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The Impact of Board Gender Diversity on Dividend Policies: Evidence from Swedish Listed Firms

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Abstract

This study explores the relationship between board gender diversity and dividend payments. The research is conducted using 3,763 observations of firms listed on the Swedish regulated markets between 2003 and 2022. We employ fixed effects OLS regressions and find evidence that firms with a higher fraction of female directors in their boards exhibit higher dividend payments. Our results suggest that the positive impact of independent female board directors is stronger than that of executive female board directors. Moreover, the positive effect on dividend payments is most prominent for firms with three or more female board directors, constituting a critical mass. The results show robustness when tested with instrumental variable regressions, lagged independent variable regressions, and propensity score matching. We conclude that increased board gender diversity can be an effective monitoring tool to mitigate agency problems and promote shareholder interests.

Keywords

Board Gender Diversity, Dividend Policy, Corporate Governance, Agency Theory, Critical Mass, Female Board Directors.

JEL Classification

G30, G35, J16

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1 Introduction

By 2026, at least 40% of non-executive board positions in listed firms across EU member states should be held by women, following a new directive from the Council of the European Union (2024). The intentions of the directive include enhancing competitiveness, boosting economic growth, and strengthening female participation in economic decisions. Nevertheless, board gender quotas have already been implemented by several countries, including Spain, France, Belgium, Italy, and Germany (Teigen, 2022). The effect of these quotas has varied largely, possibly due to weak sanctions imposed on firms not complying to the regulations (Teigen, 2021). As a result, some of the quotas have functioned more as recommendations rather than obligations.

As depicted in Figure 1, the female board representation in Sweden has increased significantly in the last 20 years, reaching 33.6% in 2022. This has been achieved without implementing any gender quotas, underscoring the importance of societal pressure and firms' own motivation to increase diversity in their boards. During our sample period, the average female board representation in Swedish listed firms is 25%, which is notably higher than that of previous research in this field. Studies report an average female board participation of 10.3% in the US (Chen et al., 2017), 8.9% in Australia (Gyapong et al., 2021), 12.8% in China (Ain et al., 2021) and 7.8% in Spain (Pucheta-Martínez and Bel-Oms, 2016). This distinction places our study in a new setting, where women have increasingly gained more power and influence in economic decision-making.

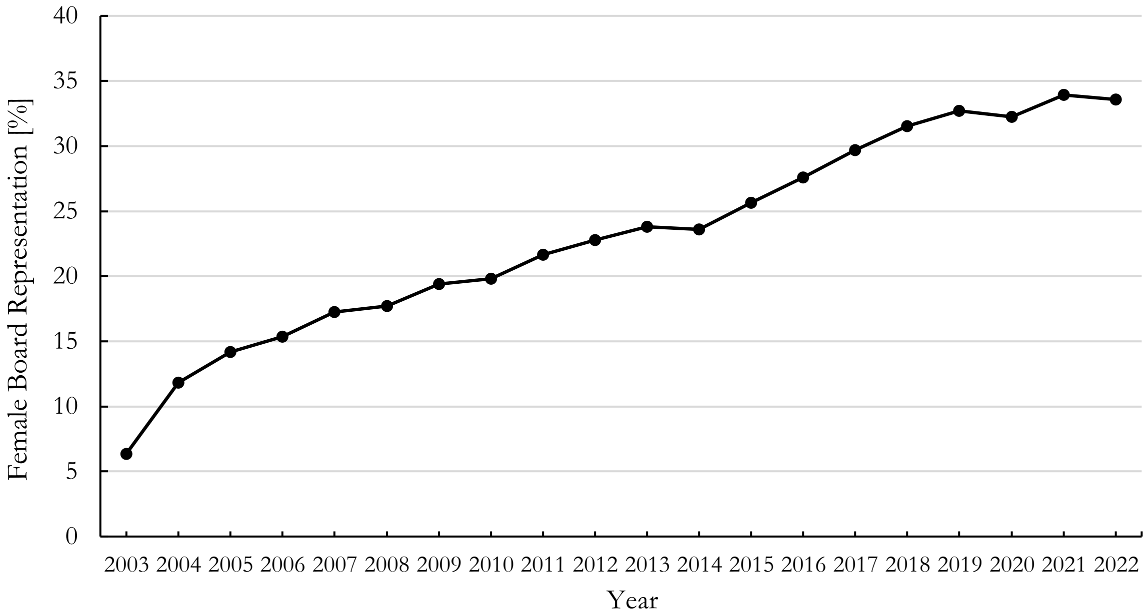

Figure 1: The 20-Year Trend of Female Board Representation in Swedish Listed Firms

Note: The graph is based on our data sample defined in Section 4.1.

A growing body of finance literature has studied the effect of board gender diversity on several firm performance measures, such as return on assets (ROA), return on sales (ROS), and firm value (Carter et al., 2010; Campbell and Minguez-Vera, 2008; Gyapong et al., 2016; Liu et al., 2014). Yet, the impact of board gender diversity on corporate decisions, such as dividend policy, remains a relatively unexplored field. The advantage of studying the effect of gender diversity on dividend policy is that corporate decisions are unlikely to be indirectly influenced by the gesture of symbolic diversity (Byoun et al., 2016). On the other hand, firm performance may increase with improved diversity, due to attracting talented employees and new customers, rather than enhancing firm operations directly (Thomas and Ely, 1996).

The purpose of this study is to examine if board gender diversity can enhance the use of dividends as a monitoring mechanism, by providing the board with a wider spectrum of perspectives, reducing group thinking and the risk of ineffective decisions. Besides being a function for allocating profits to shareholders and managing investor expectations, firms' dividend policies play an important role in counteracting the principal-agent problem. Jensen (1986) propose that by distributing the excessive free cash flow to shareholders, the resources which could be misappropriated by managers are diminished. In this regard, dividend policy serves as a monitoring function, approved by the board of directors, aligning interests of shareholders and executives. By increasing the effectiveness of monitoring and board decision-making, we expect gender-diverse boards to distribute higher dividends.

To the best of our comprehension, no prior research has studied the effect of board gender diversity and dividend payments in any of the Nordic countries. Our study adds to previous research by analyzing an unexplored market with specific market dynamics. The Swedish market is characterized by high minority shareholder protection and concentrated equity ownership, forming the institutional setting of the study (Henrekson and Jakobsson, 2012; Holmén and Knopf, 2004).[1] Further, the studied market distinguishes itself from those of previous studies, by exhibiting high levels of overall gender equality.[2] This could imply a lower glass ceiling where women feel confident in the corporate environment, thereby enhancing their impact in the boardroom.

[1] Shareholder protection refers to formal corporate governance mechanisms put in place to protect minority shareholder rights, including to ensure fair and transparent dividend policies (La Porta et al., 2000).
[2] Sweden is ranked 1st in the European Gender Equality index since 2013 (European Institute for Gender Equality, 2023).

We investigate the relationship between female board representation and dividend payments by analyzing 3,763 observations of Swedish listed firms, spanning between 2003 and 2022. Our hypothesis posits that a higher fraction of females in a firms' board is correlated with higher dividend payments. We further hypothesize that this relationship is stronger for independent female board directors compared to their executive counterparts. Moreover, we suggest that three or more female board directors have a more pronounced impact on dividend payments. By employing OLS regressions with industry and year fixed effects, we capture the effect of six different measures of board gender diversity on total dividend payments and dividends to total assets. Our findings suggest a positive and significant relationship between the fraction of female board directors and dividend payments. Additionally, we find that independent female board directors have a positive and significant impact on dividend payments, whereas no association is observed for female executive board directors. We also find evidence for the critical mass theory, suggesting that having three or more female board directors is associated with higher dividend payments. A critical mass is achieved when a firm appoints three or more females to its board, normalizing the presence of women and helping to break the male-dominated group dynamic (Konrad et al., 2008).

A general concern when conducting empirical research is the presence of endogeneity, where the observed association is driven by other factors than the interest variable itself. To address the potential endogeneity issues, we conduct three verification methods: instrumental variable regressions, lagged independent variable regressions, and propensity score matching. In the instrumental variable regressions, we address omitted variable bias by utilizing two instruments: the industry average of female board directors and the one-year lag of female board directors. Further, we employ lagged independent variable regressions, where the fraction of female board directors is lagged one, two and three years, to show robustness to reverse causality. Finally, we utilize propensity score matching to estimate the effect of female board directors on dividend payments, comparing firms with similar probabilities of hiring women to their boards. All three methods support our main results, showcasing a causal relationship between female board representation and dividend payments. Additionally, our findings are robust to alternative estimation techniques and different definitions of dividends and board gender diversity. The conclusions remain valid when controlling for stressed economic conditions.

The outcome of our study is in line with previous studies by Gyapong et al. (2021), Chen et al. (2017), and Byoun et al. (2016). These studies have been conducted in similar institutional settings, characterized by high shareholder protection (Australia and US), which could explain the similar findings. However, when looking at studies conducted in emerging countries characterized by low shareholder protection, our results differ significantly. In contrast to our findings, Saeed and Sameer (2017) find a negative relationship between female board representation and dividends in Russia, India and China. Interestingly, Ain et al. (2021) discover a positive impact of female board directors on dividend payments in their study conducted on the Chinese market, whereas McGuinness et al. (2015) find no impact, contrasting with findings by Saeed and Sameer (2017). Additionally, Pucheta-Martínez and Bel-Oms (2016) find a positive association between board gender diversity and dividend payments in Spain, which is a country characterized by low independence on boards, high ownership concentration and less developed capital markets. The contrasting results sheds light on the complexity of the broader institutional setting when assessing the impact of board gender diversity on corporate decisions, as corporate governance practices and norms may vary across different countries. Hence, the individual characteristics of specific markets could be explanations to why our results differ to some previous studies.

Our findings offer valuable contributions and implications to the existing literature. Previous studies have suggested that women are more risk-averse than men (Charness and Gneezy, 2012; Eckel and Grossman, 2008; Dwyer et al., 2002). Our results suggest that boards with a higher fraction of female directors does not show signs of higher levels of risk-aversion, as they tend to distribute more dividends to investors. The results contribute to questioning the overall perception of female decision-making in the corporate environment, where the narrative is that women are more sensitive to losses and less prone to take high risks. Moreover, our findings indicate that directives promoting board gender balance could benefit shareholders by improving monitoring and reducing agency conflicts. Additionally, our study contributes to the understanding that board gender diversity can strengthen corporate governance, potentially influencing firms' board composition choices.

The remainder of the study is structured in the following way: Section 2 contains a detailed outline of the results from previous empirical research conducted within the field. Section 3 encompasses the main theoretical framework and the development of the study's three hypotheses. Section 4 outlines the data sample and methodology used throughout the study. The main results are reported in Section 5, followed by an exposition of endogeneity concerns and robustness tests. Finally, Section 6 includes a discussion of the study's conclusions, implications, and future research.

2 Literature Review

2.1 Board Gender Diversity and Firm Performance

Multiple studies show a positive relationship between board gender diversity and firm performance (Carter et al., 2010; Campbell and Minguez-Vera, 2008; Gyapong et al., 2016; Liu et al., 2014). Gyapong et al. (2016) study the effect of gender and ethnic diversity and find a significant positive impact on firm value. They also find that the impact of gender diversity on firm value is the greatest when there are more than three female directors in the board. Similarly, Liu et al. (2014) find that the percentage of female directors has a positive impact on firm performance measured by return on sales (ROS) and return on assets (ROA) in Chinese firms. The positive effect of executive female directors on firm performance is more pronounced compared to independent female directors. The authors further conclude that the number of female board directors matter, where three or more female directors have a stronger impact on performance, supporting the critical mass theory. On the contrary, Adams and Ferreira (2009) conduct a study on US firms and find a negative relationship between the fraction of female directors and firm performance. The authors conclude that the negative relationship may be a result of excessive monitoring by female directors. Additionally, Marinova et al. (2016) find no association between the existence nor fraction of female board directors and firm performance in the Netherlands and Denmark.

2.2 Board Gender Diversity, Corporate Governance, and Dividend Policies

Gender-diverse boards may exhibit higher efficiency in corporate governance efforts and crucial corporate decisions. According to Adams and Ferreira (2009), female board directors are more likely than men to sit on committees which focus on monitoring, such as auditing, nomination, and corporate governance committees. Additionally, female directors attend more board meetings than their male counterparts, suggesting higher engagement in firm monitoring. Further, empirical research suggests contrasting effects of gender diversity on the ability to implement strategic changes in firms. Del Carmen Triana et al. (2014) describe gender diversity as a "double-edged sword", with its effect being contingent on firm performance. Firms enjoy positive effects of board gender diversity and strategic change when performing well, whereas the opposite holds true when firm performance is low. Female board directors may also have an impact on other strategic decisions, such as mergers & acquisitions. Levi et al. (2014) find that firms with a higher fraction of female directors have a lower propensity to go through with acquisitions, due to lower overconfidence of potential gains. Firms with a higher proportion of female directors also pay a lower bid premium in the acquisitions they participate in, creating higher value for shareholders.

Another important corporate decision is the firm's dividend policy, where the observed effect of board gender diversity suggest ambiguous results. Studies conducted on the US (Chen et al., 2017) and Chinese market (Ain et al., 2021) find that a higher percentage of female board directors is associated with higher dividend payouts. The results show robustness when tested with the instrumental variable approach and propensity score matching, as well as different definitions of dividend payments and female board representation. Similarly, Byoun et al. (2016) suggest a positive relationship between gender and ethnic board diversity and dividend policy, concluding that diverse boards mitigate conflicts between executives and shareholders by enhancing monitoring. Gyapong et al. (2021) study the largest listed firms in Australia, a country where high shareholder protection prevails. The authors report evidence of a positive relationship between the fraction of female board directors and dividend payments, both in absolute terms and in relation to net income. Similarly, Pucheta-Martínez and Bel-Oms (2016) study Spanish firms and identify a positive relationship between the fraction of female board directors and the propensity to pay dividends, as well as the magnitude of the dividend.

In contrast, research conducted on emerging economies, including India, China and Russia, suggest a negative relationship between dividend payments and female board directors (Saeed and Sameer, 2017). The authors conclude that their result can be explained by the ineffective regulatory landscape in emerging markets, requiring firms to adopt cautious financing strategies. Further, research performed on the UK market also suggests a negative association between female board representation and dividend payments in small and medium enterprises (Elmagrhi et al., 2017). In this setting, the negative association may suggest that gender-diverse boards focus more on finding profitable investments rather than distributing funds to shareholders (Saeed and Sameer, 2017; Conyon and He, 2017). Finally, McGuinness et al. (2015) do not find any effect of board gender diversity on dividend payout in China, suggesting no discrepancy in risk-aversion and financial knowledge between men and women.

There is evidence that board independence affects the efficiency of monitoring and dividend policies (Jaggi et al., 2009; Chen et al., 2017). Non-executive board directors may have greater incentives to increase firm transparency and work towards reducing managerial insulation and expropriation of resources (Knyazeva et al., 2013; Jiraporn et al., 2016; Setia-Atmaja et al., 2011). Aligned with this research, Ain et al. (2021) find that independent female board directors have a positive impact on dividend payments, whereas executive female board directors have no significant impact. Results from Gyapong et al. (2021) also suggest that only independent female board directors influence dividend payments positively. In contrast, the results of Pucheta-Martínez and Bel-Oms (2016) are ambiguous. The authors' results indicate that the fraction of independent female board directors does not have a significant impact on dividend payments when their entire sample is utilized. However, when considering only observations with positive net income, the result becomes significant, suggesting a positive relationship between independent female board directors and dividend payments. Aligned with Ain et al. (2021) and Gyapong et al. (2021), the authors find no effect of female executive directors on dividend payments. The evidence of the studies suggest that independent and executive female directors cannot be interpreted as a uniform group (Ain et al., 2021; Gyapong et al., 2021).

Preceding research has shown support for the critical mass theory in the context of board gender diversity and dividend payments. Ain et al. (2021) find evidence for the critical mass theory, reporting that firms with three or more female board directors have a larger effect on dividend payments. Gyapong et al. (2021) find similar results, suggesting that the presence of three or more female directors leads to higher influence over dividend policies and consequently higher dividend payments. According to Nielsen and Huse (2010), the benefits of including female directors in the boardroom may not be fully captured if the inclusion is merely a symbolic gesture to be perceived as gender-diverse by stakeholders. Rather, the inclusion of female directors should be a part of a strategic plan, where female directors are appointed based on merit and qualifications (Hillman et al., 2007; Torchia et al., 2011).

2.3 Women and Risk Aversion

An emerging body of research and experiments suggest that women tend to be more risk-averse than men (Charness and Gneezy, 2012; Eckel and Grossman, 2008). Dwyer et al. (2002) study mutual funds and find that female managers are less prone to take high risks compared to their male counterparts, though the difference is less pronounced when accounting for financial knowledge. The tendency to retain more cash may increase with higher risk aversion, suggesting that women are more restricted in the distribution of dividends (Bae et al., 2012; Khambata and Liu, 2005). Further studies suggest that women are more sensitive to losses rather than gains, which is a result of differences in estimating the probability of potential outcomes (He et al., 2008; Fehr-Duda et al., 2006; Olsen and Cox, 2001). These results may also indicate that female directors are more risk-averse and restrictive with regards to dividend policy during stressed economic conditions. The results of a study by Gyapong et al. (2021) suggests that female directors were more likely to restrain the distribution of dividends during the 2008 financial crisis.

3 Theory

3.1 Agency Theory

Understanding the relationship between a firm's board of directors and dividend policy is crucial within the agency theory framework (Fama and Jensen, 1983). In the concept of the firm, the shareholders act as principals, and the board of directors function as agents. Thereby, the board of directors are responsible for managing the company in the interest of the shareholders. However, when interests between the shareholders and board of directors are not aligned, agency problems can arise. This problem occurs as there is a separation between ownership and control, which leads to agency costs in the form of monitoring, structuring, and enforcing contracts between the parties.

Some effective tools to mitigate agency costs are dividend policy, debt financing and managerial ownership of equity (Bathala and Rao, 1995). Dividend distribution can reduce agency problems by keeping firms in the capital markets, where costs of monitoring are lower, and reduce excessive risk-taking by managers (Easterbrook, 1984). Further, by distributing free cash flow to shareholders, the resources under managers' control are reduced (Jensen, 1986). Excessive free cash flow which is not distributed to shareholders could potentially be used to fund negative net present value projects, and hence lead to inefficiencies. On the other hand, managers have incentives to retain cash and avoid the payout of dividends, as increasing firm size has a positive impact on their own compensation and private benefits. In alignment with agency theory, executive board directors may have less incentives to increase dividend payments, preferring to maintain control by retaining cash and investing in internal projects (Pucheta-Martínez and Bel-Oms, 2016).

3.2 Resource Dependence Theory

The resource dependence theory, first proposed in 1978 by Pfeffer and Salancik (2003), suggests that a firm must rely on resources from their external environment to survive. However, this reliance exposes firms to risks, which can be addressed by establishing connections with those controlling these resources. By appointing board directors with specific skills and connections, firms can reduce their dependence and the associated uncertainty. Hence, corporate boards act as a bridge connecting a firm with its environment and the external resources it relies upon, by providing the firm with expertise, increased legitimacy, and connection to a broader network.

Hillman et al. (2007) link the resource dependence theory to female board representation, suggesting that a more diverse board leads to a wider spectrum of perspectives, hence providing the board with more information when dealing with complex issues. Continuously, Burton et al. (1995) find that gender-diverse boards reduce erroneous decisions and decrease the risk of firm failure. Further, by appointing female board directors, a firm can improve its reputation towards larger stakeholders, financiers, and the public, which in turn can ease the firm's resource acquisition (Hillman et al., 2007). Lastly, female board directors may bring unique networks that increase the firm's access to resources, including capital, while also providing access to other female directors, female customers, or the female labor force.

In summary, the theories support that female board representation leads to more efficient decision-making processes, fostering shareholder interests and reducing agency problems (Gul et al., 2011). Additionally, Byoun et al. (2016) suggest that the effect of board diversity on dividend payments is greater for firms with more pronounced agency conflicts, where a higher fraction of females helps to alleviate conflicts between corporate executives and the external environment. In accordance with agency theory and resource dependence theory, as well as considering the predominant results of previous empirical studies (Chen et al., 2017; Ain et al., 2021; Gyapong et al., 2021; Byoun et al., 2016), we hypothesize:

H1: Female board representation has a positive association with dividend payments.

H2: The positive association between female board representation and dividend payments is stronger for female independent directors compared to female executive directors.

3.3 Critical Mass

The critical mass theory can explain why the impact of increasing diversity in firm boards becomes more pronounced after a certain threshold is reached. In a skewed group, the few individuals not belonging to the dominant type are identified as tokens (Kanter, 1977). Within the context of corporate boards, a single female board director can be considered a token, whose performance and ability to raise her voice and make an impact are diminished by being underrepresented (Kanter, 1977; Konrad et al., 2008). Konrad et al. (2008) highlights the impact of achieving a critical mass of female board directors, by helping break women stereotypes and a male-dominated group dynamic. The authors suggest that moving from a single or two women to three or more has a greater impact, normalizing the presence of women and constituting a critical mass that can create change. The representation of women on board is beneficial, as women tend to ask tough questions and bring valuable new perspectives on issues, improving the efficiency of board decisions. Previous research show evidence supporting the critical mass theory, suggesting that board gender diversity has an effect only after a certain threshold of female directors (Joecks et al., 2013). Empirical studies report a stronger positive effect of female board directors on firm performance (Liu et al., 2014) and dividend payments (Gyapong et al., 2021; Ain et al., 2021) for firms with more than three female directors. In accordance with the critical mass theory and previous research, we hypothesize:

H3: Firms reaching a critical mass of three or more female board directors exhibit a more pronounced positive impact on dividend payments.

4 Data and Methodology

4.1 Sample

The data sample in this study is retrieved from two main sources. The financial data is collected from Refinitiv Eikon (formerly Thomson Reuters), and board characteristics data is retrieved from annual reports provided by Retriever Business. The dataset consists of yearly observations spanning between 2003 and 2022, encompassing Swedish firms listed on the regulated markets Nasdaq OMX Stockholm and Nordic Growth Market. Firms delisted during the research period are incorporated into the data sample to mitigate survivorship bias. With the data sources available, this expands the dataset with 59 unique firms. Financial firms are excluded, as these firms tend to have unique characteristics and are subject to different regulatory standards, which could make the results biased (Saeed and Sameer, 2017; Gyapong et al., 2021). This selection leaves us with 318 unique firms and 3,763 firm-year specific data points, forming an unbalanced panel dataset. A detailed overview of the distribution of observations is presented in Section 5.1.1.

4.2 Variable Measurement

The study's variable of interest is female board representation, which is captured through six different measures, aligning with previous research on gender diversity in boards and its relation to dividend policies (Gyapong et al., 2021; Chen et al., 2017; Ain et al., 2021). Firstly, as the fraction of female directors in a firm's board (Fem), calculated as total female board directors over total number of board directors. Secondly, as the proportion of female independent directors in a firm's board (FemInd), calculated as total female independent board directors over total number of board directors. Thirdly, as the proportion of female executive directors in a firm's board (FemExec), calculated as total female executive board directors over total number of board directors. In addition to these continuous measures, three dummy variables are created to test the critical mass theory. The first dummy variable equals one if the firm has one female board director and zero otherwise (Fem1). Similarly, the second dummy variable equals one if the firm has two female board directors and zero otherwise (Fem2). Finally, the third dummy variable equals one if a firm has three or more female board directors and zero otherwise (Fem3).

The dependent variable is defined in two ways, similar to those utilized in previous studies. Firstly, as the natural logarithm of total dividends paid by the firm (LogDiv) (Gyapong et al., 2021; Pucheta-Martínez and Bel-Oms, 2016). Secondly, as the total dividends paid by the firm over total assets (DivTA) (Ain et al., 2021). In addition, two alternative measures are used for robustness testing: total dividends over net income (DivNI) (Ain et al., 2021), and as a dummy variable which takes the value one if the firm pays dividends and zero otherwise (DivDummy) (Pucheta-Martínez and Bel-Oms, 2016).

Furthermore, in consistence with previous studies in this field, several relevant control variables are utilized: board independence (BInd), natural logarithm of board size (LogBSize), return on total assets (ROA), price-to-book (PB), natural logarithm of firm size (LogFSize), leverage (Lev), retained earnings over total assets (RetTA), and CEO board membership (CEOinB). Previous literature finds that board independence and dividend payout have a positive association (Chintrakarn et al., 2022; Saeed and Sameer, 2017), suggesting that enhanced governance is characterized by greater board independence. Board independence is captured by the fraction of independent directors and a dummy variable that takes the value one if the CEO is a board member and zero otherwise. Moreover, board size is expected to have a positive effect on dividend payments (Pucheta-Martínez and Bel-Oms, 2016; Saliya and Dogukanli, 2022; Thompson and Adasi Manu, 2021), as a larger board is positioned to include stakeholders advocating for minority shareholder interests.

Firm performance, measured by ROA, is reported to be positively associated with dividend payments (Saeed and Sameer, 2017; Byoun et al., 2016; Ain et al., 2021). Gyapong et al. (2021) suggest a positive association between dividend payments and price-to-book ratio, whereas Esqueda (2015) argues for a negative relationship, due to the access to more investment opportunities for high price-to-book firms. According to previous literature, larger firms tend to have higher dividend payments, suggesting a positive relationship between firm size and dividends (Pucheta-Martínez and Bel-Oms, 2016; Saeed and Sameer, 2017). Firms with higher leverage ratio are documented to have lower dividend payouts, as they need more cash internally for payments to creditors (Pucheta-Martínez and Bel-Oms, 2016; Jensen et al., 1992). Lastly, retained earnings are expected to have a positive effect on dividend payments (Byoun et al., 2016; DeAngelo et al., 2006). To account for unobservable variations in dividend payments across industries and time, we include dummies for each industry and year in the regression models. This approach is consistent with previous studies, which assert that differences in dividend payments exist across these groups (Byoun et al., 2016; Gyapong et al., 2021; Ain et al., 2021). The variables used in the regression models are summarized in Table 1.

Table 1: Variable Descriptions

Variable	Definition
Dependent variables	
Div	Total dividends (million SEK)
LogDiv	Natural logarithm of total dividends
DivTA	Total dividends over total assets
DivDummy	Dummy variable, equals 1 if firm pay dividends; otherwise 0
DivNI	Total dividends over net income
Independent variables	
Fem	Female board directors over total number of board directors
FemExec*	Executive female board directors over total number of board directors
FemInd**	Independent female board directors over total number of board directors
Fem1	Dummy variable, equals 1 if there is 1 female in the board; otherwise 0
Fem2	Dummy variable, equals 1 if there are 2 females in the board; otherwise 0
Fem3	Dummy variable, equals 1 if there are 3 or more females in the board; otherwise 0
Control variables	
BInd**	Independent board directors over total number of board directors
BSize	Total number of board directors
LogBSize	Natural logarithm of total number of board directors
ROA	Net profit over total assets
PB	Market-price per share over book-value per share
FSize	Total assets (million SEK)
LogFSize	Natural logarithm of total assets
Lev	Total debt over total assets
RetTA	Retained earnings over total assets
CEOinB	Dummy variable, equals 1 if the CEO is a member of the board; otherwise 0
Industry	Dummies for each industry according to Fama-French 12 industry classification: Consumer Non-Durables, Consumer Durables, Manufacturing, Energy, Chemicals, Business & Software, Telecom, Financials (excluded), Utilities, Wholesale & Retail, Healthcare, Other
Year	Dummies for each of the 20 years from 2003 to 2022

Note: *Executive board directors are defined as board members who also hold executive positions in firm management. **Independent board directors are defined as board members who hold no executive positions in firm management.

4.3 Estimations

To estimate the coefficients of the independent variables, we run OLS regressions with industry and year fixed effects. Multiple studies use similar approaches to capture the effect of female board representation on dividend policies (Ain et al., 2021; Gyapong et al., 2021; Chen et al., 2017). All variables fulfil the stationarity assumption, as indicated by the Augmented Dickey-Fuller test, suggesting that estimated coefficients are unlikely to suffer from bias and reliability issues. Further, by conducting Durbin-Watson tests, we conclude that the data show signs of serial correlation, which promotes the use of a fixed effects model with time-variant effects. After performing Hausman tests to compare fixed or random effects in our models, we further conclude that the fixed effects approach is the most suitable. Additionally, autoregressive conditional heteroskedasticity (ARCH) tests were conducted to test the models for heteroskedasticity. The null hypothesis was rejected, hence there is evidence for heteroskedasticity within the models.[3] To remedy this, robust standard errors clustered on firm level have been applied to all regressions. In consistency with prior studies, we employ the natural logarithm of the variables Div, FSize and BSize (Ain et al., 2021; Gyapong et al. 2021). This approach aims to mitigate the impact of skewness and extreme outliers in our results.

The model specifications are as follows:

$$Y_{i,\,t+1}=\beta_0+\beta_1 Fem_{i,\,t}+\beta_2 BInd_{i,\,t}+\beta_3 LogBSize_{i,\,t}+\beta_4 ROA_{i,\,t}+\beta_5 PB_{i,\,t}+\beta_6 LogFSize_{i,\,t} + \beta_7 Lev_{i,\,t}+\beta_8 RetTA_{i,\,t}+\beta_9 CEOinB_{i,\,t}+ Industry + Year + \epsilon_{i,t} \quad (1)$$

$$Y_{i,\,t+1}=\beta_0+\beta_1 FemExec_{i,\,t}+\beta_2 FemInd_{i,\,t}+\beta_3 BInd_{i,\,t}+\beta_4 LogBSize_{i,\,t}+\beta_5 ROA_{i,\,t} + \beta_6 PB_{i,\,t}+\beta_7 LogFSize_{i,\,t}+\beta_8 Lev_{i,\,t}+\beta_9 RetTA_{i,\,t}+\beta_{10} CEOinB_{i,\,t}+ Industry + Year + \epsilon_{i,\,t} \quad (2)$$

$$Y_{i,\,t+1}=\beta_0+\beta_1 Fem1_{i,\,t}+\beta_2 Fem2_{i,\,t}+\beta_3 Fem3_{i,\,t}+\beta_4 BInd_{i,\,t}+\beta_5 LogBSize_{i,\,t}+\beta_6 ROA_{i,\,t} + \beta_7 PB_{i,\,t}+\beta_8 LogFSize_{i,\,t}+\beta_9 Lev_{i,\,t}+\beta_{10} RetTA_{i,\,t}+\beta_{11} CEOinB_{i,\,t}+ Industry + Year + \epsilon_{i,\,t} \quad (3)$$

where i and t represent each firm observation and year, respectively. The dependent variable Y is measured by LogDiv and DivTA. Fixed effects are captured by the variables Industry and Year, and ϵ is the error term. Variable definitions are stated in Table 1.

[3] Appendix A includes all test results. See Table A1 for the Dickey-Fuller test and Table A2 for the Durbin-Watson, Hausman, and ARCH tests.

5 Analysis and Results

5.1 Descriptive Statistics

5.1.1 Summary Statistics

As depicted in Table 2, the average total dividend for our sample is 503.207 million SEK, and the average total dividend to total assets ratio is 2.8%. Additionally, 61.9% of the firms in our sample pay dividends, where firms distribute on average 36% of their net income to shareholders. Moreover, the sample firms' board composition consists of 25% female directors on average during the research period. Among those, 24.9% are independent directors, while the rest hold executive positions in the firm. We utilize three dummy variables, Fem1, Fem2 and Fem3, to represent the presence of female board directors. The mean values indicate that, on average, 29.3% of the sample firms have one female board director, 30.2% have two female board directors, and 27.4% have three or more female board directors. Hence, a majority of the sample firms' board composition does not reach the requirement of a critical mass.

Examining the firms' general board characteristics, the average board size is approximately 7 directors and 94% of board directors are independent. In 37.8% of the firms, the CEO has a dual role, by also serving as a board director. Analyzing the financial aspects of the sample firms, the average return on total assets is 0.7%, the average price-to-book ratio is 3.389, the average firm size is 16,504.670 million SEK (measured in total assets), the average firm leverage is 20.8%, and the average retained earnings to total assets ratio is -0.068.

Table 2: Descriptive Statistics

Variable	Obs.	Mean	Std. dev.	Min	P25	Median	P75	Max
Div	3,763	503.207	1,916.164	0	0	22.105	215	49,820
LogDiv	3,763	3.025	2.831	-1.845	0	3.096	5.371	10.816
DivTA	3,763	0.028	0.043	0	0	0.015	0.036	0.244
DivDummy	3,763	0.619	0.486	0	0	1	1	1
DivNI	3,763	0.360	0.517	-0.812	0	0.294	0.539	3.032
Fem	3,763	0.250	0.151	0	0.167	0.250	0.333	0.750
FemExec	3,763	0.002	0.015	0	0	0	0	0.200
FemInd	3,763	0.249	0.151	0	0.154	0.250	0.333	0.750
Fem1	3,763	0.293	0.455	0	0	0	1	1
Fem2	3,763	0.302	0.459	0	0	0	1	1
Fem3	3,763	0.274	0.446	0	0	0	1	1
BInd	3,763	0.940	0.088	0	0.875	1	1	1
BSize	3,763	7.204	2.268	2	6	7	9	16
LogBSize	3,763	1.927	0.309	0.693	1.792	1.946	2.197	2.773
ROA	3,763	0.007	0.185	-0.946	0.007	0.049	0.085	0.294
PB	3,763	3.389	4.001	0.256	1.287	2.187	3.842	28.074
FSize	3,763	16,504.670	43,201.980	7.290	439.376	1,702.776	11,078.780	524,837
LogFSize	3,763	7.687	2.160	1.987	6.085	7.440	9.313	13.171
Lev	3,763	0.208	0.186	0	0.037	0.175	0.328	1.033
RetTA	3,763	-0.068	1.019	-6.257	0.013	0.208	0.345	0.777
CEOinB	3,763	0.378	0.485	0	0	0	1	1

Note: Variables DivTA, DivNI, ROA, PB and RetTA have been winsorized by cross-section at the 1% and 99% percentiles, due to observed extreme outliers. Div and FSize are displayed in million SEK.

Table 3 shows the distribution of firm observations, dividend paying firms and the fraction of female board directors by year. The number of observed data points increases in the later years of the sample period. Hence, we have unbalanced panel data, where more weight will be given to more recent years. Explanations for this distribution is the expansion in the number of firms listed on regulated exchanges and improved data accessibility during the research period. A majority of the sample firms pay dividends, where the annual averages span between 37% and 70.2%. Notably, in 2020, the number of dividend paying firms is particularly low at 37%. The sudden decline in dividend-payers can be attributed to the prevailing Covid-19 pandemic at the time.

Table 3: Sample Distribution by Year

Year	Obs.	%Obs.	Dividend Paying Firms	%Dividend Paying Firms	%Female Directors
2003	102	2.71	59	57.84	6.37
2004	112	2.98	66	58.93	11.80
2005	121	3.22	74	61.16	14.17
2006	131	3.48	87	66.41	15.34
2007	144	3.83	97	67.36	17.27
2008	159	4.23	106	66.67	17.70
2009	172	4.57	98	56.98	19.42
2010	179	4.76	110	61.45	19.79
2011	182	4.84	119	65.39	21.67
2012	186	4.94	112	60.22	22.76
2013	190	5.05	122	64.21	23.80
2014	189	5.02	120	63.49	23.62
2015	188	5.00	129	68.62	25.64
2016	201	5.34	141	70.15	27.57
2017	222	5.90	154	69.37	29.69
2018	233	6.19	155	66.52	31.52
2019	254	6.75	165	64.96	32.72
2020	265	7.04	98	36.98	32.23
2021	265	7.04	159	60.00	33.93
2022	268	7.12	160	59.70	33.60
Total	**3,763**	**100.00**	**2,331**	**61.95***	**25.03****

Note: *The number represents the average dividend paying firms across all observations. **The number represents the average female board representation across all observations.

The sample distribution across industry classification, presented in Table 4, shows that the average fraction of female board directors varies between 11.1% and 32.7%. Firms within Consumer Durables and Chemicals present the highest average of female directors, whereas female board representation is lowest within the Energy and Telecom sectors. Distributing dividends is most common in the Chemicals and Manufacturing sectors, with the fraction of dividend paying firms being 82.1% and 78.4%, respectively. In contrast, the Utilities and Healthcare industries present the lowest fractions of dividend paying firms. In summary, the distribution of the sample by year and industry indicate that differences exist across the grouping variables used in our panel regressions, which aligns with results of previous studies in this area (Byoun et al., 2016; Gyapong et al., 2021; Ain et al., 2021).

Table 4: Sample Distribution by Industry

Industry	Obs.	%Obs.	Dividend Paying Firms	%Dividend Paying Firms	%Female Directors
Business & Software	867	23.04	535	61.71	26.13
Chemicals	39	1.04	32	82.05	32.46
Consumer Durables	73	1.94	53	72.60	32.68
Consumer Non-Durables	175	4.65	136	77.71	29.82
Energy	29	0.77	11	37.93	11.07
Healthcare	596	15.84	180	30.20	25.46
Manufacturing	694	18.44	544	78.39	22.33
Telecom	221	5.87	100	45.25	19.87
Utilities	30	0.80	5	16.67	20.33
Wholesale & Retail	115	3.06	85	73.91	23.66
Other	924	24.55	650	70.35	25.91
Total	**3,763**	**100.00**	**2,331**	**61.95***	**25.03****

Note: *The number represents the average dividend paying firms across all observations. **The number represents the average female board representation across all observations.

When comparing the board composition of dividend and non-dividend paying firms, there are significant differences across all definitions of female board representation (see Table 5). Dividend paying firms exhibit a higher fraction of female board directors and female independent board directors, with mean differences of 0.047 and 0.046, both statistically significant at the 1% level. Additionally, firms paying dividends have a slightly higher fraction of female executive board directors. The proportion of boards with two and three or more female directors are higher in dividend paying firms, with mean differences of 0.083 and 0.131, both significant at the 1% level. Conversely, non-dividend paying firms tend to have a higher frequency of boards with only one appointed female director, with a mean difference of -0.067 compared to dividend paying firms.

Table 5: Comparison between Dividend and Non-Dividend Paying Firms

Variable	Dividend = Yes N = 2,331 Mean	Dividend = No N = 1,432 Mean	Difference
Fem	0.268	0.221	0.047***
FemExec	0.002	0.001	0.001*
FemInd	0.266	0.220	0.046***
Fem1	0.268	0.335	-0.067***
Fem2	0.334	0.251	0.083***
Fem3	0.324	0.193	0.131***

*, **, and *** indicate significance at the 10%, 5% and 1% levels.

5.1.2 Correlation

A Pearson's correlation matrix for all explanatory variables is conducted to test for multicollinearity (see Appendix B). According to Archambeault and DeZoort (2001) and Field (2005), a correlation coefficient above 0.8 may be a sign of multicollinearity. The general correlation between our variables does not exceed 0.4, although there are a few exceptions. Notably, there is a significantly high correlation between FemInd, Fem and Fem3. However, this is not an issue as these variables are not included in the same regression model. Furthermore, there is a significant correlation of -0.755 between BInd and CEOinB, which could raise some concerns. To investigate this further, a Variance Inflation Factor (VIF) test was conducted, yielding a mean VIF of 2.02 (not reported). According to Forthofer et al. (2007), a VIF greater than 10 suggests issues with multicollinearity. Considering this, we are confident that multicollinearity does not pose a problem among the explanatory variables in our regression models.

5.2 Main Results

In Table 6, the main results from the OLS regressions with fixed effects are presented (see model specifications in Section 4.3). The results in column 1 suggest that the fraction of female board directors is associated with higher levels of dividend payments and the effect is significant at the 5% level. In economic terms, an increase of 1% in the fraction of female board directors is associated with an increase in total dividend payments by a proportion of 1.013%. Furthermore, the fraction of female board directors has a significant positive effect on dividends to total assets at the 1% level, which is presented in column 2. An increase of 1% of the fraction of female board directors is associated with an increase of 0.029% in the dividends to total assets ratio. The findings support H1, indicating a positive relationship between the fraction of female board directors and dividend payments, which is consistent with previous research (Chen et al., 2017; Ain et al., 2021; Byoun et al., 2016; Gyapong et al., 2021; Pucheta-Martínez and Bel-Oms, 2016).

Table 6: Panel Regressions

Variable	Fraction of Female Directors		Independent vs. Executive		Critical Mass	
	LogDiv (1)	DivTA (2)	LogDiv (3)	DivTA (4)	LogDiv (5)	DivTA (6)
Fem	1.013** (2.47)	0.029*** (2.76)				
FemExec			2.845 (1.12)	0.032 (0.61)		
FemInd			0.990** (2.42)	0.029*** (2.77)		
Fem1					-0.024 (-0.15)	0.009** (2.39)
Fem2					0.133 (0.79)	0.008* (1.79)
Fem3					0.407* (1.91)	0.016*** (3.03)
BInd	0.760 (0.88)	-0.035 (-1.37)	0.851 (0.98)	-0.035 (-1.35)	0.955 (1.11)	-0.031 (-1.25)
LogBSize	0.243 (0.74)	0.010* (1.82)	0.234 (0.72)	0.009* (1.81)	0.022 (0.07)	0.004 (0.63)
ROA	1.715*** (4.78)	0.081*** (7.21)	1.710*** (4.77)	0.081*** (7.20)	1.743*** (5.02)	0.081*** (7.30)
PB	0.088*** (7.08)	0.003*** (6.04)	0.088*** (7.10)	0.003*** (6.06)	0.089*** (7.19)	0.003*** (6.14)
LogFSize	0.880*** (15.05)	-0.002 (-1.28)	0.881*** (15.13)	-0.002 (-1.28)	0.882*** (15.24)	-0.002 (-1.25)
Lev	-1.824*** (-4.35)	-0.046*** (-5.33)	-1.824*** (-4.34)	-0.046*** (-5.32)	-1.826*** (-4.40)	-0.045*** (-5.32)
RetTA	0.108** (1.98)	0.003** (2.52)	0.108** (1.99)	0.003** (2.52)	0.113** (2.21)	0.004*** (2.73)
CEOinB	0.419** (2.03)	-0.006 (-1.13)	0.426** (2.06)	-0.006 (-1.12)	0.432** (2.11)	-0.005 (-1.06)
Industry FE	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES
N	3,763	3,763	3,763	3,763	3,763	3,763
R-Square	0.524	0.260	0.524	0.260	0.524	0.260

Note: Variable definitions are found in table 1. t-statistics are reported in parentheses.
*, **, and *** indicate significance at the 10%, 5% and 1% levels.

Columns 3 and 4 show the results from the regressions using independent and executive female board directors as interest variables. The findings suggest a positive impact of independent female board directors on both total dividend payments and dividends to total assets, reporting coefficients of 0.990 and 0.029. The results are significant at the 5% and 1% level, respectively. The fraction of female executive board directors demonstrates positive coefficients for both dependent variables, but the results are not statistically significant. Our findings suggest that independent female board directors contribute to higher dividend payments, whereas executive female board directors do not show a significant impact. This is consistent with previous studies by Ain et al. (2021) and Gyapong et al. (2021). The statistically insignificant effect of executive female board directors on dividend payments is also in line with findings by Pucheta-Martínez and Bel-Oms (2016). Consequently, the outcomes provide evidence for H2, indicating a stronger positive association for independent female board directors in comparison to executive female board directors.

Next, to test the critical mass theory, we introduce three dummy variables for female board representation as interest variables. The results are demonstrated in column 5 and 6, where the variables representing one and two female board directors are not statistically significant for total dividend payments. However, the results suggest that having three or more female board directors is associated with higher total dividend payments, showcasing a positive coefficient of 0.407, significant at the 10% level. When utilizing dividends to total assets as the dependent variable, the results display positive coefficients of 0.009 and 0.008 for one and two female board directors, significant at the 5% and 10% level, respectively. However, having three or more female board directors has a considerably greater effect, demonstrating a coefficient of 0.016, which is significant at the 1% level. Our results regarding dividends to total assets are consistent with Ain et al (2021), suggesting that the greatest effect is viable when three or more female board directors are present. Regarding the total dividends paid, a significant positive impact is observed only for firms reaching the threshold of three or more female board directors. The results are similar to findings by Gyapong et al. (2021), although they report positive significant coefficients for one, two and three female board directors, with the impact increasing in magnitude as the number of female directors grows. Nevertheless, our findings support H3 and the critical mass theory, suggesting a stronger impact on dividend payments when firms appoint three or more female directors to their boards.

In line with our expectations and previous studies, ROA and retained earnings over total assets show a positive relationship with dividend payments in all regressions (Saeed & Sameer, 2017; Byoun et al., 2016; Ain et al., 2021; DeAngelo et al., 2006). The price-to-book ratio displays a positive association with dividend payments and the dividend to total assets ratio, as also found by Gyapong (2021). A higher level of leverage is associated with lower dividend payments, aligned with previous research and agency theory (Pucheta-Martínez and Bel-Oms, 2016; Fama and Jensen, 1983; Jensen, 1986). Firm size is associated with higher total dividend payments, as expected from previous research (Pucheta-Martínez and Bel-Oms, 2016; Saeed and Sameer, 2017). However, firm size has a negative relationship with dividends to total assets. This is reasonable because, as total assets increase, the dividend ratio will decrease, keeping dividend payments constant.

Consistent with previous research, board size positively drives dividends to total assets (Pucheta-Martínez and Bel-Oms, 2016; Saliya and Dogukanli, 2022; Thompson and Adasi Manu, 2021). Although, we find no significant relationship between board size and total dividends. CEO board membership exhibits a positive relationship with total dividends. Elsilä et al. (2013) find that an important part of CEO compensation is attributed to equity holdings, giving them incentives for distributing higher dividends. An explanation for insignificant coefficients for board independence may be that Swedish firms in general exhibit high levels of board independence, due to regulations, resulting in small variations in the variable across firms (Moursli, 2020).

5.3 Endogeneity

To ensure the reliability and validity of the results in our main regressions, several alternative approaches are utilized to isolate and evidence the effect that female board representation have on a firm's dividend payments. As the results may be coincidental, it is crucial to explore the possibility of other factors being the main drivers behind why firms pay more dividends. To control for potential endogeneity issues, we use three methods in line with previous research: instrumental variable regressions to manage omitted variable bias, lagged independent variable regressions to address reverse causality, and propensity score matching to control for self-selection bias. All regressions are conducted using the same fixed effects and control variables, with clustered standard errors on firm-level, as in Section 5.2.

5.3.1 Omitted Variable Bias

Despite employing industry and year fixed effects, the estimated regression model may still suffer from the exclusion of non-observed factors which influence dividend payments. To isolate the exogenous component from the board gender composition, we utilize two different instrument variables for Fem: the industry average and the one-year lag of the fraction of female board directors. We use an F-test of the first stage regression to test for instrument relevance. The F-statistic is well over 10 for both instruments (not reported), suggesting strong instruments from a statistical point of view.

From a theoretical standpoint, Liu et al. (2014) argue that the fraction of female board directors in an industry can have spill-over effects on other firms within that same industry, implying that the industry average influence the board choices of individual firms. Further, other firms' board compositions should not directly influence the individual corporate decisions of a firm, such as dividend policies. To build an exogenous instrumental variable, multiple studies have utilized an industry average (Ye et al., 2019; Adhikari and Agrawal, 2018; Jiang and Yuan, 2018). Hence, we argue that using the industry average of female board representation is a valid instrument. By following Gyapong et al. (2021) and Chen et al. (2017), we calculate the industry average of female board directors (IAFem) as follows:

$$IAFem_{i,\,t} = \frac{\text{Female board directors}_{\text{Industry}} - \text{Female board directors}_{i,\,t}}{\text{Total board directors}_{\text{Industry}} - \text{Total board directors}_{i,\,t}} \quad (4)$$

where i and t represent each firm observation and year, respectively.

Further, we employ the lagged value of Fem, in similarity with Ain et al. (2021), as an instrument for Fem (LFem). The first and second stage regressions are estimated as follows:

First Stage Regressions

$$Fem_{i,\,t} = \beta_0 + \beta_1 IAFem_{i,\,t} + \beta_2 BInd_{i,\,t} + \beta_3 LogBSize_{i,\,t} + \beta_4 ROA_{i,\,t} + \beta_5 PB_{i,\,t} + \beta_6 LogFSize_{i,\,t} + \beta_7 Lev_{i,\,t} + \beta_8 RetTA_{i,\,t} + \beta_9 CEOinB_{i,\,t} + Industry + Year + \epsilon_{i,t} \quad (5)$$

$$Fem_{i,\,t} = \beta_0 + \beta_1 LFem_{i,\,t} + \beta_2 BInd_{i,\,t} + \beta_3 LogBSize_{i,\,t} + \beta_4 ROA_{i,\,t} + \beta_5 PB_{i,\,t} + \beta_6 LogFSize_{i,\,t} + \beta_7 Lev_{i,\,t} + \beta_8 RetTA_{i,\,t} + \beta_9 CEOinB_{i,\,t} + Industry + Year + \epsilon_{i,t} \quad (6)$$

Second Stage Regressions

$$Y_{i,\,t+1} = \beta_0 + \beta_1 \widehat{Fem}_{i,\,t} + \beta_2 BInd_{i,\,t} + \beta_3 LogBSize_{i,\,t} + \beta_4 ROA_{i,\,t} + \beta_5 PB_{i,\,t} + \beta_6 LogFSize_{i,\,t} + \beta_7 Lev_{i,\,t} + \beta_8 RetTA_{i,\,t} + \beta_9 CEOinB_{i,\,t} + Industry + Year + \epsilon_{i,\,t} \quad (7)$$

where $\widehat{Fem}$ are the fitted values of Fem from first stage regressions, using IAFem and LFem as instrumental variables.

In Table 7, the results from the instrumental variable regressions are presented. The coefficient for the fitted values of female board representation using IAFem as instrument indicates a significant positive relationship with both definitions of dividend payments at the 1% level. The same relationship holds true when using LFem as instrument, where the coefficients are significant at the 5% level. Notably, the magnitude of the positive effect is higher compared to the one estimated with OLS regression, suggesting that the effect of female board representation reported in our main results may be underestimated. Despite the potential omitted variable bias in our model specification, the results are consistent with our main findings. This further confirms that the fraction of female board directors has a positive effect on dividend payments, supporting our main results.

Table 7: IV Regression

	Instrument: IAFem		**Instrument: LFem**	
Variable	LogDiv (1)	DivTA (2)	LogDiv (3)	DivTA (4)
$\widehat{\text{Fem}}_{\text{IAFem}}$	2.816*** (4.87)	0.086*** (3.02)		
$\widehat{\text{Fem}}_{\text{LFem}}$			1.194** (2.15)	0.034** (2.51)
Controls, industry and year FE	YES	YES	YES	YES
N	3,763	3,763	3,445	3,445
R-Square	0.526	0.269	0.529	0.266

Note: Second stage regression coefficients for the fitted variable Fem, using IAFem and LFem as instrumental variables. t-statistics are reported in parentheses.
*, **, and *** indicate significance at the 10%, 5% and 1% levels.

5.3.2 Reverse Causality

The estimated effect of female board directors on dividend payments may not be as straightforward as the results imply. There could be a reverse relationship, where firms with better corporate governance and monitoring functions, and potentially higher dividend payments, are more likely to appoint female board directors. Moreover, the effect of appointing female board directors may not have an immediate impact on firm monitoring. Newly appointed directors may need a period of time to familiarize themselves with board duties to implement their ideas effectively. Thus, we employ one, two and three lags of the fraction of female board directors to address potential issues with reverse causality, in similarity with previous studies (Ain et al., 2021; Gyapong et al., 2021; Gul et al., 2011). For simplicity, we only showcase the results for the explanatory variable Fem, though the results are similar for all definitions of female board representation included in Section 5.2. The results in Table 8 suggest positive and significant coefficients, at the 5% level, for all three lags of the independent variable, which reinforces our findings.

Table 8: Lag of Female Board Representation

Variable	LogDiv (1)			DivTA (2)		
Fem_{t-1}	0.903** (2.15)			0.026** (2.51)		
Fem_{t-2}		0.890** (2.01)			0.026** (2.31)	
Fem_{t-3}			1.032** (2.23)			0.030** (2.54)
Controls, industry and year FE	YES	YES	YES	YES	YES	YES
N	3,445	3,135	2,833	3,445	3,135	2,833
R-square	0.529	0.534	0.561	0.266	0.275	0.286

Note: t-statistics are reported in parentheses.
*, **, and *** indicate significance at the 10%, 5% and 1% levels.

5.3.3 Self-Selection Bias

Female board directors may be more inclined to join a firm that posits certain characteristics rather than making this choice randomly. This can result in self-selection bias, where firms with gender diverse boards exhibit significantly different traits than firms with non-gender diverse boards. If such a distinction is present, the firm may offer higher dividends independent of the presence of female board directors (Ain et al., 2021). By following previous literature (Byoun et al., 2016; Chen et al., 2017; Ain et al., 2021), we construct a propensity score matching model to mitigate this potential issue. Propensity score matching is a method used to create comparable groups by matching firms with similar observed covariates (Rosenbaum and Rubin, 1983). The propensity score is defined as the conditional probability of being assigned to the treatment group based on a specific set of covariates. By matching units from the treatment and control group based on propensity scores, we reduce the bias, hence making the comparison between groups more meaningful.

Firstly, we divide the sample into two groups: one consisting of firm-year observations with at least one female board director (treatment group) and the other consisting of firm-year observations with zero female board directors (control group). Using the constructed groups, a dummy variable is created, taking the value one if treated and zero otherwise (Treat). Subsequently, this variable is used as the dependent variable in the following logit regression model to estimate the conditional probability of a firm recruiting female board directors:

Logit regression

$$Treat_{i,t} = \beta_0 + \beta_1 BInd_{i,t} + \beta_2 LogBSize_{i,t} + \beta_3 ROA_{i,t} + \beta_4 PB_{i,t} + \beta_5 LogFSize_{i,t} + \beta_6 Lev_{i,t} + \beta_7 RetTA_{i,t} + \beta_8 CEOinB_{i,t} + Industry + Year + \epsilon_{i,t} \quad (8)$$

Secondly, we predict a propensity score of each observation based on the logit regression and perform nearest-neighbor matching with a 0.01% caliper, ensuring close to identical matched pairs.[4] Post matching, we obtain 31 pairs that, apart from female board representation, exhibit no significant differences across the control variables (see Table 9). Finally, we use the matched pairs and estimate the average treatment effect on dividend payments. As presented in Table 10, the groups show significant differences in total dividends and dividends to total assets. The results support our previous findings, suggesting that the observed positive relationship between female board representation and dividend payments is robust to self-selection bias.

Table 9: Post-Match Estimates

Variable	Treated	Controls	Difference	t-stat
BInd	0.920	0.944	-0.024	-0.95
LogBSize	1.759	1.781	-0.022	-0.43
ROA	0.001	-0.063	0.064	1.23
PB	2.964	2.117	0.847	1.52
LogFSize	6.982	6.498	0.484	1.34
Lev	0.244	0.186	0.058	1.02
RetTA	-0.041	0.064	-0.105	-0.61
CEOinB	0.355	0.290	0.065	0.54

Note: Observed differences in control variables between the treatment group and the control group post matching. *, **, and *** indicate significance at the 10%, 5% and 1% levels.

Table 10: Average Treatment Effects

Variable	Treated	Controls	Difference	t-stat
LogDiv	1.953	0.771	1.182**	2.57
DivTA	0.024	0.010	0.014*	1.69

Note: Observed differences in dividend payments between the treatment group and the control group. *, **, and *** indicate significance at the 10%, 5% and 1% levels.

[4] Nearest-neighbor matching refers to the matching of pairs which exhibit the most similar propensity scores. This matching is conducted without replacement, ensuring each treated firm is matched with a control firm only once. The caliper sets the maximum acceptable difference in propensity score for matching to occur.

5.4 Robustness Tests

To further check the validity of our results in Section 5.2, we perform multiple robustness tests using alternative estimation techniques and variable definitions. Consistent with previous research, Fama-Macbeth regressions, Tobit regressions and logit regressions are used to confirm validity of the main results (Chen et al., 2017; Gyapong et al., 2021; Byoun et al., 2016).[5] Standard errors are clustered at the firm level in the Tobit and logit regressions, whereas Newey-West standard errors have been used in the Fama-Macbeth regressions, following previous research (Chen et al., 2017). Two alternative definitions of dividends have been employed in the regressions: dividends to net income (DivNI) and a dummy variable which takes the value one if the firm pays dividends and zero otherwise (DivDummy). Further, the squared value of the fraction of female board directors have been utilized, to capture a potential non-linear relationship with dividend payments. Additionally, we construct two dummy variables to control for the effect that the financial crisis and the Covid-19 pandemic had on firms and dividend payments. The variable FCrisis takes the value one if the observation is in 2007 or 2008 and zero otherwise (Ain et al., 2021), whereas Covid19 takes the value one if the observation is in 2020 or 2021 and zero otherwise. For conciseness, only coefficients for the independent variable Fem are reported, however the results are similar for all measures of female board representation.

The robustness checks reported in Table 11 show evidence for our main results, suggesting that female board directors have a significant positive relationship with all definitions of dividend payments. The findings are consistent when estimating coefficients with Fama-Macbeth, Tobit and logit regressions, as well as using a non-linear independent variable. Hence, our conclusions remain valid for various estimation techniques and definitions of the dependent and independent variable. The findings further suggest that despite the impact of the financial crisis and Covid-19 pandemic on firms, the fraction of female board directors still report a significant positive effect on dividend payments. Therefore, our main results show robustness to the impact of stressed economic conditions.

[5] Fama-Macbeth regressions are optimized for asset-pricing models but can also be used for estimating panel regressions in corporate finance research, giving equal weight to all time periods in an unbalanced data sample (Yoon and Lee, 2019). Tobit regressions are useful when the dependent variable is censored, as the model accounts for unequal sampling probabilities (Tobin, 1958). DivTA and DivNI has lower limits at zero, therefore we run tobit regressions for these dependent variables. See model specifications for Fama-Macbeth and Tobit in Appendix C.

Table 11: Robustness Tests

	LogDiv (1)	DivTA (2)	DivNI (3)	DivDummy (4)
OLS regressions				
Fem	1.013** (2.47)	0.029*** (2.76)	0.176* (1.75)	0.263*** (2.96)
Fama-Macbeth regressions				
Fem	1.050*** (4.73)	0.031*** (4.17)	0.185*** (3.23)	0.301*** (8.19)
Tobit regressions				
Fem		0.026*** (2.66)	0.171* (1.72)	
Non-linearity				
$(Fem)^2$	1.959*** (2.79)	0.045*** (2.67)	0.288* (1.88)	0.355** (2.51)
Logit regression				
Fem	1.775** (2.39)	1.775** (2.39)	1.775** (2.39)	1.775** (2.39)
Stressed economic conditions				
Fem	1.030** (2.57)	0.027*** (2.67)	0.174* (1.75)	0.262*** (2.97)
FCrisis	-0.061 (-0.32)	-0.001 (-0.38)	-0.102* (-1.90)	-0.030 (-0.70)
Covid19	-1.049*** (-4.14)	-0.012** (-2.11)	-0.117* (-1.89)	-0.205*** (-3.91)
Controls, industry and year FE	YES	YES	YES	YES

Note: Variable definitions are found in Table 1. t-statistics are reported in parentheses.
*, **, and *** indicate significance at the 10%, 5% and 1% levels.

6 Conclusion

Our empirical results show evidence for a positive and significant relationship between a firm's fraction of female board directors and dividend payments. Therefore, we conclude that boards featuring a larger fraction of female directors are more inclined to employ dividend policies as a mechanism for corporate governance. Further, our findings suggest that the fraction of independent female board directors drive dividend payments positively. In contrast, the results for executive female board directors are insignificant, indicating a limited monitoring role of executive directors in terms of dividend policies. Our results are ambiguous regarding boards with less than three female directors, indicating that appointing only one or two female directors do not fully accumulate the positive effect of board gender diversity. However, the presence of three or more female board directors is positive and statistically significant. The outcomes affirm the critical mass theory, insinuating that being three or more female directors in a board leads to women gaining greater power and influence in board decisions. The main findings are not only resilient to alternative estimation techniques and different measures of dividend payments and board gender diversity, but also remain valid during stressed economic conditions. Furthermore, the validity of our findings is confirmed by utilizing several endogeneity tests, specifically instrumental variable regressions, lagged independent variable regressions, and propensity score matching, all of which are consistent with our main results.

The findings of our study have valuable implications for policy decisions regarding gender diversity legislation and regulations, which has been discussed frequently in recent years. The European Union has adopted a directive to improve gender balance in boards, as the progress of attaining more equality in this area remain slow (Council of the European Union, 2024). Our empirical results suggest that, in addition to improving overall gender equality across member states, the directive may also have benefits for shareholders, by having a monitoring effect and reducing agency problems. The results also indicate broader implications for corporate decision-making at the firm level, encouraging firms to appoint more female board directors to strengthen overall corporate governance.

In this study, we have focused on dividend payments as a means of monitoring and mitigating agency costs. However, distributing more dividends may not always be the optimal choice for a firm. As proposed by Jensen (1986), excessive free cash flow which is not used for positive net present value investments should be distributed to shareholders, to avoid cash slack. Nevertheless, if there are profitable investments for the firm to invest in, retaining cash to promote firm growth may be more advantageous to increase shareholder value. Further, firms may implement share buyback programs to reduce excessive cash holdings, as an alternative or complement to dividend payments. This option can potentially be more efficient, due to tax advantages for shareholders. For future research, an intriguing approach would be to explore the relationship between board gender diversity and the identification of investment opportunities, as well as complementary corporate strategies such as share buyback programs.

Finally, it is important to explore this study's limitations and acknowledge that there are factors that have not been accounted for in our models. Although we have addressed endogeneity by employing multiple robustness checks, it is often difficult to eliminate this risk completely. Due to limited data availability, our study has not included board member characteristics such as age, education, and experience of board members. These individual characteristics of board members may have an impact on their risk appetite and their ability to make efficient financial decisions, resulting in different approaches to dividend policies. Further, the study lacks data on the ownership structure of the observed firms, for instance if large shareholders are also board members. The ownership structure and board independence with regards to large shareholders may also have an impact on the dividend policy applied by firms. Swedish firms exhibit relatively high levels of ownership concentration (Henrekson and Jakobsson, 2012), which may create incentives to extract private benefits and reduce dividend payments. For future research, more detailed board characteristics and firm specific ownership structures could be included, to investigate their impact on dividend policies.

7 References

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Appendices

A. Statistical Tests

Table A1: Output from Augmented Dickey-Fuller test[6]

Variable	Test Statistic	Reject H0
LogDiv	-5.054	YES
DivTA	-10.202	YES
Fem	-9.671	YES
FemExec	-10.617	YES
FemInd	-9.742	YES
Fem1	-12.918	YES
Fem2	-13.251	YES
Fem3	-7.331	YES
BInd	-10.271	YES
LogBSize	-5.724	YES
ROA	-8.877	YES
PB	-7.113	YES
LogFSize	-3.939	YES
Lev	-9.113	YES
RetTA	-5.967	YES
CEOinB	-8.357	YES

Table A2: Output from Hausman test, Durbin-Watson test, and ARCH test

	Fraction of Female Directors		**Independent vs. Executive**		**Critical Mass**	
Variable	**LogDiv**	**DivTA**	**LogDiv**	**DivTA**	**LogDiv**	**DivTA**
Hausman test[7]						
chi2-statistic	22.14	416.73	0.17	412.82	147.78	-451.75
Reject H0	YES	YES	NO	YES	YES	YES
Durbin-Watson test[8]						
d-statistic	0.683	0.686	0.683	0.686	0.685	0.686
Serial correlation	Positive	Positive	Positive	Positive	Positive	Positive
ARCH test[9]						
Coefficient	0.434***	0.623***	0.435***	0.623***	0.437***	0.626***
z-statistic	(13.45)	(33.29)	(13.45)	(33.31)	(13.47)	(33.78)

[6] H0: Random walk without drift, d = 0. We reject H0, suggesting stationarity and no existence of a unit root.
[7] H0: Difference in coefficients not systematic. We reject H0 in 5/6 models, hence the use of fixed effects is appropriate.
[8] Positive autocorrelation: d-statistic < 2, no autocorrelation: d-statistic = 2, negative autocorrelation: d-statistic > 2
[9] H0: There is no ARCH effect present. We reject H0, implying potential heteroskedasticity within the data.

B. Correlation Matrix

Variable	Fem	FemExec	FemInd	Fem1	Fem2	Fem3	BInd	LogBSize	ROA	PB	LogFSize	Lev	RetTA	CEOinB
Fem	1													
FemExec	.087***	1												
FemInd	.994***	-.0133	1											
Fem1	-.362***	-.048***	-.359***	1										
Fem2	.204***	.043***	.200***	-.424***	1									
Fem3	.644***	.034**	.642***	-.396***	-.405***	1								
BInd	.252***	-.146***	.267***	-.075***	.096***	.139***	1							
LogBSize	.157***	-.004	.158***	-.189***	.024	.441***	.091***	1						
ROA	.118***	.029**	.116***	-.037**	.071***	.089***	-.026	.187***	1					
PB	.061***	-.027	.064***	-.041**	.052***	-.008	.041**	-.087***	-.141***	1				
LogFSize	.254***	-.022	.258***	-.156***	.033**	.377***	.013	.633***	.345***	-.223***	1			
Lev	.068***	.001	.068***	-.021	.028*	.051***	-.070***	.059***	.075***	-.154***	.437***	1		
RetTA	.067***	.007	.066***	-.042***	.059***	.070***	-.066***	.212***	.636***	-.256***	.368***	.049***	1	
CEOinB	-.203***	.065***	-.210***	.022	-.053***	-.030*	-.755***	.246***	.072***	-.088***	.229***	.096***	.126***	1

Note: The table displays Pearson's correlation coefficients for all explanatory variables.
*, **, and *** indicates significance at the 10 %, 5 % and 1 % levels.

C. Alternative Estimation Techniques

Variable definitions are found in Section 4.2.

Fama-Macbeth Regressions

We run cross-sectional regressions for each time period t using model specification:

$$Y_{i,\,t+1}=\beta_0+\beta_1 Fem_{i,\,t}+\beta_2 BInd_{i,\,t}+\beta_3 LogBSize_{i,\,t}+\beta_4 ROA_{i,\,t}+\beta_5 PB_{i,\,t}+\beta_6 LogFSize_{i,\,t} + \beta_7 Lev_{i,\,t}+\beta_8 RetTA_{i,\,t}+\beta_9 CEOinB_{i,\,t}+ Industry + Year + \epsilon_{i,t} \qquad (9)$$

From the time-series estimates of β_t, we estimate the average betas, yielding:

$$\hat{\beta}=\frac{1}{T}\sum_{t=1}^{T}\hat{\beta}_t \qquad (10)$$

Tobit Regressions

We set the censoring value to zero for the dependent variables DivTA and DivNI:

$$Y_{i,\,t+1}=\begin{cases}0 & \text{if } Y_{i,\,t+1}\leq 0\\ Y_{i,\,t+1} & \text{if } Y_{i,\,t+1}>0\end{cases}$$

Then, we run the Tobit regressions using model specification:

$$Y_{i,\,t+1}=\beta_0+\beta_1 Fem_{i,\,t}+\beta_2 BInd_{i,\,t}+\beta_3 LogBSize_{i,\,t}+\beta_4 ROA_{i,\,t}+\beta_5 PB_{i,\,t}+\beta_6 LogFSize_{i,\,t} + \beta_7 Lev_{i,\,t}+\beta_8 RetTA_{i,\,t}+\beta_9 CEOinB_{i,\,t}+ Industry + Year + \epsilon_{i,t} \qquad (11)$$