Does Board Structure Impact Financial Performance and Corporate Risk?

Eshita Mishra and Selma Salah

Stockholm School of Economics

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Abstract

This paper examines the impact of board structure, in terms of board size and board gender diversity, on financial performance and corporate risk in Sweden. The study uses data on firms listed on Nasdaq Stockholm between 2014 and 2018. By running various regressions, our analysis indicates that board structure does have a significant effect on a company's financial performance and risk-taking. The empirical evidence shows a positive relationship between board size and financial performance, which when moderated for firm size, indicated a less pronounced effect for bigger firms. The results also indicate a negative relationship between board size and corporate risk. Furthermore, the analysis exhibits a negative correlation between board gender diversity and risk, which under the purview of firm size, shows a less pronounced effect for larger companies. However, board gender diversity fails to show any effect on the firm's financial performance. Hence, an important takeaway from this paper is that board gender diversity can be used to minimize corporate risks without negatively affecting corporate performance. This research gives a theoretical and practical insight into the corporate governance mechanisms, like board structure and composition, that can be used as tools in order to mitigate unnecessary risks and facilitate firm performance.

Keywords: Corporate Governance, Board Structure, Board Size, Gender Diversity, Financial Performance, Corporate Risk

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* Author contact information
Eshita Mishra 41228@student.hhs.se
Selma Salah 22998@student.hhs.se

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1. Introduction

In the course of a business, many managerial decisions need to be taken by the members of the board. The kind of decisions taken defines the growth, the direction and the risk the firm is ready to take. As defined by the Swedish Corporate Governance Code, the board of directors bears the responsibility for the management and organization of the firm's business. While the board of directors' work and make decisions in the interest of the company and its shareholders, their main task involves handling the company's affair, setting corporate goals, defining growth and expansion strategies, and monitoring the risks associated with the business operations. While it may seem, they set internal controls to monitor business operations periodically, their managerial decisions tend to affect the day to day activities of the business.

The size, composition, and structure of the board should be such that they neither hinder the decision-making process of the board nor compromise with the efficiency and integrity of the administrating process of the company's activities. The Swedish Corporate Governance Code has set forth certain rules that suggest that a company should work towards a more gender diverse and gender-balanced board.

> *"Board members that are elected by the shareholders on the general meeting should collectively exhibit diversity and breadth of qualifications, experience, and background" - Rule 4.1, The Swedish Corporate Governance Code 2016.*

Gender composition or diversity among the board can include factors such as gender, experience, age, nationality, educational background and organizational membership (Campbell and Mínguez-Vera, 2008). In Sweden, some politicians even promote quotas for women on board as a method of achieving gender-equality in firms boards. However, does forced diversity in boards impact the firm's financial performance and risk-taking negatively or positively?

A lot of the previous literature weighs heavily on the impact of corporate governance, board composition and board structure on the performance of the company and the corporate risk it takes. While corporate risk a company takes can help nurture its long-term growth plans, history has also shown how excessive risk-

taking among companies can create a domino effect bringing down economies, for example, the Asian financial crisis of 1997-1998 and the credit crunch of 2007-2008. The International Monetary Fund (IMF) report of 2016 already highlights the deteriorating corporate health around the world. Hence, to protect themselves against excessive or unnecessary exposure to risk, companies around the world are engaging in better corporate governance practices. While some policies focus on encouraging market discipline through compliance reports, others are in place to increase the effectiveness of the board composition and board structure. The papers so far have studied this impact in various developing and developed countries. But this area of study hasn't been touched upon in the context of Swedish corporates very vastly. Sweden is a great example of an economy that fairs well in terms of gender equality. Along with that Sweden, today has a mix of old established family companies and a new generation of startups. All of this makes Sweden an interesting backdrop for our study.

Thus, to study the effect of board structure and gender diversity among its board members, on corporate performance and risk, is actually taking a step towards recognizing board practices that could increase its effectiveness and mitigate unnecessary or disguised risks that a company could actually avoid, and thus increasing its corporate performance and market value.

1.2 Purpose of the Study

The purpose of this study is to examine whether board structure and board composition have an effect on firm performance and firm risk. The aim is to study in particular the impact of board size and gender diversity among the board members on firm performance and firm risk. Furthermore, the study will analyze whether this effect is more pronounced in larger firms or smaller firms. The purpose of the paper is to understand this impact especially among the listed companies in Sweden. This is done to gain a deeper insight into the effectiveness of the board decisions by learning more about the implications of the board structure and its composition.

1.3 Research Boundaries

The study will focus on firms listed on Nasdaq Stockholm in Sweden between the time period 2014 to 2018. The time period of five years has been chosen to accommodate for any big market fluctuations that could have affected all the companies or seasonal movements. With five years of data, the study has also accounted for a diverse sample of companies both old and relatively new. To study firm risk, stock volatility has been used while to examine firm performance, both market-based performance measures- Tobin's Q, and accounting-based performance measures- return on assets (ROA), have been used.

1.4 Thesis Outline

The first section in this study presents an introduction to corporate governance followed by the purpose and boundaries of the study. In section 2, a review of previous literature in the research field is presented. Next, theories and hypotheses development are presented in section 3. Section 4 consist of a description of the data and methodology used in the paper. Empirical results and analysis are provided in section 5, followed by a discussion and conclusions of our findings which are presented in section 6. Limitations of our studies and suggestions for further research are addressed and presented in section 7. Section 8 shows the tables of regression results, descriptive statistics, and other statistical tests. Finally, the reference list and appendix is found in section 8 and 9 respectively.

2. Previous Literature

2.1 Board Governance and Firm Risk and Performance

Various papers in the past have studied the importance of sound corporate governance in driving a company and the economy as a whole. One of the biggest examples of a catastrophe due to weak legal institutions for corporate governance or unsound corporate governance itself was the Asian crisis. In the literature by Breach et al. (1999) the authors studied the crisis with respect to corporate governance and concluded that weak legal systems and corporate governance, in general matter to the economy when we discuss the exchange rate depreciation and stock market decline during 1997-98, because all these primarily led to the decline of investor's confidence in the economy and the financial market.

With the importance of corporate governance well established, it is natural to see papers and previous literature studying its direct impact on a micro level, its impact on the performance of the company and the risk the company can take. Sai et al. (2014) in their research paper studied this correlation with respect to the Malaysian publicly listed companies. To study the impact, they focused on the board size and the board independence as the board of directors' activities set the pace and strategic direction for the company, thus acting as the central pillar for corporate governance in a company. There are established rules for minimum independent or non-exclusive directors in the board but when it comes to the total number of directors on board, it varies largely. Though this paper played an emphasis on the ownership concentration in the company and its impact on the performance, our paper focuses only on the board size and its composition and their impact on the performance and risk-taking capacity of the company. With the independent variables used, the paper highlighted that better corporate governance directly created a positive impact on firm performance. This followed from their argument that higher board size and lower board independence creates a higher firm performance.

Another research that looked into the impact of corporate governance on firm performance was the paper "Good Governance driving Corporate Performance?" by

Deloitte (2016). The paper studied different corporate governance variables and their impact on firm performance. The variables studied included board independence, board diversity, remuneration, characteristics of the CEO, oversight and ownership structure. The white paper was able to provide academic evidence for all the variables and hence prove 'good' corporate governance can enhance firm performance. Though the use of these variables as tools in practice cannot be overnight and requires a whole different set of discussions, their proven effect establishes the fact that these tools can, in reality, be used to create more structurally balanced decisions when it comes to critical dilemmas related to firm performance and targets.

2.2 Board Size and Corporate Risk

While board size reflected the efficiency with which numerous board members interacted and took decisions regarding the company, some papers suggest that board size also reflects a tradeoff or balance between firm-specific benefits and costs of monitoring, which means in a way it also reflects the amount of risk a company is willing to take or its risk capacity (Boone et al., 2007).

The relationship between board size and firm risk-taking has previously been studied by Haider and Fang (2016) where the author looked at the relevance of board size and firm's risky policy choices in a sample of 1,502 Chinese listed firms. One of the key takeaways from this paper was the evidence that suggested that even though the board size was negatively correlated to the risk-taking of a company, the economic impact of a change in board size was much smaller than that in other developed markets, this highlighted the market differences that could impact the correlation between the two parameters.

A similar study based in Japan, by Nakano and Nguyen (2012) provided a similar result. The study indicated that firms with larger boards showed lower performance volatility as well as a lower bankruptcy risk. A key takeaway from this paper was that when examined under the scope of investment and growth opportunities, the effect of board size was found to be less significant when firms had large investment opportunities, but much more significant when firms had fewer growth options. This study shed light on the relationship between board structure and

the company's growth opportunities. Akbar et al. (2017) studied a sample of banks, insurance, real estate, and financial services companies in the UK to examine the relationship between the two parameters. Their research provided evidence that the presence of independent directors and powerful CEOs reduced firms' risk-taking.

Many other pieces of research like that of Ling Ho et al. (2013) studied the impact of organizational structure and board composition on risk-taking in the U.S. property casualty insurance industry. Wang (2012) on the other hand studies the relevance of board size and firm's risky policy choices in investments by looking into the manager and CEO compensation and incentives schemes and its impact on the leverage and risk-taking capacity of the company. Huang and Wang (2014) investigated the systematic relationship between board size and firm's risky policy choices and its impact on performance. Their study provided concrete evidence of a negative correlation between board size and the risk-taking decisions of the company.

These previous studies and papers act as a base and study ground for our research paper to examine the impact of board size on the risk-taking of the company.

2.3 Board Size and Financial Performance

Board size signifies the efficiency with which the numerous members on the board communicate and coordinate to reach a decision for the company. There exists literature that shows a negative correlation between board size and the firm performance, showing that smaller boards improve firm performance, and hence, decreasing the failure risk. While Yermack (1996) studied this relationship in the US corporates between 1984-91 indicating that lower board size was more likely to create higher firm value and better CEO performance, Eisenberg et al., (1998) studied the same relationship in a sample of small and midsize Finnish firms. There were more studies like Bennedsen et al. (2008); Fich and Slezak et al. (2008); Paniagua et al. (2018) that researched a similar relationship between board size and firm performance, using different samples and different types of independent variables, all suggesting similar negative correlation between the two parameters.

As and when the industries grew more complex and integration grew more intense between economies, many papers failed to notice that the negative relation

between the board size and firm performance could be due to inefficient communication between board members or lack of coordination. (Guest, 2009). These results suggested that the findings of the earlier corporate governance research did not take into account that the dynamic nature of corporate governance could be affected by bias. Numerous studies in contrast to the ones discussed earlier, provide significant evidence of a positive relationship between board size and firm performance. While most of these studies took Tobin's Q as their performance indicator, some also examined ROA for the firm profitability. Abidin et al. (2009) studied the board structure and corporate performance in a sample of companies listed on Bursa Malaysia, and their results indicated that board size had a positive impact on firm performance where they defined performance as the value added (VA) efficiency of the firm's physical and intellectual resources instead of the commonly used performance ratios like Return on Asset (ROA), Return on Equity (ROE) or Tobin's Q. Nicholson and Kiel, (2003) on the other hand used the common performance measures to study the relation between board size and firm performance in a sample of 348 Australia public listed firms. Their results were in line with that of Abidin et al. (2009), showing a positive correlation when controlled for firm size. Similarly, Kajola (2008) used another performance ratio Return on Equity (ROE) to show a positive relationship between board size and firm performance in their sample of the Nigerian Stock Exchange (NSE) listed firms.

> *"This positive relationship could be explained by the intellectual capital theory of corporate governance which suggests correct skills and knowledge have to be combined with the numbers of the board in order to deliver sufficient needs at a particular point of time" - Sai et al. (2014).*

Another important study by Adams and Mehran (2012) provided evidence of a positive relationship between the board size and its performance. It also provided new evidence that increases in board size due to additions of directors with certain subsidiary directorships could affect the correlation between board size and risk-taking and also board size and performance of the company. This study not only delved into

the complexity of the company structure and its impact on the value addition but also the impact a large board size could have.

The empirical studies so far indicate ambiguous results. Whether board size has a negative or positive impact on firm performance can be argued based on the degree of integration of ideas, capabilities and corporate experience of board members.

2.4 Female Board Members and Risk

There exists previous literature to support the fact that women in comparison to men are more risk-averse. While there are studies to prove the negative relationship between female board members and firm risk, there are studies that argue women tend to take more risk than men (Adams and Funk, 2011, and Berger et al., 2014).

While Faccio et al. (2016) argued that female CEOs tend to lower leverage through lower borrowings and lower volatility in earnings, Jogulu and Vijayasingham (2015) are paper suggested female managers to act more rationally than their male counterparts. A similar study by Lenard et al. (2014) concluded gender diversity among board members reduced firm risk. Stellingwerf (2016) examined the relationship between board gender diversity and corporate risk-taking within the US non-financial firms and found a similar negative correlation. Chong et al. (2018) studied the effect of board composition, political connections and sustainable practices on corporate risk-taking and performance in Malaysia. Their results were in sync with the results of Mathew et al. (2016) who also determined a negative relationship between gender diversity in board and corporate risk-taking.

Though this literature initially built upon the studies on experimental economics and psychology, in the recent years more and more research has been done with respect to gender roles in management and their direct impact on corporate decisions and performance. Studies in developed and developing economies have all suggested gender diversity has a noticeable effect on corporate governance and risk-taking. Levi et al. (2014), Loukil and Yousfi (2016), Rossi et al. (2017), all examined the same relation between female directors and firm risk, with different indicators and under different countries and environments, yet all concluded a negative correlation between the ratio of female directors on board and firm risk.

In spite of a few papers supporting positive relationship between female board members and firm risk, much of the previous literature is biased towards a negative relation between the two parameters.

2.5 Female Board Members and Financial Performance

Studies in the field of gender diversity in higher management and its impact on the company's performance, have taken leaps in the last decade. With more research in this field, its practical implications have also become more acknowledged.

Li and Chen (2018) investigated the relationship between gender diversity in the board and its impact on the firm performance with respect to firm size among the listed non-financial firms in China. Their results provided evidence of a positive correlation between the two if the firm size was less than a critical value. Such results showed that firm size could, in fact, weaken the positive effect of gender diversity among the board on the performance of the company. Thi Cam Tu (2017) studied a similar relationship between female board of directors on firm performance using a sample of over 600 listed companies in Vietnam using ROA, ROE and Tobin's Q to examine the firm performance, with the study delving deeper into the research and examining their impact on dividend payout policies as well. Their results showed a positive relationship between the ratio of female directors and firm performance.

Many other papers studied gender diversity among the board and its impact on firm performance and showed a similar positive correlation. One research that supports a similar sample as this paper is by Andersson and Wallgren (2018). Their paper studied the board gender diversity and its impact on the firm's financial performance examining a sample of 100 companies listed on Nasdaq Stockholm. Their results were in line with the previous studies that showed a positive correlation between gender diversity in the board and firm performance. Reguera-Alvarado et al. (2017) had suggested this positive effect was a result of new ideas, skills and different views that came with the diversity in the board. Hence, in boards with a low level of diversity, by excluding some people from participating in the decision-making process, there was a high probability that the company could not take advantage of different knowledge and experience (Westphal and Milton, 2000).

While previous studies by Gordini and Rancati (2017) and Campbell and Mínguez-Vera (2008) have found similar evidence of a positive effect, there exists literature that indicates no significant relationship between board gender diversity and the firm's financial performance (Rose, 2007; Randøy et al, 2006). Unlike previous papers that delved deeper into other developed and developing countries, this paper is more focused on the situation in Sweden.

3. Underlying Theories and Hypotheses Development

3.1 Theory

The theory on corporate governance is influenced by and built upon several other theories: namely, agency theory, institutional theory, decision-making theory, contingency theory, stewardship theory and resource dependence theory. In this section, each of the mentioned theories and their possible link to board structure and gender diversity will be presented.

Institutional Theory

Institutional theory suggests that social institutions, formal or informal rules, regulations, norms and acceptable behavior, form countries' business systems and thus firms (Brammer et. al 2012). As social institutions vary depending on nation, culture or different institutional contexts, the business environment will most likely also differ across countries. Business environment in itself can act as an externality affecting the corporate governance mechanisms. Previous research has analyzed the impact of institutional settings of a country on corporate risk. The studies show that strong protection of investors' and creditors' rights and legislation for hostile takeovers all have a negative relationship with corporate risk-taking (John et al., 2008, Acharya et al., 2011 and Low 2009). Listed companies in Sweden have regulations (Companies Act), codes (Code of Corporate Governance) and principles (Swedish Securities Council) on corporate governance, and as based on the institutional theory, preferences, and behaviors of board members ought to be influenced; one can thus expect that firms operating in Sweden take on less risk compared with firms in other countries.

Agency Theory

The agency theory addresses the potential issues between agents and principles. The main concern is that the agent acts in his/her best interest at the expense of the principle. The differences in "goals" is driven by the self-interested opportunism which can result in agency costs in terms of, for example, board members using company's resources for their own benefit or the costs associated with monitoring the agent (McColgan, 2001). This, in turn, could result in a negative financial performance for the company. One way to minimize the conflict of interest between the board and shareholders, ensure financial performance efficiency and less risk, is to have independent board members. Previous literature has shown that independent directors, who can ensure better and unbiased decision making, lead to better financial performance and less corporate risk-taking (Dahya and McConnell, 2005 and Mathew et al. 2016).

Decision Making Theory

The theory of decision-making process draws from the doctrines of social psychology and organizational theory. The theory suggests that the size of the decision-making group has a potential impact on the result. Kogan and Wallach (1965) in their article expressed how large group decisions were considered to be less extreme. Their argument was based on the fact that it is rather difficult to convince a large group of decision makers to agree upon a potentially risky decision. Sah and Stiglitz (1986) applied this concept to the business and economics framework. Their study proved empirically that due to a variety of distinct and diverse views it was more difficult for a large group of decision makers to agree upon good or bad decisions. Hence, as a result, decisions made by large groups of decision makers were far more moderate and less risky than the decisions made by small groups. This led to divergent views concerning board size and its impact on corporate performance. While many researchers favored smaller boards as they were considered to be more unified, more productive, and more efficient in monitoring the firm (Jensen, 1993; Yermack, 1996; Lipton and Lorsch, 1992), there were others who challenged this idea and found that

small and large firms, in fact, had significantly different board structures and needs. Thus, based on the cost and benefits of the board function, different firms structured their boards differently according to their needs and hence, large boards proved more effective for larger and complex firms due to their distinctive needs for advising and firm size (Coles, Daniel, and Naveen, 2008; Linck, Netter, and Yang, 2008). Thus, the decision-making theory suggests that as the board size increases, the decisions are likely to become more moderate and less risky. However, this theory has its own limitations and hence, cannot be applied under all circumstances.

Stewardship Theory

This theory was first developed by Donaldson with later worked upon by Davis et al. (1997) and Cornforth (2003). Unlike agency theory, stewardship theory rests upon two pillars of mechanism- psychology and sociology. In this alternative model of corporate governance, theorists believe that the goals of the board of directors and their managers are actually aligned and not conflicted. This is based on the theory that managers are intrinsically motivated to act in the best interests or for the benefit of the organization in order to gain intangible rewards like opportunities for personal growth and achievement.

Under this theory, directors and managers are viewed as trustworthy stewards of the firm, who would work towards maximizing the shareholders' wealth for the better of the company to gain recognition from peers or more responsibility. This personalization of organizational failure and success makes monitoring redundant (Donaldson 1990; Donaldson and Davis, 1991; Donaldson and Davis, 1994; Davis et al., 1997, Bathula, 2008). Stewardship theory suggests that when professional managers are allowed to hold control, it encourages them to maximize the firm's financial performance and profits. By the same logic, more inside executive directors are preferred over the independent directors on the board as these inside directors understand the business better and have a stronger commitment to the company, thus, they can govern better. Following the same reasoning, CEO duality is considered beneficial for firm performance because of the benefits associated with a unified leadership and goal alignment. There exists both conceptual (e.g., Davis et al., 1997)

and empirical evidence for the stewardship perspective of corporate governance (Bhagat and Black, 1999).

Contingency Theory

According to contingency theory, while studying a relationship between two parameters, there could be additional factors that could affect the relationship in question, that is the relationship is contingent on external factors. Hence, according to the contingency theory under the business purview, firm size could be one of the important contingency organizational factors (Child, 1975). In previous studies like that of Damanpour (2010) and Zona et al. (2013), firm size has been considered as one of the moderating variables that could either enhance or constrain company's activities, like the decision-making process, group information-processing and firm innovation to name a few.

However, in spite of it all, previous studies include firm size only as one of the control variables in examining the impact of corporate governance and board composition on corporate performance, for example, papers of Adams and Ferreira (2009) and Rose (2007). Recent studies in the board structure and firm performance sector suggest that the effectiveness of particular governance mechanisms, for example, board composition, may depend upon the presence or the absence of other governance mechanisms, for example, ownership concentration, or the research boundaries set up for investigation.

Pye and Camm (2003); Giovannini (2010); Zattoni et al., (2017) and many more have included the concept of contingency theory in their studies based on the argument that a 'one size fits all' approach to board composition fails to include some important aspects of interactions between different governance mechanisms (Coles et al., 2001).

Resource Dependency Theory

The role board members have and how they impact a firm as a resource is explained by the resource dependency theory. The principle suggests that the composition of all resources in a firm, including human capital, are crucial for the growth and value added

for a firm. This theory explains that the board composition plays an important role in what information, skills, knowledge, and network the board in a firm contains. The main argument is that board members act as tools or resources themselves to help facilitate the firm performance. The reason behind this is that the board members bring with them connections and the resources with them that can benefit the firm directly. Another argument is that the resources of a firm reduce the dependency on external factors (Pfeffer and Salancik, 1978) and lower transaction costs (Williamson, 1984). Thus, the resource dependency theory argues that the larger the board the higher probability of having the human capital you need to work as efficiently as possible and improving the decision-making of the board.

3.2 Hypotheses Development

The previous literature specified in section 2 lays the background for this paper. With corporate governance and its impact, gaining more and more attention lately, this paper intends to further this research to gain more insights as to how to use the tools of corporate governance to improve firm performance and control corporate risk-taking. Following this intent, we set up our first hypothesis:

Hypothesis H_{1a}: There is a negative relationship between board size and corporate risk

While the size of the board encapsulates the large extent of ideas and experiences coming together, its impact on the company's risk-taking capacity and decisions reflects the risk-averseness of the board in its investments, expansion, and growth.

Based on the decision-making theory discussed earlier, we believe that decisions taken by a large group tend to be less extreme. This follows the reasoning that it is far more difficult to convince a large group of decision makers to make a potentially risky decision. Sah and Stiglitz (1986) even proved this phenomenon in economic and business scenarios. Hence, with a large number of board members, it would be difficult to get a risky investment or decision approved easily. This further strengthens our expectation of a negative correlation between board size and firm risk.

Another contributor to our reasoning is the institutional theory discussed earlier that suggests that along with board size, the managerial decision making and the country's institutions and regulations have a significant influence on corporate risk-taking. Hence, following the arguments of Low (2009), if we expect Sweden to have strong laws for hostile takeovers, it is likely that the overall risk that the managers or decision makers take, itself is lower, as decision-makers would like to keep their positions more secure. As of 2018, hostile takeovers and unsolicited bids have become more common in Sweden. Thus, with such market practice becoming more common in Sweden, we have more reason to expect that board members, in general, are more risk-averse compared to other countries.

Following the previous literature in this field like Nakano and Nguyen (2012), Akbar et al. (2017), Chia-Jane Wang (2012) and Huang and Wang (2015), this paper expects the results to be in line with what has been concluded from previous studies, that a large board size can indeed reduce the risk-taking in a company. There could be multiple tools to do this, for example by lowering leverage, controlling the volatility in the firm value or taking on less risky investments. Hence, with such results in mind, we could expect the Swedish listed companies in the sample to follow a similar pattern of negative correlation between board size and corporate risk-taking.

Following the examination of the relationship between board size and firm risk, we move on to building our next hypothesis:

Hypothesis H_{1b}: There is a positive relationship between board size and corporate financial performance

As mentioned previously the extent of research in this field and the mixed results gained from it, the impact of board size on the firm's financial performance acts as one of the interesting relationships to study. With the sample ranging from small to large listed Swedish companies, the history and the market environment of the companies, makes this sample unique.

Applying the agency theory that suggests board of directors is there to monitor and reduce conflict of interest between the managers and shareholders, there is reason to believe, that more number of directors and in particular, independent directors in

the boardroom could facilitate better decision-making by the board (Dahya and McConnell, 2005) and higher profit efficiency for the company (Hardwick et al., 2011), as they can make unbiased and beneficial decisions for the company and the shareholders.

The decision-making theory contributes to our expectation of better firm performance. This is because, with a larger board, there are lower chances of extreme decisions getting approved easily, thus increasing the probability of better financial performance of the company. The resource dependency theory also suggests additional board members could bring with them personal resources and networks that could improve the financial performance of the company.

We expect this study to produce similar results to those of Nicholson and Kiel (2003); Abidin et al. (2009) and Adams and Mehran (2012), who all presented a significantly positive correlation between the board size and firm performance, due to the similarity in the sample and indicators used.

This paper intends to study the correlation between the two parameters while controlling for firm size so as to avoid any bias arising due to firm scale. To study the firm performance some previously used ratios like ROA and Tobin's Q have been used which would make the results of this paper later comparable.

The next hypothesis aims to study what kind of effect can firm scale bring to this relationship.

Hypothesis H_{1c}: The relationship between board size and corporate financial performance is less pronounced for bigger firms

Till now we have considered firm size to be just a control variable in order to avoid any bias arising due to firm scale on the relationship between board size and firm performance, but according to the contingency theory, firm size could actually be considered as one of contingency organizational factors (Child, 1975), meaning firm size could be that moderating variable which could either facilitate or constrain the firm's activities, such as the decision-making process (Damanpour, 2010; Zona et al., 2013).

We believe, bigger firms are under more scrutiny. They have to go through stricter control measures and harsher regulations. This, in turn, does not give the board as much freedom in the decision-making process as a board in a smaller firm would enjoy. Hence, following the arguments of institutional theory, stronger regulations for larger firms are expected to affect the relationship between board size and financial performance. Additionally, bigger firms have more well-defined structures and policies that make the board take longer time and more thorough communication process to decide upon even the smallest of changes or other managerial decisions. Hence the paper expects that in bigger firms, larger board size would have a lower effect on firm performance than in smaller firms due to stricter regulations, time-consuming decision-making process and poor effectiveness of the large board.

Another factor other than corporate governance and firm size that could affect the performance and risk-taking of a company is the gender diversity among the board members. Under the corporate scenario gender diversity on board directly impacts the corporate risk the company takes. To further study this relationship, we build our fourth hypothesis:

Hypothesis H_{2a}: A board with higher gender diversity is negatively correlated with corporate risk

This paper expects a negative correlation due to the fact that female board members bring to the table a more risk-averse approach and have a more cautious take in the investments and expansion decisions.

Agency theory further supports this expectation by suggesting that a more gender diverse board would, in fact, make the board's monitoring process more effective and help keep the firm risk in check. Another theory that works quite oppositely to the agency theory yet supports the expectations of the paper, is the stewardship theory. As discussed previously this theory focuses more on the advice and counsel function of board members rather than the monitoring. Since, managers and directors under this theory, are considered to be good stewards of corporate assets or people who strongly identify with their organizations instead of self-interested agents like in agency theory, they tend to personalize organizational failure and

success. This makes the personal preferences of the directors and those corporate assets to have a direct impact on the board decision. Hence with higher female directors on the board, there is a higher probability that their personal risk preference could directly impact the firm risk. Thus, this paper expects to see a negative correlation between gender diversity among board members and corporate risk due to the risk-averse nature of female directors.

We expect the Swedish companies to be more biased towards a negative correlation between the two parameters due to the existing literature in a similar environment in terms of gender equality and regulations and hence, provide results which are in line with the studies of Lenard et al. (2014), Faccio et al. (2016) and Mathew et al. (2016).

Next, we build the hypothesis to study the impact of higher gender diversity among board members on firm performance.

Hypothesis H_{2b}: A board with higher gender diversity is positively correlated with corporate financial performance

With more representation of gender, ideas, and experiences on the board, the company has a higher chance of taking advantage of these in the decision-making process for better firm performance.

Alongside the previous literature (Li and Chen, 2018; Gordini and Rancati; 2017; Campbell and Mínguez-Vera, 2008) and reasonings, one of the most popular corporate governance theories, the agency theory further supports the expectations of the paper. According to the theory, the board of directors is a monitoring mechanism which also helps minimize conflict of interest among decision makers. Hence, board heterogeneity in terms of gender could actually bring more diverse ideas, skills, and experiences that could help improve communication and make the monitoring of the management more effective. This, in turn, would increase the firm's financial performance. Hence, the paper expects a positive correlation between gender diversity among board members and corporate performance.

While gender diversity would seem just like a female to male ratio among the board, the impact of this has become a well-researched topic in the last few years.

Thus, we build the next hypothesis to study the effect of firm size on this relationship between board gender diversity and corporate risk decisions.

Hypothesis H_{2c}: The relationship between gender diversity and corporate risk is less pronounced for bigger firms

As discussed under the contingency theory, the paper expects the firm size to either promote or constrain firm performance, hence, we expect the firm scale to have an impact on this relationship between firm performance and higher gender diversity on board.

In larger corporations, where corporate culture is stronger and imposing (Zeng and Luo, 2013) there is a reason to believe, females in bigger firms are more exposed to silent learning. This means that they are more likely to adopt the behavior of or are more assimilated to the traditional "male" board members who are considered to be less risk averse (Rose, 2007; Gordini and Rancati, 2017; Andersson and Wallgren, 2017). Consequently, the beneficial impact of having more female directors on the board would not be realized to its full potential in bigger firms. Thus, the firm size can, in fact, nullify or ratify the impact of higher board gender diversity on firm risk.

Another reason to expect less pronounced results for bigger firms could be that the larger firms have more complex and hierarchical structures (Nahavandi and Malekzadeh, 1993; Nelson, 2009) which could result in widespread distribution of power and responsibilities along with lower discretion (Nahavandi and Malekzadeh, 1993; Papadakis, 2006). This could, in turn, diminish the positive effect of board gender diversity on firm risk and performance due to ineffective or sluggish communication during the decision making and strategic management. On the other hand, smaller firms are more likely to have a fast and effective decision making and implementation process (Gong, Zhou, and Chang, 2013; Hannan and Freeman, 1984; Tripsas and Gavetti, 2000). Thus, this paper expects to see a less pronounced relationship between gender diversity and corporate risk for bigger firms.

4. Data and Methodology

4.1 Sample

In order to conduct the study and analyze the relationship between board structure, the performance and risk-taking capacity of a firm, both board and financial data is required. The board and financial data were cleaned and merged in excel based on mutual firm-year observations. However, the limitation of the data sample was based on the board structure data because the Modular Finance database only provides data for firms listed on Nasdaq Stockholm between 2014 and 2018. As this study only focuses on Sweden, it is worth to mention that the limitation of the scope is of great importance as corporate governance regulations can differ depending on the country and can, therefore, lead to inter-country differences if not limited to one country.

The financial data, consisting of firms listed on Nasdaq Stockholm and Nasdaq First North for the years 2011-2018, was collected from Thomson Reuters Datastream and included 894 firms. Furthermore, using Modular Finance database for board structure measures, our sample landed on approx. 340 observed firms. Next, we matched financial and board data into one sample and dropped the firms that were not found in both datasets. Since financial data was missing for some firms, we completed the missing values through data found on Capital IQ. Finally, the final sample was balanced by deleting firms that had one or more missing value for any of the variables used in the baseline regression for the years between 2014 and 2018. The final data sample was reduced to 244 firms and 876 firm-year observations. The data collecting process is presented in **Table 1**.

Sample Selection Bias

When a proper randomization selection of a sample is not achieved, selection bias of a data sample can occur; in that scenario, a distortion of the statistical analysis is possible and thereby leading to incorrect conclusions. When preparing the final data sample, a majority of the financial data was dropped due to a lack of board structure data. The board structure data only covered 340 firms listed on Nasdaq Stockholm which limited the data sample towards more established firms. However, a data sample

consisting of only mature companies could possibly lead to bias as this selection do not fully represent the population, in this case, the Swedish companies, intended to be analyzed. Established and mature firms are most likely to have larger boards and are more stable financially which could affect the results. However, we believe that this issue does not affect our analysis significantly and that we can still draw conclusions based on the final data sample.

4.2 Variable Description

In order to test this study's hypothesis, regressions are run based on dependent, independent and control variables. The following section presents all the variables in detail.

Dependent Variables

Financial Performance Measure

Financial performance, the ability to use a firm's assets to generate revenue, is a common measure used in previous literature analyzing the relationship between board structure and firm performance (Abidin et. al, 2009). There are mainly two categories of financial performance measures that have been used in previous literature, namely accounting-based measures and market-based measures. A frequently used market-based measure in previous literature is Tobin's Q (e.g., Campbell and Mínguez-Vera, 2008; Reguera-Alvarado et al., 2017). Tobin's Q is originally defined as the market value of a firm divided by the replacement cost of a firm's assets (Tobin, 1996). Using this variable, one can measure markets expectations of future earnings; if the value is lower than 1, the firms are considered to be undervalued, whereas a value higher than 1 indicates an overvalued firm. Consistent with previous literature, we have used the measure of Tobin's Q in order to capture market-based financial performance. However, there are several approaches on how to calculate Tobin's Q and we have chosen to follow Li and Chen's (2016) approach. See Table 2 for definitions and calculations of all variables used in our regressions.

A proxy for financial performance commonly used in previous corporate governance literature is the accounting-based measure return on asset (ROA) (e.g.; Galeotti, 2006; Easterwood et al. 2012; Ben Barka and Legendre, 2017). ROA measures how efficiently a firm utilizes its capital and is calculated as the ratio of operating income to the total asset.

Corporate Risk Measure

To understand how the size and diversity of a board impact the total risk-taking of a firm, we follow Bargeron et al. (2010) definition of total firm risk and use annual stock volatility (SV) as the measure of risk. To measure annual stock volatility, we first calculated daily stock returns using daily stock prices. We then went on to calculate the monthly returns and subsequently, the standard deviation of monthly stock returns. The standard deviation of monthly stock returns is a common proxy or risk indicator used in much of the previous literature to measure the stock volatility over a period of time. This variable is used as an indicator of total risk at the firm level (Haider and Fang, 2016)

Thomas Reuters defines stock volatility as, “A measure of a stock's average annual price movement to a high and low from a mean price for each year.”, which means that if for example, a firm has a stock's price volatility of 15%, then the stock's annual high and low price has shown a historical variation of +15% to -15% from its annual average price. This follows the studies of Adams et al. (2005) and Cheng (2008) and Koerniadi et al. (2014) who also used standard deviation of monthly returns as the measure of risk-taking at the firm level.

Independent Variables

Board Size

As mentioned in section 2.3, board size is a variable that has been widely studied and refers to the total number of members on board. Following Haider and Fang (2016) we measured board size as the total number of board members on a corporate board.

Board Diversity

In order to capture how gender diversity in a board impact corporate performance and corporate risk, we used the percentage of female members on board as an explanatory variable, following the previous literature (Haishan Li and Peng Chen, 2018).

Control Variables

To avoid other factors that could possibly cause biased estimators in our empirical model, we include multiple control variables. One factor that might influence risk is the size of a firm; larger firms can diversify away risk to a greater extent compared to smaller firms (Konishi and Yasuda, 2004) and can also use advantages such as economy of scale to reduce risk. Like previous studies on risk-taking, we control for ***firm size*** and measure this as the natural logarithm of total assets (Low, 2009 and Boubakri et al., 2013). Evidence also shows that company risk could be an effect of ***financial leverage***, we therefore also control for risk to capture the impact of debt servicing on profitability and risk (Adams et al., 2005). Following Ozkan and Ozkan (2004), we measure leverage (RISK) as the ratio of total debt to total assets. Previous studies also show that more experienced firms are better at avoiding risk and we have therefore included ***firm age*** as a control variable to capture this in our regression (Lewellyn and Muller-Kahle, 2012). In addition, as Junaid and Hong-Xing (2016) did in their paper, we control for the potential effects of growth opportunities though including ***capital expenditure*** as a control variable. Table 2 summarizes all details of definitions for all control variables.

4.3 Baseline Model and Statistical Tests

Baseline Model and Hypothesis H_{1a-b}

$$CFPR_{it} = \beta_1 TOTBM_{it} + \beta_2 SIZE_{i,t-1} + \beta_3 RISK_{i,t-1} + \beta_4 FIRM\_AGE_{i,t-1} + \beta_5 CAPEX_{i,t-1} + \delta_{jt} + \theta_i + u_{it}$$

Where:

$CFPR_{it}$	is measured as Stock Volatility, ROA or Tobin's Q for firm i at time t
$TOTBM_{it}$	is the number of total board members for firm i at time (t-1)
$SIZE_{i,t-1}$	is measured as the natural logarithm of total assets for firm i at time (t-1)
$RISK_{i,t-1}$	is measured as long-term debt to total assets for firm i at time (t-1)
$FIRM\ AGE_{i,t-1}$	is measured as the age of a firm i at time (t-1)
$CAPEX_{i,t-1}$	is measured as the capital expenditure of a firm i at time (t-1)
δ_{jt}	is a set of dummy variables that capture the industry-year fixed effects
θ_i	is a set of dummy variables that capture the firm fixed effects
u_{it}	is the error term

Hypothesis H_{1a-c}

We start with testing our first two hypotheses (H_{1a-c}) by using total board members (TOTBM) as the explanatory variable. We will see how TOTBM correlates with corporate risk in terms of SV (H_{1a}) as well as with financial performance in terms of ROA and Tobin's Q (H_{1b}). Following the previous literature (Hermalin and Weisbach, 1991), we have implemented a one-year lag between firm-level control variables and the dependent variable.

To examine Hypotheses H_{1c} – the relationship between board size and corporate financial performance is less pronounced for bigger firms – we created an interaction variable. An interaction variable measures how the effect of an independent variable, in this case, total board members, changes with the size of a firm (SIZE), which is the moderating variable. An interaction variable is usually created using a product term (Turrisi et al., 2003); to analyze Hypotheses H_{1c}, we have created the

product term SIZE*TOTBM, between the TOTBM variable and SIZE variable. The interaction variable SIZE*TOTBM is run in a regression in combination with TOTBM to analyze whether larger firms show a more positive relationship between TOTBM and the dependent variables. A positive statistically significant interaction term would mean that firm size has a positive and more pronounced effect on the relationship between total board members and financial performance variables.

The baseline model in this study is a fixed effect model controlling for both firm and industry-year fixed effects. By using a fixed effects model for our panel data, we are able to control for some endogeneity. Endogeneity is a common concern when doing regression analysis and appear when the explanatory variable is correlated with the error term. This could be the result of reverse causality or omitted variables. In our study, we have controlled for time-invariant unobserved heterogeneity through the firm and industry-year fixed effects. Firm fixed effects control for time-invariant characteristics that are specific for each firm and thus control for unobserved heterogeneity associated with factors at a firm-level. For instance, corporate culture or corporate governance are two factors that could be seen as time-invariant firm aspects that could impact both financial performance and board structure in a firm. We see the variation of risk attitude between directors as something that differs from firm to firm but is constant throughout the time period we examined. Moreover, our baseline model control for industry-year fixed effects, which means controlling for time-varying industry conditions that could affect both financial performance and board structure. By implementing the industry-year fixed effect, we are able to control for unobserved effects across industries and within industries over time. An industry's business cycle is one example of industry characteristics that could influence the explanatory or dependent variables. In addition, we use one-year lagged control variables to minimize the potential double causality between board size/diversity and the control variables. Lastly, we cluster errors at the firm-level. Worth mentioning is that a quadratic term of the explanatory variable total board members and diversity were included in the model to test whether it made the model better fitting to the nature of our data; however, the quadratic term was not significant, and therefore not included.

Hypothesis H_{2a-c}

For the hypotheses H_{2a} and H_{2b}, to investigate whether diversity in a board impact financial performance or corporate risk, we will change the explanatory variable from total board members to diversity and keep all other variables in the baseline model equal. Furthermore, we will keep the one-year lag on the control variables, control for firm and industry-year fixed effects and cluster errors at the firm-level.

In order to examine H_{2c} - The relationship between gender diversity and corporate risk is more pronounced for bigger firms - we interact the DIVERSITY variable with SIZE creating DIVERSITY*SIZE and run the coefficient in combination with the de DIVERSITY with the regression. We will keep the one-year lag for the control variables and control for firm and industry-year fixed effects, and cluster errors at the firm-level.

Diagnostic Test

After performing a Breusch-Pegan/Cook-Weisberg test for all our hypotheses we can firmly reject the null hypothesis of heteroskedasticity at a 0% significant level, and have therefore used robust standard errors in all of our regressions.

When residuals are correlated over time it can lead to bias in the standard errors. This bias is called serial correlation and means that OLS estimators cannot be seen as the best linear unbiased estimators (Wooldridge, 2009). To test for serial correlation in our model we have performed a Wooldridge test (Wooldridge, 2002; Drukker, 2003), which shows that the null hypothesis can be rejected at the 10% significance level for our baseline model in which ROA is a proxy for financial performance. Clustered standard errors at firm-level have been used for all our regressions in order to address these biases.

5. Empirical results and analysis

5.1 Summary Statistics

To get an overview of the data sample, summary statistics and a Pearson's correlation coefficient for all variables used in our regressions are presented and found in Table 3 and Table 4 respectively. The summary statistics show that the average board size for Swedish firms is 6.59, which is relatively lower than the average found in previous studies (Lee-Lee Chong et al., 2017; Junaid and Hong-Xing; 2016 and Scafarto; and della Corte, 2017). Worth to mention is that none of the boards in the sample has more than 13 board members, but there are also some firms with board sizes as small as one member. The percentage of women on the board, the DIVERSITY variable, is on average 30% which is in line with the results of 32.2% by Andra AP fonden Kvinnoindex (2017). This suggests that boards in Sweden are more diversified as compared to other economies with an average of approx. 12% in China (Li and Chen, 2018) and 17% in Europe (Reguera-Alvarado et al., 2017). The higher percentage in Sweden could possibly be a reflection of political priorities. The standard deviation of diversity is relatively low (15%) in Sweden, indicating that the composition between men and women on boards do not differ to a great extent among Swedish firms. Moreover, the average age of a firm is approx. 52 years; however, the standard deviation for this variable is rather high (47%). On average, the sample's total risk (SV) is approx. 28%. With an average of 1.77, Tobin's Q indicates that the market equity and the book value of liabilities for our sample firms are, on average, valued 77% higher than the book value of total assets.

Pearson's Pairwise Correlation Analysis

The Pearson pairwise correlation between the baseline regressions variables is shown in Table 4. As one can expect, the two financial performance variables are positively correlated. Furthermore, and as predicted, we can also see that both SIZE and FIRM AGE are negatively correlated with SV, which implies that larger and older firms have lower total risk compared to smaller and younger firms. Moreover, a relatively strong

positive correlation is found between DIVERSITY and SIZE, which indicates that larger firms have a higher percentage of women on board compared to smaller firms.

According to Kennedy (1985), if the correlation between predictors exceeds 0.80, multicollinearity should be considered, which is not the case for our variables. Lastly, a variance inflation factors (VIF) test was done to examine whether variables were causing any multicollinearity in the regressions; Table 9 shows that no independent variable has a VIF value greater than 10, which is the general rule of thumb to detect multicollinearity.

5.2 Regression Results

Hypothesis H_1

As mentioned in section 4.2, all our regressions are run with a one-year lag between the dependent and the control variables, we control for firm fixed effect and industry-year fixed effects, and finally cluster standard errors at the firm-level. The results from the hypothesis regarding board size impact on financial performance and corporate risk is presented in Table 5 and Table 7, and the hypotheses addressing diversity's impact on financial performance and corporate risk are presented in Table 6 and Table 7. Two of the baseline regressions (1) and (3) addressing board size show statistically significant relations between Total Board Members (TOTBM) and Stock Volatility (SV) and Tobin's Q (Q) respectively.

The result from Hypotheses H_{1a} - there is a negative relationship between board size and corporate risk - is shown in regression (1), which indicates a negative significant relationship between TOTBM and SV (-0.248, $p<0.05$). This result thus supports our hypotheses H1a and implies that the bigger the board, the lower overall risk for a firm. This result is consistent with Ying Sophie and Huang Chia-Jane (2015) findings who suggest a negative relationship between board size and corporate risk. However, their paper defines risk as the variance of monthly stock returns over 12 months post the fiscal year end. A reason for this result could be that larger firms have

more diversification opportunities which are in line with Nakano and Nguyen (2012) and Koerniadi et al. (2014) studies.

Moreover, the results for Hypothesis H_{1b} - there is a positive relationship between board size and financial performance - is presented for the measure ROA in regression (2) and Tobin's Q in regression (3). Also, here the results support our hypotheses and the results imply that the bigger the size of the board, the better the financial performance. However, the result is only significant for the market-based performance measures Tobin's Q. Hence, our results suggest that board members in Swedish firms perform better in larger groups and that larger boards may lead to that ideas and skills are shared in a more efficient way compared with smaller boards.

For Hypothesis H_{1c} - The relationship between board size and corporate financial performance is less pronounced for larger firms - the results show only significant results for the Tobin's Q coefficient. This implies that the size of the firm affects the relationship between the number of board members and financial performance. A statistically significant negative coefficient (-0.0659, $p<0.05$) is shown for the interaction variable SIZE*TOTBM in regression (9), indicating that larger firms show a more negative relationship between TOTBM and Q compared to other firms, which is in line with hypothesis H_{1c}.

Hypothesis H_2

In Table 6, the result for regression (4) supporting Hypothesis H_{2a} are shown - that a board with higher gender diversity is negatively correlated with corporate risk. The negative relationship (-3.532, $p<0.05$) between DIVERSITY and SV implies that a board with higher percentage of female board members has a more risk-averse approach and are a more cautious when it comes to investments and expansion decision, a result in line with previous literature (Mathew et al. 2016, Jogulu and Vijayasingham, 2015). Next, the two baseline regressions (5)-(6) show no statistically significant relationship between DIVERSITY and financial performance measures ROA and Q respectively. These results are consistent with the findings of Randøy et al. (2006) who analyze a sample of 500 of the largest companies in Denmark, Norway, and Sweden, and fail to find any significant impact of board gender diversity on stock

performance or ROA. An interpretation of this finding could be that board compensation does not impact a firm's financial performance but rather individual board task performance (Tacheva and Huse 2006), or that it is hard to establish the relationship between board diversity and financial performance as there are a lot of other elements that could influence a company's financial performance.

5.3 Robustness Tests

To check our models for robustness, additional regressions (13)-(15) in Table 8 for hypothesis H_{1a-b} by controlling for sales growth have been run. Firm growth is considered to be one of the important factors that need to be taken into account by investors before making any investment decisions. Hence, sales growth is considered to have an impact on risk and firm performance (Serrasqueiro, 2009). On running the additional regressions, the results for hypothesis H1a (impact of board size on firm risk) are consistent with previous results, showing the statistical significance level of 1%. However, for hypothesis H_{1b}, the results turn out to be insignificant as opposed to earlier results. This indicates that sales growth has an effect on the relationship between board size and financial performance, as we see a significant correlation between sales growth and firm performance measures.

Robustness tests (regression (16)-(18)) were also done for hypothesis H_{2a-b} using an alternative indicator for board gender diversity. In this case, a dummy variable was generated for gender diversity among the board members (FEMDUM) measured as 1 if there was at least one female member on the board and 0 otherwise (Li and Chen, 2018).

We find that the results for these additional regressions are in accordance with the previous results. The results for the hypothesis H_{2a-b}, the impact of female board members on firm risk were shown to be significant when using a 10% level, whereas the result for hypothesis H_{2b} remained insignificant when regressions were ran using the dummy variable for gender diversity on the board.

6. Discussion and Conclusion

In a competitive and globalizing market like today's, each company aims to create a competitive edge either by efficiently cutting production costs and setting itself aside through price or through innovating and creating brand value. But both strategies require a thorough understanding of the factors that drive the company value and the risks it takes. Corporate governance today is not just a global practice but a necessity, hence, using different corporate governance mechanisms as tools to moderate financial performance of a company and the risks it faces has become a widely researched topic.

There exists a vast amount of previous literature examining the impact of board structure and its composition over a firm's financial performance. But there are relatively fewer studies that investigate the relationship between board size and corporate risk, especially for the Swedish companies. There are empirical studies documented in the literature concerning the banks and financial institutions that research the correlation between board size and risk-taking but not so many in the other industries.

In this paper, we attempted to examine the systematic relationship between board size and corporate risk-taking choices along with board size and corporate performance. We also studied the impact of board gender diversity on the firm's performance and risk-taking. Furthermore, we evaluated these relationships under the purview of firm size. This study was done for the listed companies in Sweden during the time period 2014-2018.

Our empirical findings exhibited a strong negative correlation between board size and firm's risk-taking, alongside a positive relation between board size and firm's financial performance. This proved that Swedish companies do show a significant impact of board structure on firm's financial and strategic management decisions. Our findings further showed that when moderated for firm size, we see bigger firms to exhibit a less pronounced effect of board size on firm performance. This goes to say, that an additional board member in a smaller company can add more value to the company than an additional board member in a larger firm.

This paper further confronted the long-discussed topic of whether more female board members can affect the risk decision the company makes or the firm's financial performance. While the results supported the previous literature and provided empirical results for a negative correlation between board gender diversity and corporate risk, the paper failed to find a positive relationship between gender diversity among board members and firm performance. One of the reasons for these insignificant results could be the firm's complex and hierarchical structures and the silent learning adopted by the females in the company, end up ratifying any effect that female board members have. Another plausible cause for this could be the various organizational contingency factors that were missing from the model or not moderated for. Previous literature on this has produced mixed results so far, with some supporting a positive relation (Carter et al., 2003; Sabatier, 2015), some arguing for a negative correlation (Adams and Ferreira, 2009; Ahern and Dittmar, 2012), while others like this paper suggesting no significant relation at all (Chapple and Humphrey, 2014; Rose, 2007). Moreover, board gender diversity and firm risk were further examined with firm size moderating the relationship as a contingency factor. The findings of the paper affirmed that smaller firms were better able to realize the risk-averse effect that higher board gender diversity brought with it than the larger firms.

While the reasons and theories behind the results gave us a theoretical aspect of the different relationships, the aim of the paper was to provide not only insight but a practical implication of these findings. We realize that in order to mitigate unnecessary risks and facilitate firm performance, board structure and its composition can, in fact, be used as tools.

The new perspective we shed light on could help the companies and investors move over cost-cutting and mergers and acquisitions to achieve growth targets and tap into a different set of corporate governance mechanisms to help facilitate their corporate performance and manage risk. Another important takeaway would be the use of gender diversity as a means to an end for improving the firm's corporate value and minimizing corporate risks. We know changing board gender diversity in itself is no solution to improve performance but we do understand that higher board gender diversity of Swedish firms does not generate lower firm performance. This implies

that attaining higher board gender diversity in Swedish firms, either by setting certain board gender ratios by law or by empowering women or giving them equal opportunities by choice, can be done without negatively impacting the firm performance or shareholder return. In fact, as proven by this study, a greater number of diverse directors could better monitor the firm, effectively solving problems and making less risky strategic decisions (Zahra and Pearce, 1988; Hillman and Dalziel, 2003). While the paper does provide evidence for a positive correlation between board size and firm performance, it is to note, this relation can be affected immensely if board size was to increase disproportionately or excessively as compared to the firm size. This means, there exists an optimal board number beyond which an increase in board size could potentially affect the firm performance negatively. This follows from the previous literature and decision-making theory that sets down the practical implications of excessive board members as ineffective and slow communication and decision-making process.

Thus, keeping in mind the empirical results, practical implications and new perception into the beneficial effects of board structure and corporate governance, we have come to fulfill the aim of this paper to add to the previous literature some affirming results and practical insights.

7. Limitations and Suggestions for Further Research

This study has been done to produce valid results on the relationship between board structure and corporate financial performance and risk, therefore the limitations of the study need to be addressed. First of all, previous literature has stressed the importance of controlling for board-level control such as the proportion of independent directors, ownership concentration and the competence of board directors (Akbar et al., 2017 and Sai et al. 2014), which have all been shown to affect the board's link to performance and risk. This study has not controlled for these variables due to lack of data and it can, therefore, be considered as a shortcoming of our model specification.

Moreover, our risk measurement for firms (stock volatility) could possibly have some shortcomings. First, following Haider and Fang (2016) the total risk of a firm could instead be measured as the standard deviation of market adjusted monthly stock returns. Their risk measure takes into account the market's value weighted monthly stock return. Second, the total risk of a company, which the stock volatility measure in this study is a proxy for, perhaps does not specifically cover the risk that is affected by decisions made by the board. One could argue that a better proxy for risk that is affected by the board members could be the idiosyncratic risk of a firm. Following Adams (2005) idiosyncratic risk can be calculated as the standard deviation of the residuals from two-index market models. Our suggestion for further research is to use a risk measure that is better covering the impact of board members decisions on the risk of the company. Moreover, due to the results in this field being sensitive to model specification and choice of methodological, we suggest examining alternative methodological techniques, such as instrumental variable estimation to capture potential endogeneity.

Another issue impacting our results is the potential presence of endogeneity. Although we have used a fixed effect model in order to control for some of the endogeneity the issue of reverse causality is still a concern. It is not certain that larger boards lead to a lower total corporate risk or if it is the other way around. One way to control for this issue is to include instrumental variables which help extract exogenous

variables. For example, for the diversity and performance relationship, a variable that could be used as an instrument is the lagged value of the average percentage of female board directors across all the other firms in the same industry.

Furthermore, as our findings are based on Swedish listed firms, we cannot draw conclusions that are applicable to other countries due to the difference in the institutional and social settings in each country that could potentially affect the results. In addition, as our data is restricted to only firms on Nasdaq Stockholm the study becomes biased towards large corporates. Further research could thus extend their analyses to cross-national data and if possible, to firms that are not listed, to see if our results hold.

8. Tables

Table 1: Sample selection

Sample selection process	Observations	Firms
Firms covered by Thomson Reuters Datastream	3995	894
Firms covered by Capital IQ	84	0
Firms covered by Modular Finance + adjustments to balance panel data	-3203	-650
Final sample	876	244

This table show the process of the sample selection. The financial performance data is collected from Thomson Reuters Datastream and Capital IQ and the board structure data is retrieved from the database Modular Finance. First, the financial data from Datastream were complemented by the missing data that could be found in Capital IQ. Next, the financial data and board data were matched into one sample and firms that were not found in both datasets were dropped. Finally, we balanced the final sample by deleting firms having one or more missing value for any of the variables used in the baseline regression for the years between 2014 and 2018.

Table 2: Variable definitions

Key variables	**Definition**	**Source**
Dependent variables		
Tobin's Q	[Market capitalization + Total Liabilities]/ [Total Assets]	Thomson Reuters Datastream and calculated manually
Return on Assets	EBT/ Total Assets	Thomson Reuters Datastream and calculated manually
Annual Stock Volatility	Standard deviation of monthly stock returns calculated using daily stock prices	Thomson Reuters Datastream and calculated manually
Independent variables		
Total board members	Total number of board members	Finance Modular
Percentage of female members on board	Number of females on board/Total number of board members	Finance Modular and calculated manually
Control variables		
Size	Natural logarithm of firm total assets	Thomson Reuters Datastream and calculated manually
Risk	Long-Term Debt/Total Assets	Thomson Reuters Datastream and calculated manually
Firm Age	A number of years since a firm is established	Manually extracted
Capex	Capital Expenditures	Thomson Reuters Datastream
Industry	Industry dummy	Finance Modular

This table include definitions and source of the main variables used in the baseline regressions.

Table 3: Summary statistics

Variable	Mean	SD	Min	Max	25th	Median	75th
Dependent variable							
SV	0.28	0.10	0.00	0.70	0.21	0.25	0.33
ROA	0.07	0.16	-1.74	0.75	0.04	0.08	0.13
Q	1.77	3.06	0.01	56.30	0.78	1.06	1.71
Board characteristics							
TOTAL BOARD MEMBERS	6.59	1.64	1.00	13.00	6.00	7.00	7.00
DIVERSITY	0.30	0.15	0.00	1.00	0.20	0.33	0.40
Control variables							
SIZE	15.09	2.09	9.64	21.81	13.48	15.00	16.48
RISK	0.16	0.17	0.00	0.88	0.00	0.12	0.27
FIRM AGE	51.46	46.90	2.00	329.00	19.00	32.00	72.00
CAPEX	728476	2112213	0	18700000	5950	47169	401237

This table show descriptive statistics of means, standard deviations, minimum values, maximum values and percentiles for the main variables. The dependent variables include stock volatility (SV), return on assets (ROA), and Tobin's Q (Q). The board-level variables include size of a firm (SIZE), long-term debt/total assets (RISK), age of a firm (FIRM AGE) and capital expenditure of a firm (CAPEX). All the detailed definition of each variables can be found in table 2.

Table 4: Pearson's pairwise correlation analysis

	SV_t	ROA_t	Q_t	$TOTBM_t$	$DIVERSITY_{(t-1)}$	$SIZE_{(t-1)}$	$RISK_{(t-1)}$	FIRM $AGE_{(t-1)}$	$CAPEX_{(t-1)}$
SV_t	1								
ROA_t	-0.2199*	1							
Q_t	-0.0217	0.0738*	1						
$TOTBM_t$	-0.3735*	0.0897*	0.0019	1					
DIVERSITY	-0.3384*	0.1188*	0.1257*	0.2453*	1				
$SIZE_{(t-1)}$	-0.4962*	0.1422*	-0.1857*	0.5893*	0.3521*	1			
$RISK_{(t-1)}$	-0.1057*	-0.0210	-0.2427*	0.0892*	0.0936*	0.3703*	1		
FIRM $AGE_{(t-1)}$	-0.2761*	0.0761*	-0.1067*	0.3013*	0.1160*	0.3495*	0.0791*	1	
$CAPEX_{(t-1)}$	-0.2246*	0.0219	-0.0830*	0.2937*	0.1947*	0.4974*	0.2007*	0.0982*	1

This table presents the Pearson's pairwise correlation coefficients between the main variables used in the regressions. Stock volatility (SV), return on assets (ROA), Tobin's Q (Q), Total board members (TOTBM), percentage of females on board (DIVERSITY), size of a firm (SIZE), long-term debt/total assets (RISK), age of a firm (FIRM AGE) and capital expenditure of a firm (CAPEX). All the detailed definition of each variables can be found in table 2. *** $p<0.001$, ** $p<0.05$, * $p<0.01$

Table 5: Baseline regression - Hypothesis 1

Hypotheses	Hypothesis 1a	Hypothesis 1b	
Dependent variables	SV	ROA	Q
Regression	(1)	(2)	(3)
Explanatory variables			
TOTAL BOARD MEMBERS	**-0.248****	**0.000**	**1.116****
	(0.124)	(0.006)	(0.048)
Control variables			
SIZE $_{(t-1)}$	-1.294**	-0.0440	0.791**
	(0.505)	(0.034)	(0.327)
RISK $_{(t-1)}$	-1.147	0.038	-1.811***
	(1.615)	(0.065)	(0.644)
FIRM AGE $_{(t-1)}$	-0.017	-0.018	-0.073
	(1.931)	(0.020)	(0.129)
CAPEX $_{(t-1)}$	-0.000**	0.000	0.000
	(0.000)	(0.000)	(0.000)
Regression details			
Industry-Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Firms	244	244	244
Observations	876	876	876
R^2	0.383	0.200	0.954

This table present the regression results for hypothesis H_{1a-b} where a fixed effects model is used. Hypotheses H_{1a} analyze the relationship between total board members and corporate total risk in terms of stock volatility (SV), is shown in regression (1). Hypotheses H_{1b} the relationship between total board members and financial performance is also examined. The financial performance measures are return on assets (ROA) shown in regression (2) Tobin's Q (Q) shown in regression (3). In all regressions, *SIZE*, *RISK*, *FIRM AGE* and *CAPEX* are used as control variables. All the detailed definitions of each variables can be found in table 2. A one-year lag between the dependent and control variables is used. Robust standard errors, clustered at the firm-level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Baseline regression - Hypothesis 2

Hypotheses	Hypothesis 2a	Hypothesis 2b	
Dependent variables	SV	ROA	Q
Regression	(4)	(5)	(6)
Explanatory variables			
DIVERSITY	**-3.532****	**-0.005**	**0.463**
	(1.174)	(0.054)	(0.634)
Control variables			
$SIZE_{(t-1)}$	1.384***	0.048	0.831**
	(0.497)	(0.033)	(0.349)
$RISK_{(t-1)}$	-1.417	0.039	-1.761***
	(1.584)	(0.064)	(0.639)
$FIRM\ AGE_{(t-1)}$	-0.206	-0.021	-0.095
	(1.907)	(0.020)	(0.131)
$CAPEX_{(t-1)}$	-0.000**	0.000	0.000
	(0.000)	(0.000)	(0.000)
Regression details			
Industry-Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Firms	244	244	244
Observations	876	876	876
R^2	0.391	0.198	0.954

This table present the regression results for hypothesis H_{2a-b} where a fixed effects model is used. Hypotheses H_{2a} analyze the relationship between diversity, in terms of percentage of female members on board, and corporate total risk in terms of stock volatility (SV), which is shown in regression (4). Hypotheses H_{2a} the relationship diversity and financial performance is also examined. The financial performance measures are return on assets (ROA) shown in regression (5) Tobin's Q (Q) shown in regression (6). In all regressions, *SIZE*, *RISK*, *FIRM AGE* and *CAPEX* are used as control variables. All the detailed definitions of each variables can be found in table 2. A one-year lag between the dependent and control variables is used. Robust standard errors, clustered at the firm-level, are in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Baseline regression - Hypothesis 1c and 2c

Hypotheses	Hypothesis 1c			Hypothesis 2c		
Dependent variables	SV	ROA	Q	SV	ROA	Q
Regression	(7)	(8)	(9)	(10)	(11)	(12)
Explanatory variables						
TOTAL BOARD MEMBERS*SIZE	0.032	0.000	-0.066**			
	(0.048)	(0.002)	(0.027)			
DIVERSITY*SIZE				0.940*	0.030	0.437
				(0.568)	(0.020)	(0.406)
TOTAL BOARD MEMBERS	-0.737	-0.002	1.140**			
	(0.787)	(0.035)	(0.448)			
DIVERSITY				-17.32**	-0.439	-6.083
				(8.566)	(0.289)	(6.487)
Control variables						
$SIZE_{(t-1)}$	1.156**	0.042	1.097***	1.272**	0.043	0.770**
	(0.585)	(0.030)	(0.091)	(0.526)	(0.032)	(0.346)
$RISK_{(t-1)}$	-1.186	0.038	-1.807***	-1.376	0.041	-1.731***
	(1.629)	(0.065)	(0.653)	(1.617)	(0.064)	(0.630)
FIRM $AGE_{(t-1)}$	-0.053	-0.019	-0.007	-0.324	-0.024	(0.162)
	(1.929)	(0.020)	(0.116)	(1.929)	(0.019)	(0.097)
$CAPEX_{(t-1)}$	-0.000**	0.000	0.000	-0.000**	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Regression details						
Industry-Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Firms	244	244	244	244	244	244
Observations	876	876	876	876	876	876
R^2	0.384	0.200	0.955	0.396	0.200	0.279

This table shows the regression results for hypothesis H_{1c} and $H_{2c.}$ A fixed effects model is used for H_{1c} to analyze if the relationship between board size and corporate financial performance is less pronounced for bigger firms by using an interaction variable, SIZE*TOTBM, which is a product of the TOTAL BOARD MEMBERS variable and SIZE variable. The financial performance measures are return on assets (ROA) shown in regression (8) Tobin's Q (Q) shown in regression (9). We also examine (H_{2c}) if the relationship between board size and DIVERSITY is less pronounced for bigger firms by using an interaction variable, SIZE*DIVERSITY, which is a product of the DIVERSITY variable and SIZE variable. The firm risk measure is stock volatility (SV) shown in regression (10). Size of a firm (SIZE), long-term debt/total assets (RISK), age of a firm (FIRM AGE) and capital expenditure of a firm (CAPEX) are used as control variables for all of our regressions. A one-year lag between the dependent and control variables is used. Robust standard errors, clustered at the firm-level, are in parentheses. $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 8: Robustness test – alternative diversity variable and adding a control variable

Hypotheses	Hypothesis 1a-b			Hypothesis 2a-b		
Robustness test	Sales growth control variable			Alternative diversity variable		
Dependent variables	SV	ROA	Q	SV	ROA	Q
Regression	(13)	(14)	(15)	(16)	(17)	(18)
Explanatory variables						
TOTAL BOARD MEMBERS	-0.228*	-0.000	-0.008			
	(0.132)	(0.006)	(0.021)			
FEMDUM				-1.094*	0.015	0.024
				(0.581)	(0.034)	(0.106)
Control variables						
$SIZE_{(t-1)}$	1.280**	0.057*	-0.012	1.420***	0.045	-0.012
	(0.499)	(0.030)	(0.091)	(0.499)	(0.034)	(0.090)
$RISK_{(t-1)}$	-1.119	0.017	0.111	-1.528	0.043	0.085
	(1.615)	(0.064)	(0.220)	(1.635)	(0.063)	(0.223)
FIRM $AGE_{(t-1)}$	-0.020	-0.019	-0.073	-0.109	-0.018	-0.066
	(1.932)	(0.019)	(0.098)	(1.912)	(0.021)	(0.097)
$CAPEX_{(t-1)}$	-0.000**	0.000	-0.000	-0.000**	0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
SALES $GROWTH_{(t-1)}$	0.028	-0.008***	0.009***			
	(0.017)	(0.002)	(0.003)			
Regression details						
Industry-Year FE	YES	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES	YES
Firms	244	244	244	244	244	244
Observations	876	876	876	876	876	876
R^2	0.383	0.258	0.291	0.384	0.199	0.279

This table shows the regression results of our robustness test. For hypothesis H_{1a-b} the variable SALES GROWTH, is added as a control variable which is shown regression (13)-(15). For hypothesis H_{2a-b} FEMDUM, an alternative indicator for board gender diversity is used as the explanatory variable instead of percentage of female on board variable (DIVERSITY). For the variable FEMDUM we generate a dummy variable measured as 1 if there is at least one female member on the board and 0 otherwise. Size of a firm (SIZE), long-term debt/total assets (RISK), age of a firm (FIRM AGE) and capital expenditure of a firm (CAPEX) is used as control variables for all of our regressions. A one-year lag between the dependent and control variables is used. Robust standard errors, clustered at the firm-level, are in parentheses *** p<0.01, ** p<0.05, * p<0.1

Table 9: VIF-tests to detect severe multicollinearity

(1)			(2)		
Variable	VIF	1/VIF	Variable	VIF	1/VIF
TOTBM	1.82	0.5493	DIVERSITY	1.19	0.8397
SIZE	2.48	0.4026	SIZE	1.91	0.5239
RISK	1.22	0.8180	RISK	1.17	0.8544
FIRM AGE	1.20	0.8331	FIRM AGE	1.17	0.8533
CAPEX	1.36	0.7354	CAPEX	1.36	0.7352

This table show the variance inflation factors (VIF) for the main independent variables used in our regressions. Test (1) show VIFs for the regressions with the total board member explanatory variables. Test (2) show VIF values for the regressions with the explanatory variable DIVERSITY (percentage of females on board). A rule of thumb is that a VIF value above 10 indicate presence of severe multicollinearity.

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