z-score and its components. To the best of our knowledge, there is no prior research on the relationship between the Altman Z-score and CEO gender. Our findings in this regard are novel. However, as mentioned previously, our findings on the relationship between CEO gender and the risk of bankruptcy as measured by the Altman Z-score align with previous research, with the main difference being the method used to measure the risk of default. According to our findings, female CEOs in our sample tend to acquire companies with higher asset turnover ratios. It would be interesting to investigate further the reasons behind this relationship and whether there are other characteristics that differentiate female CEOs from their male counterparts.

Finally, we would like to highlight our approach in this study. Previous research has focused on understanding the relationship between male and female risk aversion by analysing the characteristics of companies with male or female CEOs. In contrast, our study aims to identify key risk factors and measure the risk in the target company, i.e., the company being acquired. This study aims to understand the types of risk that female and male CEOs acquire through M&A transactions instead of the risk they have within their own companies. There is a strong connection

between a company's risk and the risk it acquires through mergers and acquisitions, however, we believe that examining the target company's financials in M&A transactions is more indicative of risk aversion; therefore, we would be interested in more research focusing on this aspect.

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Appendix

Table A.1		Industry Classification	
Industry	No. of companies	Male CEO	Female CEO
Business Services (1)	162	137	25
Construction and Manufacturing (2)	280	269	11
Consumer services (3)	118	102	16
IT, Communications and Media (4)	108	101	7
Real estate and Property management (5)	60	57	3
Transportation and Logistics (6)	129	123	6
Total	857	789	68

Table A.2	Test for Heteroscedasticity
Regression	Breusch-Pagan
Altman (1)	0.692
Solvency ratio (2)	0.000***
Cash ratio (3)	0.000***

Note: The values reported are the p-values for each Breusch-Pagan-test.
***Significance on 1%-level, ** significance on 5%-level, * significance on 10%-level.

Table A.3 VIF-test for multicollinearity

Regression	Altman	Solvency ratio	Cash ratio
	(1)	(2)	(3)
LN(Sales)	1.11	1.11	1.11
ROA	1.08	1.08	1.08
Female dummy	1.06	1.06	1.06
2016	1.99	1.99	1.99
2017	2.17	2.17	2.17
2018	2.05	2.05	2.05
2019	1.78	1.78	1.78
2020	1.55	1.55	1.55
2021	1.88	1.88	1.88
2022	1.35	1.35	1.35
Industry (2)	1.96	1.96	1.96
Industry (3)	1.51	1.51	1.51
Industry (4)	1.48	1.48	1.48
Industry (5)	1.32	1.32	1.32
Industry (6)	1.62	1.62	1.62
Mean VIF	1.59	1.59	1.59

Note: The table shows the VIF-mean values for each of the regressions. A VIF value below 10 is normally interpreted as unproblematic, and the lowest possible value is 1. Conclusively, none of the regressions has a high degree of multicollinearity.

Table A.4 T-test for dependent variable

Dependent variable	t-value	P-value
Altman [Male – Female < 0]	-3.118	0.000**
Solvency ratio [Male – Female > 0]	1.018	0.154
Cash ratio [Male – Female > 0]	0.476	0.317

Note: The table shows t-test for all three of the dependent variables.
*** Significance on 1%-level, ** significance on 5%-level, * significance on 10%-level

Table A.5 Altman factor test

Factor	X_1	X_2	X_3	X_4	X_5
Female Dummy	-0.096***	-0.019*	0.014	-0.057**	0.745***

Note: The table shows a regression on each factor of the Altman Z-score (see section 3.2.3). Each factor was run on the same regression as with the risk proxies. Reported values shows the coefficients of each factor.
*** Significance on 1%-level, ** significance on 5%-level, * significance on 10%-level