Board Gender Diversity and Short Sellers: The Role of Liquidity

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Abstract

We study the effect of board gender diversity (BGD) on short sales activity in an international sample of European countries. We find a positive association between short sale activity and the share of female board members. To mitigate causality concerns, we use the mandatory introduction of gender board quotas in European countries as a natural experiment and implement a staggered and stacked difference-in-difference research design. We confirm that the evidence is causal and that BGD positively affects short sale activity. We find that the mechanism that explains why short sellers react to BGD is through liquidity. We further show that cross-sectional heterogeneity in normative acceptance of gender diversity is essential.

JEL code: G14, G18, M14

Keywords: short selling, board gender diversity, corporate governance, performance, liquidity

1. Introduction

Empowering women is an international objective and one of 17 UN Sustainable Development Goals (United Nations, 2015). Many countries around the world are implementing gender board quotas. For example, the “Women on Boards" Directive adopted in the European Union requires that Member States must adopt national rules that 33% of all board members of listed companies are women by the end of 2024. Similarly, the Financial Conduct Authority introduced a 40% women quota in the UK in 2022. However, how these quotas affect a firm’s operational ecosystem, performance, corporate governance, and value is vividly debated.

In this paper, we analyze a novel research question: How do short sellers react to the introduction of gender board quotas? Short sellers sell the securities they borrow from a broker to profit from a price decline. They are informed traders and serve an essential role in exposing corporate fraud and discipline managers (Karpoff & Lou, 2010; Fang et al., 2016). The activity of short sellers is important for the proper functioning of the financial markets and increases the accuracy of stock prices (Boehmer & Wu, 2013; Curtis & Fargher, 2014). They are estimated to constitute 20% of the trading volume (Boehmer et al., 2008). While the literature focuses on the role of short sellers in financial markets, the motivations behind short sellers’ stock coverage decisions are not fully understood.

We propose a novel motive for short sellers’ coverage: the composition of females on the board of directors. Previous studies show that stock market reaction to gender board quotas is mixed and the effects on operating performance and innovation are not consistent (Nygaard, 2011; Ahern & Dittmar, 2012; Matsa & Miller, 2013; Hwang et al., 2021; Griffin et al., 2021; Gertsberg et al., 2021; von Meyerinck et al., 2024; Eckbo et al., 2022; Baik et al., 2024; Barroso et al., 2024). Given the mixed results about profitability and operational activities of firms after the introduction of gender quotas, it is difficult to predict if short sellers will react to the

mandatory changes. However, the mixed results also suggest mispricing and heterogeneity among firms that short sellers might exploit during the regulatory change.

We, therefore, aim to answer several research questions. 1) Do short sellers care about the female ratio on boards? 2) Do short sellers exploit the regulatory changes related to the introduction of board gender quotas? 3) What drives short sellers activity related to the female ratio on boards? 4) Does the short sellers' coverage of stocks depend on cross-country heterogeneity in normative acceptance of gender diversity?

The effect of gender diversity on short sale activity is unclear *ex-ante*. On the one hand, board gender diversity improves information asymmetry about firm fundamentals, which should mitigate adverse selection problems, lower transactional costs, and, in turn, attract short sellers who are trying to exploit mispricing. On the other hand, board gender diversity might not affect short sellers' activity. For example, Eckbo et al. (2022) show that board gender quotas did not affect stock returns in the short run; thus, they do not affect short sellers' activity.

To test these hypotheses, we comprehensively analyse gender diversity on boards and short-selling activity in an international setting. We use a sample of female employment in 17 European countries from 2011 to 2022. After matching several datasets, our panel comprises 106,629 firm-year observations and 9,932 unique firms. We proxy for board gender diversity using two measures used in previous literature: 1) Female Ratio and 2) Gender Quotas. In order to measure short sellers' activity, we use short interest, which is the ratio of aggregate short positions to the number of shares outstanding. Previous literature used it to proxy for mispricing of firm fundamentals.

We employ several alternative research designs. First, we run an OLS regression and show that the greater female ratio on the boards of directors is associated with the increase in short sale activity. Second, we exploit the fact that since 2003, ten European countries have mandated board gender quotas. It allows us to employ a staggered difference-in-differences

specification to help establish causality. Third, we also employ a stacked regression approach to address concerns related to heterogeneous treatment effects or variations in treatment timing (Cengiz et al., 2019; Roth et al., 2023).

Our empirical results show consistent and robust evidence. We find that the adoption of board gender quotas is followed by a significant increase in the short sale activity. This suggests that short sellers exploit this regulatory change due to the introduction of gender quotas and increase their short selling activity.

In order to understand the causes of the increased activity of short sellers, we investigate how the representation of females on boards affects stock price liquidity. Liquidity is important for short sellers as it lowers their transaction costs. The theory on boards of directors generally claims that board gender diversity improves the monitoring and advisory functions of the board of directors (Bernile et al., 2018). Generally, the boards of directors play an important role in improving financial transparency by restricting managerial incentives to distort information disclosure (Leuz et al., 2003). Also, Chung et al. (2010) show that firms with better corporate governance have narrower spreads. This suggests that firms with more diverse boards, i.e. better governance, should have lower costs of short selling (narrower bid-ask spreads), and thus, the activity of short sellers should increase. Our results confirm that this is the channel through which females on boards of directors affect short sellers' activity. Liquidity increases the higher the representation of females on the boards of directors, which attracts more short sellers.

Next, we examine cross-country heterogeneity related to normative acceptance of gender diversity in an institutional environment. We show that the effect of gender diversity will be more pronounced, and therefore, firms would experience greater short sellers activity in countries where gender diversity has been normatively accepted. This confirms that only in countries where gender diversity is normatively accepted can the changes in female ratio or mandatory gender quotas explain greater short sellers coverage.

We also run a number of robustness tests. First, we show that results are unaffected if we exclude periods when EU countries introduced short sale bans. Second, we control for other corporate governance measures related to gender diversity, such as whether the CEO or Chair is female, whether the board has female independent directors and the level of risk the firm faces. The results remain unchanged.

Our findings show that an increase in the female ratio on boards of directors boosts the short sale activity due to increased liquidity. These findings add to the literature in the following way. First, we contribute the literature on the effects of board diversity and gender quotas on firms and capital markets. There is mixed evidence on how the stock market responds to board gender quotas (Nygaard, 2011; Ahern & Dittmar, 2012; Matsa & Miller, 2013; Hwang et al., 2021; Griffin et al., 2021; Gertsberg et al., 2021; von Meyerinck et al., 2021; Eckbo et al., 2022). We show that the female ratio and gender quotas are essential for stock market liquidity and, thus, the activity of short sellers.

Second, our paper adds to the literature on the determinants of short selling and liquidity. Our study suggests that the presence of women on corporate boards and the implementation of gender quotas can significantly impact stock market liquidity and the behavior of short sellers. Finally, our paper also adds to the economics literature on regulatory and legislative efforts that incentivize social changes. Existing work (Acemoglu & Angrist, 2001; Cullen & Pakzad-Hurson, 2023) also cautions against laws targeting firms with a social agenda, including gender equality, since firms' responses might undo the intended effects or even backfire. We add to this literature that reforms increasing gender diversity on boards of directors improved liquidity and short sellers activity, which is important for financial markets' proper and efficient functioning. However, it depends on the normative acceptance of gender diversity in a particular country.

2. Literature review

2.1 Short selling market overview in the European Union

Short sellers in the developed stock markets are typically institutional traders (Boehmer & Wu, 2013). Short selling in EU countries has been regulated since 2012 by implementing the Short Selling Regulation (SSR) with an adoption date of 14 March 2012 and a compliance date of 1 November 2012. On 30 September 2016, the SSR was incorporated into the European Economic Area (EEA) agreement with the compliance date in the EEA of 1 February 2017, which means its incorporation in the three EEA EFTA countries (Iceland, Liechtenstein, and Norway). In Switzerland, the SIX x-clear, one of the central counterparties, implemented a similar rule, according to which short sales are generally not forbidden in Switzerland. However, the so-called "naked short sales" (applicable only to transactions not covered by a corresponding hypothecation of securities) are prohibited. In UK law, SSR was retained following the UK EU Exit[1].

This EU-wide reporting SSR aimed to increase market stability by reducing the opaqueness of market activities through mandatory daily reporting by institutional investors. One can distinguish two main policy implications of the EU N236/2012 on the underlying securities: the first one refers to the short positions transparency, and the second one, which remains beyond the scope of this study, refers to the sovereign debt CDS transparency. Referring to the first implication, the investors must report daily the net and change in the short positions of specific EU securities in their portfolio holdings about the qualifying rules. This requirement aims to improve the transparency of institutional investors' market activities and reduce the settlement risks and other risks associated with naked short-selling activities. According to the SSR, the significant net short positions in shares must be: 1) reported to the relevant competent authorities when they at least equal to 0.2% of company-issued share capital

[1] According to the Short Selling Regulation Review Government response as of July 2023: *"The government will give the Financial Conduct Authority (FCA) rule-making powers to deliver the firm-facing aspects of the new UK short selling regime. When the FCA consults on a short selling regime that will replace the SSR, it will take the responses to the Call for Evidence and the views of the government, as set out in this response, into account."* (https://www.gov.uk/government/calls-for-evidence/short-selling-regulation-call-for-evidence, accessed 5 Dec 2023).

and every 0.1% above that (art. five par. 2); 2) disclosed to the public when they are at least equal to 0.5% of the company issued share capital and every 0.1% above that (art. six, par. 2). As described above, SSR was implemented in 30 European countries, including 27 EU countries and 3 EEA EFTA countries. Similar solutions were implemented in Norway and the UK.

2.2 Short selling literature

Short sellers borrow stocks in the equity lending market and sell them at market price. Later, they purchase stocks from other sellers and return them to the initial lender, betting on stock price decline. Theoretical arguments by Diamond and Verrecchia (1987) suggest that short sellers are more informed due to the high costs of short selling and the absence of liquidity. Empirical evidence shows that short sellers are informed traders and serve an important role in financial markets by preventing price bubbles, overpricing, and increasing the accuracy of stock prices (Aitken et al., 1998; Boehmer & Wu, 2013; Curtis & Fargher, 2014; Cumming et al., 2015; Boehmer et al., 2022). Karpoff and Lou (2010) show that short sellers anticipate financial misrepresentation of financial statements and its severity. Fang et al. (2016) show that short sellers can even prevent financial fraud. The firm also adjusts its investment and financing decisions and compensation in response to short sellers' activity (Mitchell et al., 2004; De Jong et al., 2011; Grullon et al., 2015; DeAngelis et al., 2017; Dutordoir et al., 2019).s

Short sellers respond to various economic events. For example, Dechow et al. (2001) show that they typically follow firms with a low fundamental ratio, a large market value, and a high institutional shareholding. Similarly, Christophe et al. (2004) find more shorting of stocks with low book-to-market valuations. Anderson et al. (2012) show that family firms are shorted more than non-family firms. Short sellers are also interested in stocks with lower financial reporting quality, more earnings management, are about to disclose material weaknesses in internal controls and have less comparative financial statements (Karpoff & Lou, 2010; Park,

2017; Singer et al., 2018; Cheng et al., 2019). Jiang et al. (2022) provide a systematic literature review on the determinants and implications of short sellers' activity based on 149 papers published from 1967 to 2020.

2.3 Gender board diversity

The primary responsibility of the board of directors is to monitor and advise top management. Previous literature on the effects of board diversity on firm policies and capital markets varies (Falconieri & Akter, 2023). Previous studies show that firms with diversified boards have lower volatility and better performance, while others find no evidence of firm risk (Ferreira, 2015; Sila et al., 2016; Bernile et al., 2018). The female characteristics that seem to have beneficial effects on firms are different from men's core values and risk attributes (Adams & Funk, 2012), unique skills and expertise (Kim & Starks, 2016), and better academic and professional qualifications (Field et al., 2020). Gul et al. (2011) find that gender board diversity has important effects on capital markets due to improvements in stock price informativeness.

In an international context, cross-country factors affect the links between board gender diversity and firm policies. Adams and Ferreira (2009) show that the link between gender diversity and performance is positive only for firms with weak shareholder rights but negative for firms with strong shareholder rights. Ye et al. (2019) argue that the influence of board gender diversity on dividend policy is more minor in good institutional environments.

Gender diversity on corporate boards has received increasing attention in recent years (Baker et al., 2022; Wiersema & Mors, 2023). Norway was the first country in Europe to implement a mandatory quota for women on board representation, with a target of 40% by 2008. Other European countries followed the Norwich experience. From 2004 to 2020, nine European countries (Austria, Belgium, France, Germany, Iceland, Italy, Netherlands, Spain and Portugal) implemented mandatory corporate gender quotas. Mensi-Klarbach and Seierstadt (2020) classified the variations in the board quotas into three groups. Norway, Portugal,

Belgium, Italy, and Germany were found to have hard quotas, France and Austria had medium-hard quotas, and the Netherlands, Iceland, and Spain had soft quotas.

The changes in the policy referring to the corporate board diversity quotas in European countries are continuously ongoing. That has irrevocably led to rapidly growing theoretical and empirical research in the corporate governance field on the impact of the corporate boards' gender diversity on the companies' management and performance. For example, Bian et al. (2024) show that firms with greater female ratios at the executive level have lower demand for female labour. In addition, Edmans et al. (2023) show that diversity, equity, and inclusion (DEI) have little correlation with gender balance in the boardroom.

2.4 Gender board diversity and short sale

The literature on board gender diversity is not conclusive in terms of how stock markets react to greater female presence on boards (Nygaard, 2011; Ahern & Dittmar, 2012; Matsa & Miller, 2013; Hwang et al., 2021; Griffin et al., 2021; Gertsberg et al., 2021; Eckbo et al., 2022; Fernández-Méndez & Pathan, 2023; von Meyerinck et al., 2024). Given the mixed results, it is unclear how short sellers react to the changes in the female ratio or the introduction of board gender quotas.

Previous literature shows that female directors change the corporate boards as they have different perspectives, ethics, experience, networks, and engagement that offer more effective monitoring and advice (Adams & Ferreira, 2009; Loyd et al., 2013; Post & Byron, 2015; Wahid, 2019; Jain & Zaman, 2020; Nadeem, 2020). Firms with diverse boards have more readable and transparent reporting systems and are less opaque (Upadhyay & Zeng, 2014). We can, therefore, conjecture that board gender diversity improves information asymmetry about firm fundamentals, which should mitigate adverse selection problems, lower the transactional costs, and, in turn, attract short sellers trying to exploit mispricing.

Other studies show that board gender quotas do not affect stock returns. Eckbo et al. (2022) show that board gender quotas do not influence stock returns in the short run. Thus, we can expect that changes in female composition on boards of directors do not affect short sellers' activity. *Ex-ante*, it is not clear theoretically how the short sellers react to board gender diversity; therefore, we test it empirically.

3. Data and research design

3.1. Research design

Regression analysis. To examine the correlation between board gender diversity and short sales, we run a firm-level OLS regression as follows:

$$ShortSale_{it} = \beta_0 + \beta_1 FemaleRatio_{it} + \beta_2 Controls_{it} + FEs + \varepsilon_{it} \qquad \text{(Eq. 1)}$$

where $ShortSale$ refers to one of the measures of short sales: MeanNet, MedianNet or MaxNet that are respectively the mean, median and maximum value of net short position in the particular year (position denotes the percentage of shares shorted by the position holder as a fraction of issuer's total shares outstanding). There are mandatory transparency rules of net short positions. Significant net short positions in shares must be: (i) reported to the relevant competent authorities when they at least equal to 0.2% of company issued share capital and every 0.1% above that or (ii) disclosed to the public when they at least equal to 0.5% of company issued share capital and every 0.1% above that. $FemaleRatio$ is the proportion of the number of women on board to the total number of persons on board. We also include a set of explanatory variables and year, industry, and country fixed effects. In particular, we control for firm's: 1) *Leverage*—the long term debt to the total assets (source: Orbis); 2) *Strategic Ownership*—the percentage of shares held by strategic investors (Corporations, Holding companies, Individuals and Government Agencies) divided by the number of shares outstanding (source: Refinitiv Eikon); 3) *Tobin's Q*—total market value of the firm scaled to total assets (source: Orbis); 4) *ROA*—net income to total assets (source: Orbis); 5) *Cash*—the sum of total cash and short

investment to total assets (source: Orbis); 6) *Return*—annual simple rate of return (source: Orbis); 7) *Size*—the natural logarithm of total assets (source: Orbis); 8) *Family*—dummy variable, which equals 1 when a company is controlled by families, zero otherwise (source: Orbis); 9) *Financial Company*—dummy variable, which equals 1 when a company's main shareholder is a financial company, i.e. mutual and pension fund/ insurance/ foundation/ hedge fund, zero otherwise (source: Orbis); 10) *% Females in Pop*—percentage of females in population (source: WorldBank World Development Indicators); 11) *GGP Index*—Global Gender Gap Index, a framework for capturing the magnitude and scope of gender-based disparities and tracking their progress. The GGP Index benchmarks national gender gaps on economic, political, education- and health-based criteria and is based on a total of 14 indicators from these categories (source: World Economic Forum); 12) *GDP Growth*—annual GDP growth (%) (source: WorldBank World Development Indicators). We provide a summary of the definitions of control variables in Appendix 1. We winsorize all continuous variables at the one percent level and cluster standard errors by the firm.

Difference in difference tests. To establish causality, we employ firm-level analysis to examine the treatment effects. We exploit the mandatory introduction of gender board quotas in Europe, which were introduced in different countries at different points in time. We therefore run the following staggered difference-in-differences (DID) regression as follows:

$$ShortSale_{it} = \beta_0 + \beta_1 Post\ x\ Treat_{it} + \beta_2 Controls_{it} + FEs + \varepsilon_{it} \quad \text{(Eq. 2)}$$

where *Post* is an indicator variable equal to one for years after the board gender quota implementation and zero otherwise. *Treat* is an indicator variable equal to one for countries that implemented board gender quota. We also include a set of control variables discussed in previous section and year and firm fixed effects. The coefficient β_1 captures the effect of quota introduction on short sale. Recent studies show that when there is variation in treatment timing the estimates from staggered DiD regressions obtained through ordinary least squares (OLS)

estimations can be biased (Callaway & Sant'Anna, 2021; Goodman-Bacon, 2021; Baker et al., 2022; Barrios, 2022). We therefore also apply stacked regression approach. In those estimations, we use all observations from before and after the treatment and where the control groups are never treated.

3.2 Sample construction

In this section, we discuss our sample's data sources and formation. We start with data collection from 32 European countries from 2011 to 2022. The information on corporate board members is from BoardEx Europe. We supplement it with firm-level characteristics from Orbis and Refinitiv Eikon and country-level variables from the following databases: World Economic Forum, WorldBank World Development Indicators, and Gender Board Diversity Dataset provided by GRAPE. Our final sample consists of 17 European countries and 9,932 unique companies. Sample construction is summarized in Appendix 2. Sample compositions by fiscal year, industry, and country are presented in Appendix 3.

We source information on board gender quotas from their legislature offices, including for all European countries. Table 1 summarises the types of quotas and their introduction and implementation dates.

[Insert Table 1]

4. Results

4.1 Summary statistics

The descriptive statistics are presented in Table 2. Based on the 19,795 observation, the mean (median) for short sales variables is equal to 0.161 (0) for the Mean Net, 0,152 (0) for the Median Net and, finally, 0.267 (0) for the Max Net short sale measure. The standard deviations are equal to 0.341, 0.323, and 0.847, respectively. The distribution of all three short-sale proxies is right-skewed and leptokurtic. However, the Max Net measure distribution is ultimately skewed and leptokurtic. In the subsequent panels, we report descriptive statistics on BGD

measures, control variables, volatility ratio, illiquidity ratio, and normative acceptance proxies. Notably, the descriptive statistics results for the bid-ask spread, the proxy for the illiquidity ratio, are very similar to the findings obtained by Fang et al. (2014). A correlation table for all variables used in the analysis is provided in Appendix 4.

[Insert Table 2]

4.2 Baseline results

Regression analysis. We present the primary set of regression results in Table 3. We show that *Female Ratio* is positively correlated with our three measures of short sale activity. The coefficient is statistically significant at the 1% level. This suggests that an increase in female representation on the board of directors encourages short sellers' activity.

[Insert Table 3]

Difference in difference tests. After establishing that board gender diversity is positively associated with short sale activity, we now address causality. Short sale activity and female ratio might be correlated with unobservable firm characteristics and lead to correlated omitted variable bias. We, therefore, exploit the introduction of mandatory gender board quotas as a quasi-natural experiment to test how gender diversity affects short sellers' activity. We identify *Treatment* firms as those from the countries that introduced gender quotas (compare Table 1). Control sample are firms in countries that have not introduced gender quotas.

In Table 4, we present the results. In Panel A, we show the time trends. To ensure the validity of our DID model, we test the parallel trends assumption through estimating in Eq. (2), where we replace *Post* with dummy variables before and after the treatment and zero otherwise. Year *t-1* is the reference year. Our results confirm that the assumption of parallel trends is valid.

Figure 1 provides an event-time analysis of the treatment effect. We estimate a version of Table 4 for *ShortSale* for three years before ($t \leq -4$) or after ($t \geq +4$) the introduction of BGD quotas. We omit the year $t=-1$ so that the effects are relative to this benchmark year. The figure

shows that the short sale increases from the year the BGD quotas are introduced (t=0). There is little evidence for noticeable pre-trends.

[Insert Figure 1]

In Panel B of Table 4, we show the staggered DiD test results. The coefficient on *Treatment x Post* is positive and statistically significant. This confirms our previous results that short sellers react to changes in female representation on boards.

In Panel C of Table 4, we show the stacked DiD test results. The coefficient on *Treatment x Post* is again positive and statistically significant. This ensured that our results were not affected by the heterogeneous timing of the treatment.

In Panel D and E of Table 4, we show the results from estimating the DiD model where the Treatment is the introduction of hard and soft quotas, respectively. The positive and statistically significant effect still holds irrespective of the type of gender board quota introduced.

In the final Panel F, we present the results from the *Placebo* test. We repeat our analysis using 2014 as the placebo year of exogenous change for a sample of -4 to +4 years relative to 2014. We find no evidence of any effect on short sale activity.

[Insert Table 4]

4.3 Channel analysis

In this subsection, we aim to understand the mechanism through which changes in board gender diversity affect short sellers' coverage of European firms. Previous literature suggests that, in general, board gender diversity is associated with improved monitoring and advisory functions of the board of directors that lead to better operational performance (Baik et al., 2024; Barroso et al., 2024; Fauver et al., 2024). Boards that are more effective in monitoring management improve the quality and the frequency of information released by management (Ajinkya et al., 2005; Karamanou & Vafeas, 2005).

Leuz et al. (2003) show that an important function of board directors is to improve financial transparency by restricting managerial incentives to distort information disclosure. Further, Chung et al. (2010) show that firms with better corporate governance have narrower spreads.

Therefore, Better corporate governance can improve financial and operational transparency by helping shareholders discern management and discover the firm's actual value. This suggests that firms with better governance due to improvements in board gender diversity should have lower costs of short selling (narrower bid-ask spreads) and, thus, the activity of short sellers should increase.

To test the liquidity channel, we use a model presented in Eq. (3). The model includes a set of controls discussed before, as well as time and firm fixed effects:

$$Illiquidity_{it} = \beta_0 + \beta_1 FemaleRatio_{it} + \beta_2 Controls_{it} + FEs + \varepsilon_{it} \qquad \text{(Eq. 3)}$$

Illiquidity is measured as *bid-ask spread ratio*=$ln\left|\frac{Bid-Ask\ Spread}{Midpoint\ Price}\right|$, where $Bid - Ask\ Spread = P(a) - P(b)$, $Midpoint\ Price = \frac{P(a)+P(b)}{2}$; $P(a)$—best ask price; $P(b)$—best bid price. Our main variable of interest is the coefficient on β_1. Based on our previous conjectures we expect the coefficient on β_1 to be negative and statistically significant. Panel A of Table 5 shows the results of this analysis. The coefficient on *FemaleRatio* confirms our expectations that an increase in board gender diversity decreases illiquidity. To further examine whether improvement liquidity is the channel through which BGD increases the short sellers activity, we next run Eq. 1 including *Illiquidity* as the main independent variable. We present the results in Table 5 Panel B. The coefficient on *Illiquidity* is negative and statistically significant showing that higher the costs of shorting the stock the lower the short sellers activity.

Overall, the results in Table 5 support the conjecture that increased short sellers' activity after board gender diversity improvements is due to improvements in liquidity or lower costs for short sellers.

[Insert Table 5]

4.4 Cross-sectional analysis: Normative acceptance

Our previous evidence suggests that, on average, GBD positively affects short sale. We now analyze if the effect varies with the normative acceptance of gender diversity in institutional environments across countries. Normative legitimacy theory suggests accepting practice as appropriate and desirable based on shared organizational norms and values. Zhang (2020) shows that normative acceptance of gender diversity can explain the diverse effects of GBD on a firm's revenue and performance. Therefore, GBD reforms would have a stronger effect in countries with lower acceptance of gender diversity at the country level. We therefore expect that in countries where gender diversity has not been normatively accepted, the effect of gender diversity reforms will be more pronounced, and, therefore, firms would experience greater short sellers' activity.

To test this prediction, we estimate the following equation:

$$ShortSale_{it} = \beta_0 + \beta_1 Post\ x\ Treat_{it} x ZeroFemSh + \beta_2 Controls_{it} + FEs + \varepsilon_{it} \quad \text{(Eq. 4)}$$

where as before, *Post* is an indicator variable equal to one for years after the board gender quota implementation and zero otherwise. *Treat* is an indicator variable equal to one for countries that implemented board gender quota. $ZeroFemSh$ is the dummy variable equal to one if the share of the firm with no women in any board is greater than mean share, and zero otherwise. We also include a set of control variables discussed in previous section and year and firm fixed effects. The coefficient β_1 captures the effect of cross-sectional heterogeneity.

We present the results in Table 6. The triple interaction term is positive and statistically significant, suggesting that in countries with lower normative acceptance of gender diversity, gender reforms are associated with greater short sales.

[Insert Table 6]

4.5 Robustness tests

We present several robustness tests in Table 7. In Panels A-D, we control for other corporate governance measures related to gender diversity, such as *Female CEO, Female Chair, Female Ind. NED*. Including those additional proxies for female representation in corporate governance structures does not change our results. In Panel E of Table 7, we control for the general level of risk faced by the firm by including as additional control the standard deviation of monthly stock returns *(Std_dev_return*) within the calendar year, and our results hold. We find that the coefficient on *FemaleRatio* is positive and significant. Overall, the addition of these controls does not change our inferences. In Panel F of Table 7, we demonstrate that results are unaffected if we exclude periods when EU countries introduced bans on short sales.

[Insert Table 7]

5. Conclusion

Empowering women became a high priority for policymakers and regulators. In this paper, we shed light on the reaction of short sellers to the changes in the share of females on boards of directors and the mandatory introduction of gender quotas. Short sellers are important capital market participants and often discover fraud and discipline managers. We find an increase in short sellers' activity after the BGD increases by running several econometrics tests, including OLS and staggered and stacked difference in difference design. The main channel through which BGD affects short sales is through liquidity. The improvements in the advisory and monitoring role of females on the board of directors improve liquidity and thus lower the costs for short sellers to exploit mispricing. We also find that these results are more pronounced in countries with greater normative acceptance of gender diversity. Our results are robust to a number of tests, including additional controls for the presence of females in managerial structures, firm risk, and excluding short sale ban periods.

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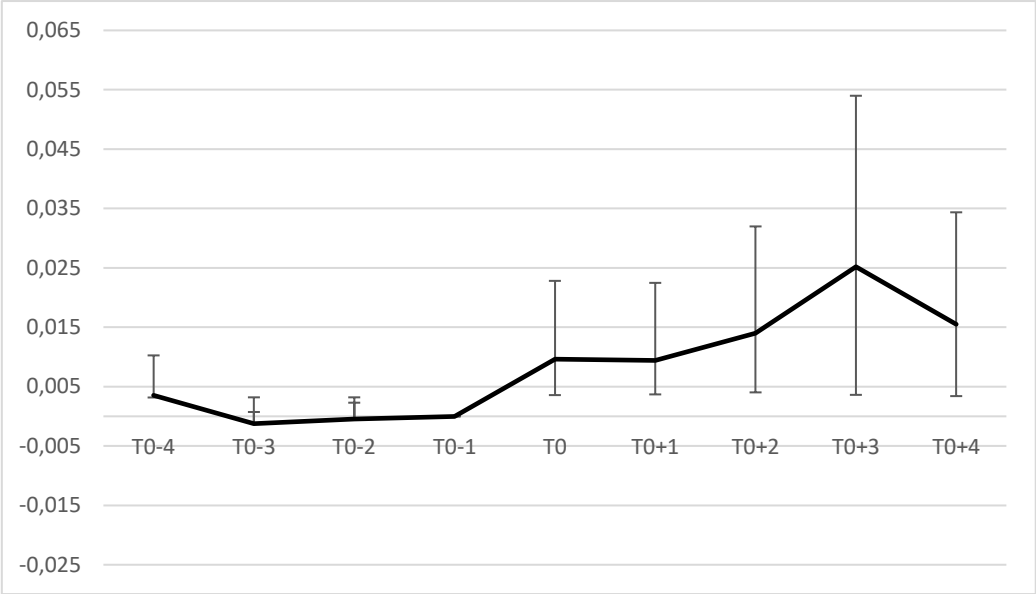
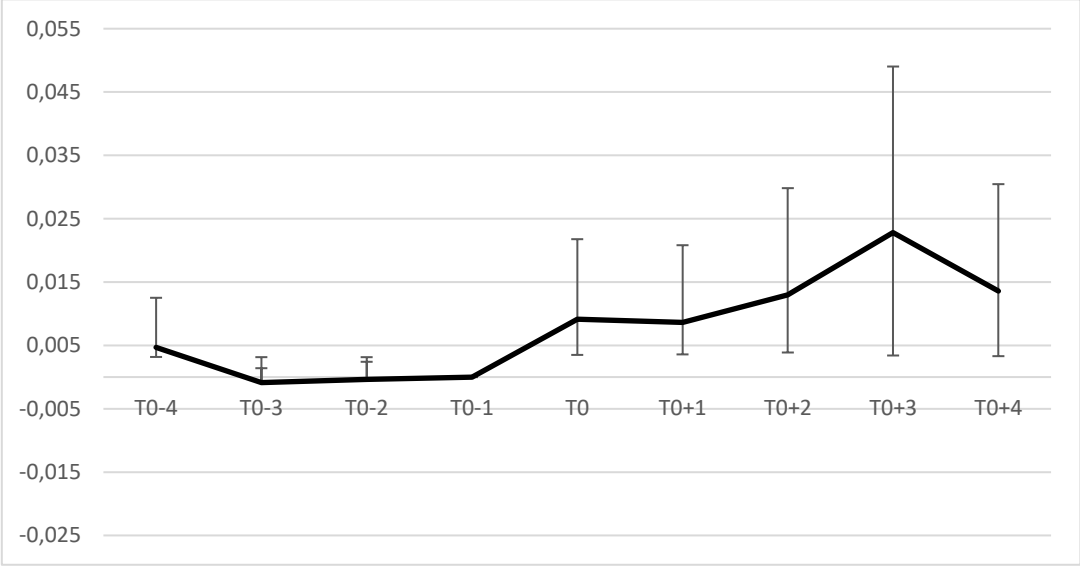
FIGURE 1
Changes in Short Sale around Gender Quota

Panel A: Treatment effect on Short Sale: *Mean Net* indicator



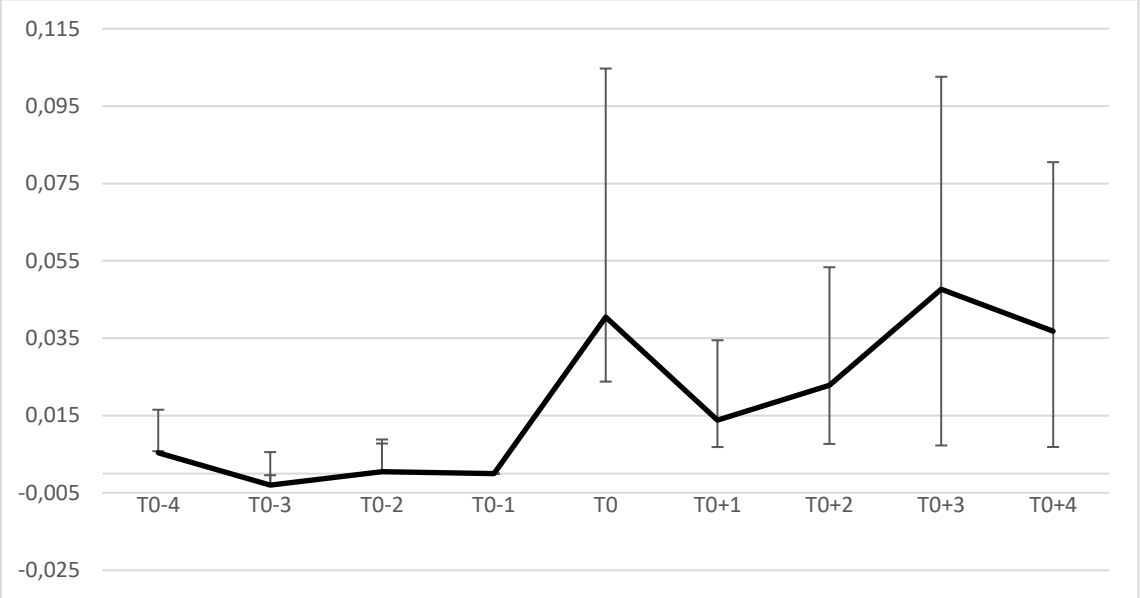
(coefficient – robust std error; coefficient + robust std error)

Panel B: Treatment effect on Short Sale: *Median Net* indicator



(coefficient – robust std error; coefficient + robust std error)

Panel C: Treatment effect on Short Sale: *Max Net* indicator



(coefficient – robust std error; coefficient + robust std error)

TABLE 1
Mandatory corporate board gender quotas in European countries

No.	Country	Introduction year	Implementation year	Quota (%)
1	Norway	2003/2006[2]	2004/2008	40[3]
2	Iceland	2010	2013	40
3	Italy	2011	2015	33
4	Spain	2007	2015	40
5	Germany	2015	2016	30
6	Netherlands	2011	2016	30
7	France	2011	2017	40
8	Austria	2017	2018	30
9	Belgium	2011	2012/2018[4]	33
10	Portugal	2017	2020	33

[2] In Norway, the gender quota was introduced in 2003 (for state-owned companies) and 2006 (for private companies), with compliance years 2004 and 2008, respectively.
[3] In Norway, the quota was equal 40% for boards with more than 9 members; in the case of boards with less than 9 members, the quota's ranged between 33.3% and 50%.
[4] In Belgium, the gender quota for state-owned companies was implemented in 2012 and for listed companies – between 2017 and 2019.

TABLE 2

Summary Statistics

The table presents summary statistics for the sample, which contained 19,795 observations from 2011 to 2022. The definitions of all variables are provided in Appendix 1.

	#	Mean	Std. dev	Min	10th	Median	90th	Max	Skew	Kurt
Short Sale Variables										
Mean Net	19795	0.161	0.341	0	0	0	0.672	4.350	2.553	12.508
Median Net	19795	0.152	0.323	0	0	0	0.630	4.540	2.733	15.631
Max Net	19795	0.267	0.847	0	0	0	1	73.000	34.879	2783.374
Gender Diversity										
Female Ratio	19795	0.228	0.214	0	0	0.200	0.500	1	1.207	5.162
Female CEO	19795	0.071	0.256	0	0	0	0	1	3.352	12.236
Female Chair	19795	0.074	0.261	0	0	0	0	1	3.266	11.666
Female Ind. NED	19795	0.084	0.277	0	0	0	0	1	3.007	10.045
Controls										
Leverage	19795	0.174	0.161	0	0	0.143	0.397	.885	1.131	4.453
Strategic Ownership	19795	0.421	0.343	0	0.013	0.399	0.798	1.952	1.373	7.052
Tobin's Q	19795	1.188	1.636	0.014	0.212	0.700	2.528	14.619	4.336	28.177
ROA	19795	2.594	14.421	-79.344	-10.267	4.429	14.556	38.668	-2.200	11.986
Cash	19795	0.151	0.164	0.000	0.018	0.100	0.345	0.976	2.303	9.242
Return	19795	0.065	0.509	-0.852	-0.433	-0.017	0.594	2.692	2.017	10.003
Size	19795	13.420	2.192	5.238	10.598	13.356	16.312	18.704	0.115	2.675
Family	19795	0.574	0.495	0	0	1	1	1	-0.298	1.089
Financial Company	19795	0.795	0.404	0	0	1	1	1	-1.464	3.142
% Females in Pop	19795	50.816	0.590	49.541	49.876	50.741	51.638	51.675	-0.233	2.526
GGP Index	19795	0.769	0.039	0.672	0.709	0.770	0.822	0.861	0.016	2.840
GDP Growth	19795	1.447	3.732	-11.325	-2.355	1.950	5.102	24.370	-1.237	7.438
Volatility										
Std_return	19642	0.105	0.071	0	0.048	0.088	0.179	2.053	5.237	86.078
Illiquidity										
Bid-ask spread ratio	19156	-5.052	1.549	-10.449	-7.098	-5.066	-3.040	0.693	0.074	2.745
Normative acceptance										
Zero_fem_share	19795	0.760	0.427	0	0	1	1	1	-1.217	2.481
Zero_fem_share_stl	19795	0.537	0.499	0	0	1	1	1	-0.150	1.022

TABLE 3
Short Sale and Female Ratio

This table reports the results from estimating Eq. (1). In column (1), the dependent variable is the *Mean Net* short sale indicator; in column (2), the dependent variable is the *Median Net* short sale indicator; in column (3), the dependent variable is the *Max Net* short sale indicator. All variables are defined in Appendix 1. The sample spans the period 2011-2022. The values reported in parentheses below coefficients represent t-statistics. Standard errors are clustered at the firm level. *, **, *** represent significance at 1%, 5%, and 10% respectively.

	(1)	**(2)**	**(3)**
	Mean Net	*Median Net*	*Max Net*
Female Ratio	0.059***	0.053***	0.110***
	(3.27)	(3.15)	(3.14)
Leverage	0.068***	0.067***	0.122**
	(2.64)	(2.75)	(2.39)
Strategic Ownership	-0.138***	-0.130***	-0.249***
	(-12.92)	(-13.00)	(-10.68)
Tobin's Q	0.013***	0.013***	0.018***
	(5.18)	(5.50)	(3.46)
ROA	-0.001***	-0.001***	-0.002***
	(-4.27)	(-3.96)	(-4.91)
Cash	0.121***	0.110***	0.224***
	(5.05)	(4.91)	(4.56)
Return	-0.031***	-0.029***	-0.062***
	(-5.99)	(-6.16)	(-5.08)
Size	0.050***	0.047***	0.084***
	(20.35)	(20.68)	(17.53)
Family	0.005	0.005	0.028
	(0.65)	(0.65)	(1.35)
Financial Company	0.064***	0.059***	0.123***
	(9.27)	(9.03)	(8.70)
% Females in Pop	-0.111***	-0.112***	-0.203***
	(-2.77)	(-2.88)	(-2.67)
GGP Index	-0.194	-0.133	-0.730*
	(-1.07)	(-0.77)	(-1.96)
GDP Growth	0.001	0.002*	0.000
	(1.24)	(1.66)	(0.22)
R-squared	0.206	0.202	0.104
Observations	19,795	19,795	19,795
Constant	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes

TABLE 4
Difference in Difference Tests

This table reports the results from estimating Eq. (2). In column (1), the dependent variable is the *Mean Net* short sale indicator; in column (2), the dependent variable is the *Median Net* short sale indicator; in column (3), the dependent variable is the *Max Net* short sale indicator. All variables are defined in Appendix 1. The sample spans the period 2011-2022. The values reported in parentheses below coefficients represent t-statistics. Standard errors are clustered at the firm level. *, **, *** represent significance at 1%, 5%, and 10% respectively.

Panel A: Time-trends

	(1) *Mean Net*	(2) *Median Net*	(3) *Max Net*
T0-4 × Treatment	0.004	0.005	0.005
	(1.12)	(1.47)	(0.93)
T0-3 × Treatment	-0.001	-0.001	-0.003
	(-0.39)	(-0.28)	(-0.53)
T0-2 × Treatment	-0.000	-0.000	0.001
	(-0.14)	(-0.11)	(0.07)
T0-1 × Treatment	*Ref.*	*Ref.*	*Ref.*
T0 x Treatment	0.010***	0.009***	0.040*
	(2.69)	(2.61)	(1.70)
T0+1 × Treatment	0.009**	0.009**	0.014**
	(2.54)	(2.41)	(2.01)
T0+2 × Treatment	0.014***	0.013***	0.023***
	(3.46)	(3.34)	(2.98)
T0+3 × Treatment	0.025***	0.023***	0.048***
	(6.97)	(6.69)	(6.55)
T0+4 × Treatment	0.015***	0.014***	0.037***
	(4.55)	(4.12)	(5.35)
R-squared	0.489	0.465	0.450
Observations	358,920	358,920	358,920
Constant	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Relative year fixed effects	Yes	Yes	Yes

Panel B: Difference-in-Difference Staggered

	(1) *Mean Net*	(2) *Median Net*	(3) *Max Net*
Treatment × Post	**0.021*** **	**0.020*** **	**0.064** **
	(2.68)	**(2.62)**	**(2.15)**
R-squared	0.562	0.541	0.380
Observations	28,408	28,408	28,408
Constant	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes

Panel C: Difference-in-Difference Stacked

	(1) *Mean Net*	(2) *Median Net*	(3) *Max Net*
Treatment* × *Post	**0.034*** **	**0.031*** **	**0.081*** **
	(3.94)	**(3.79)**	**(3.09)**
R-squared	0.595	0.572	0.492
Observations	55,522	55,522	55,522
Constant	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Relative year fixed effects	Yes	Yes	Yes

Panel D: Difference-in-Difference Stacked, hard quotas: NO2008, IT2015, DE2016, FR2017, AT2018, BE2018

	(1) *Mean Net*	(2) *Median Net*	(3) *Max Net*
Treatment* × *Post	**0.028*** **	**0.028*** **	**0.071** **
	(3.14)	**(3.19)**	**(2.38)**
R-squared	0.595	0.572	0.492
Observations	55,522	55,522	55,522
Constant	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Relative year fixed effects	Yes	Yes	Yes

Panel E: Difference-in-Difference Stacked, soft quotas: ES2015, NL2016

	(1) *Mean Net*	(2) *Median Net*	(3) *Max Net*
Treatment* × *Post	**0.057** **	**0.045** **	**0.120*** **
	(2.54)	**(2.06)**	**(2.79)**
R-squared	0.595	0.571	0.491
Observations	55,522	55,522	55,522
Constant	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Relative year fixed effects	Yes	Yes	Yes

Panel F: Placebo test

	(1) *Mean Net*	(2) *Median Net*	(3) *Max Net*
Treatment* × *Post (Placebo)	**0.016**	**0.015**	**0.038**
	(1.28)	**(1.28)**	**(1.53)**
R-squared	0.646	0.618	0.646
Observations	24,494	24,494	24,494
Constant	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Relative year fixed effects	Yes	Yes	Yes

TABLE 5 Channel Analysis

In panel A we report the results from estimating Eq. (3). The dependent variable is the *bid-ask spread ratio*= $ln\left|\frac{Bid-Ask\ Spread}{Midpoint\ Price}\right|$; $Bid - Ask\ Spread = P(a) - P(b)$; $Midpoint\ Price = \frac{P(a)+P(b)}{2}$; $P(a) - best\ ask\ price$; $P(b) - best\ bid\ price$. All other variables are defined in Appendix 1. The sample spans the period 2011-2022. The values reported in parentheses below coefficients represent t-statistics. Standard errors are clustered at the firm level. *, **, *** represent significance at 1%, 5%, and 10% respectively.

In panel B we report the results from estimating Eq. (1). In column (1), the dependent variable is the *Mean Net* short sale indicator; in column (2), the dependent variable is the *Median Net* short sale indicator; in column (3), the dependent variable is the *Max Net* short sale indicator. All variables are defined in Appendix 1. The sample spans the period 2011-2022. The values reported in parentheses below coefficients represent t-statistics. Standard errors are clustered at the firm level. *, **, *** represent significance at 1%, 5%, and 10% respectively.

Panel A: Liquidity and Female Ratio

	Illiquidity (Bid-ask spread ratio)
Female Ratio	-0.319***
	(-5.43)
Leverage	0.194**
	(2.09)
Strategic Ownership	0.648***
	(12.23)
Tobin's Q	-0.155***
	(-15.42)
ROA	-0.005***
	(-5.79)
Cash	-0.404***
	(-4.93)
Return	-0.037***
	(-2.11)
Size	-0.492***
	(-62.63)
Family	-0.094***
	(-3.86)
Financial company	-0.142***
	(-4.55)
% Females in Population	-0.652***
	(-5.18)
Global Gender Gap Index	4.746***
	(6.62)
GDP Growth	-0.016***
	(-4.32)
R-squared	0.551
Observations	19,156
Constant	Yes
Year fixed effects	Yes
Country fixed effects	Yes
Industry fixed effects	Yes

TABLE 5 Channel Analysis cont.

Panel B: Short Sale and Liquidity

	(1)	(2)	(3)
	Mean Net	*Median Net*	*Max Net*
Illiquidity	-0.039***	-0.036***	-0.068***
(Bid-ask spread ratio)	(-15.69)	(-15.62)	(-13.38)
Leverage	0.079***	0.077***	0.142***
	(3.04)	(3.13)	(2.72)
Strategic Ownership	-0.116***	-0.110***	-0.211***
	(-11.11)	(-11.21)	(-9.08)
Tobin's Q	0.007***	0.008***	0.008
	(2.88)	(3.26)	(1.44)
ROA	-0.001***	-0.001***	-0.003***
	(-4.82)	(-4.46)	(-5.36)
Cash	0.108***	0.099***	0.204***
	(4.54)	(4.41	(4.14)
Return	-0.033***	-0.031***	-0.065***
	(-6.32)	(-6.50)	(-5.28)
Size	0.031***	0.030***	0.052***
	(11.97)	(12.15)	(10.29)
Family	0.000	0.000	0.020
	(0.04)	(0.00)	(0.98)
Financial company	0.060***	0.055***	0.116***
	(8.61)	(8.35)	(8.15)
% Females in Population	-0.140***	-0.138***	-0.254***
	(-3.38)	(-3.46)	(-3.25)
Global Gender Gap Index	0.045	0.085	-0.319
	(0.24)	(0.48)	(-0.83)
GDP Growth	0.001	0.001	-0.000
	(0.92)	(1.36)	(-0.04)
R-squared	0.220	0.215	0.110
Observations	19,156	19,156	19,156
Constant	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes

TABLE 6
Cross Sectional Analysis: Normative Acceptance of Gender Diversity

This table reports the results from estimating Eq. (4). In column (1), the dependent variable is the *Mean Net* short sale indicator; in column (2), the dependent variable is the *Median Net* short sale indicator; in column (3), the dependent variable is the *Max Net* short sale indicator. All variables are defined in Appendix 1. The sample spans the period 2011-2022. The values reported in parentheses below coefficients represent t-statistics. Standard errors are clustered at the firm level. *, **, *** represent significance at 1%, 5%, and 10% respectively.

In panel A, a dummy ***ZeroFemSh*** is equal to 1 when a share of firms with no women in any board (neither management nor supervisory) is higher than the mean share of firms with no women in any board. In Panel B, a dummy ***ZeroFemSh_stl*** is equal to 1 when a share of stock listed firms with no women in any board (neither management nor supervisory) is higher than the mean share of stock listed firms with no women in any board.

Panel A: Measure Based on All Firms

	(1) *Mean Net*	(2) *Median Net*	(3) *Max Net*
Post* × *ZeroFemSh	**0.042*** **	**0.039*** **	**0.091*** **
	(3.58)	**(3.51)**	**(3.76)**
ZeroFemSh	-0.005	-0.004	-0.025
	(-0.58)	(-0.48)	(-1.40)
R-squared	0.562	0.541	0.381
Observations	28,408	28,408	28,408
Constant	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes

Panel B: Measure Based on Public Firms

	(1) *Mean Net*	(2) *Median Net*	(3) *Max Net*
Post* × *ZeroFemSh_stl	**0.021** **	**0.016** **	**0.041** **
	(2.55)	**(2.13)**	**(2.41)**
ZeroFemSh_stl	-0.009	-0.006	-0.037**
	(-1.41)	(-1.07)	(-2.09)
R-squared	0.562	0.541	0.381
Observations	28,408	28,408	28,408
Constant	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes

TABLE 7
Short Sale and Female Ratio: Robustness Tests

This table reports the results from estimating Eq. (1). In column (1), the dependent variable is the *Mean Net* short sale indicator; in column (2), the dependent variable is the *Median Net* short sale indicator; in column (3), the dependent variable is the *Max Net* short sale indicator. All variables are defined in Appendix 1. The sample spans the period 2011-2022. The values reported in parentheses below coefficients represent t-statistics. Standard errors are clustered at the firm level. *, **, *** represent significance at 1%, 5%, and 10% respectively.

Panel A: Controlling for corporate governance, female CEO

	(1)	**(2)**	**(3)**
	Mean Net	*Median Net*	*Max Net*
Female Ratio	0.060***	0.054***	0.113***
	(3.35)	(3.23)	(3.21)
R-squared	0.206	0.202	0.104
Observations	19,795	19,795	19,795
Constant	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Female CEO	-0.012	-0.012	-0.021
	(-0.70)	(-0.73)	(-0.61)
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes

Panel B: Controlling for corporate governance, female chair

	(1)	**(2)**	**(3)**
	Mean Net	*Median Net*	*Max Net*
Female Ratio	0.057***	0.051***	0.108***
	(3.15)	(3.03)	(3.05)
R-squared	0.206	0.202	0.104
Observations	19,795	19,795	19,795
Constant	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Female Chair	0.010	0.009	0.012
	(0.73)	(0.73)	(0.46)
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes

Panel C: Controlling for corporate governance, female independent non-executive director

	(1)	(2)	(3)
	Mean Net	*Median Net*	*Max Net*
Female Ratio	0.069***	0.067***	0.108**
	(3.14)	(3.29)	(2.47)
R-squared	0.206	0.202	0.104
Observations	19,795	19,795	19,795
Constant	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Female Ind. NED	-0.016	-0.023	0.002
	(-0.69)	(-1.05)	(0.07)
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes

Panel D: Controlling for corporate governance, female CEO, female chair, female independent non-executive director

	(1)	(2)	(3)
	Mean Net	*Median Net*	*Max Net*
Female Ratio	0.069***	0.067***	0.109**
	(3.10)	(3.26)	(2.43)
R-squared	0.207	0.203	0.104
Observations	19,795	19,795	19,795
Constant	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Female CEO	-0.014	-0.014	-0.022
	(-0.81)	(-0.86)	(-0.64)
Female Chair	0.011	0.010	0.014
	(0.78)	(0.77)	(0.55)
Female Ind. NED	-0.017	-0.023	0.003
	(-0.70)	(-1.07)	(0.05)
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes

Panel E: Controlling for Volatility

	(1)	(2)	(3)
	Mean Net	*Median Net*	*Max Net*
Female Ratio	0.063***	0.056***	0.117***
	(3.46)	(3.33)	(3.34)
R-squared	0.216	0.211	0.111
Observations	19,642	19,642	19,642
Constant	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Volatility	0.543***	0.493***	1.134***
	(9.34)	(9.42)	(7.90)
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes

Panel F: Controlling for Short sale bans

	(1)	(2)	(3)
	Mean Net	*Median Net*	*Max Net*
Female Ratio	0.069***	0.062***	0.127**
	(3.82)	(3.69)	(3.64)
R-squared	0.194	0.190	0.097
Observations	19,795	19,795	19,795
Constant	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Short sale ban dummy	-0.014	-0.013	-0.031
	(-1.28)	(-1.17)	(-1.47)
Country fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes

Short sale ban dummy = 1 for year 2020, 0 otherwise

Panel G: Controlling for Short sale bans – sample limited to 2010-2019

	(1)	(2)	(3)
	Mean Net	*Median Net*	*Max Net*
Female Ratio	0.088***	0.078***	0.170***
	(3.59)	(3.40)	(3.61)
R-squared	0.210	0.205	0.091
Observations	12,806	12,806	12,806
Constant	Yes	Yes	Yes
Controls	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes
Country fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes

APPENDIX 1
Definitions of variables

This table reports definitions of variables used in the study.

Variable	Definition	Source
Mean Net	Mean value of net short position (the percentage of shares shorted by the position holder as a fraction of issuer's total shares outstanding) during year t	WRDS
Median Net	Median value of net short position (the percentage of shares shorted by the position holder as a fraction of issuer's total shares outstanding) during year t	WRDS
Max Net	Maximum value of net short position (the percentage of shares shorted by the position holder as a fraction of issuer's total shares outstanding) during year t	WRDS
Female Ratio	Proportion of the number of women on board to the total number of persons on board in the i^{th} company in year t	BoardEx
Female CEO	A dummy variable equal to 1 when the i^{th} company has at least one CEO who is a female in year t, and 0 otherwise	BoardEx
Female Chair	A dummy variable equal to 1 when the i^{th} company has at least one female on the board's chairman position in year t, and 0 otherwise	BoardEx
Female Ind. NED	A dummy variable equal to 1 when the i^{th} company has at least one female on the independent non-executive director position in year t, and 0 otherwise	BoardEx
Leverage	Long-term debt scaled to total assets	Orbis
Strategic Ownership	The number of shares held by strategic investors: Corporations, Holding companies, Individuals and Government Agencies divided by the number of shares outstanding in the i^{th} company in year t	Refinitiv Eikon
Tobin's Q	The total market value of the firm scaled to total assets	Orbis
ROA	Net income scaled to total assets	Orbis
~~*MB*~~	~~Market capitalization scaled to total assets~~	~~Orbis~~
Cash	The sum of total cash and short investment scaled to total assets	Orbis
Return	The annual simple rate of return	Orbis
Size	The natural logarithm of total assets (in thousands of USD)	Orbis
Family	A dummy variable equal to 1 when the i^{th} company is controlled by families in year t, and 0 otherwise	Orbis
Financial Company	A dummy variable equal to 1 when a company's main shareholder in year t is a financial company, i.e. mutual and pension fund/ insurance/ foundation/ hedge fund, and 0 otherwise	Orbis
% Females in Pop	The percentage of females in the population	World Bank
GGP Index	Global Gender Gap Index benchmarks national gender gaps on economic, political, education- and health-based criteria, based on 14 indicators from these categories	World Economic Forum
GDP Growth	Annual GDP growth (in %)	World Bank
Std_return	The annual standard deviation of the monthly rate of returns	Orbis

Bid-ask spread ratio	$ln\left\|\frac{Bid-Ask\ Spread}{Midpoint\ Price}\right\|$; where the Bid-Ask Spread is the difference between the best ask price and the best bid price and the Midpoint Price is an arithmetic mean of the best ask price and the best bid price	Refinitiv Eikon
ZeroFemSh	A dummy is equal to 1 when a share of firms with no women in any board (neither management nor supervisory) is higher than the mean share of firms with no women in any board, and 0 otherwise	GRAPE
ZeroFemSh_stl	A dummy is equal to 1 when a share of stock listed firms with no women in any board (neither management nor supervisory) is higher than the mean share of stock listed firms with no women in any board, and 0 otherwise	GRAPE

APPENDIX 2
Sample Selection

This table reports sample selection.

	#observations dropped	#observations
Number of observations on stock-listed firms available on Orbis between 2011-2022		215,244
Less :		
Missing short sale WRDS data	19,815	
Companies delisted between 2010-2022	88,800	
Final sample		**106,629**

APPENDIX 3
Sample Composition

This table reports the composition of the sample by fiscal year in Panel A; by industry (by Bureau van Dijk BvD industry) in Panel B and by country (in panel C).

Panel A. Sample composition by year

Year	*Freq.*	*Percent*
2011	9,932	9.31
2012	9,749	9.14
2013	9,514	8.92
2014	9,360	8.78
2015	9,224	8.65
2016	9,060	8.50
2017	8,854	8.30
2018	8,674	8.13
2019	8,446	7.92
2020	8,201	7.69
2021	7,954	7.46
2022	7,661	7.18
Total	106,629	100.00

Panel B. Sample composition by BvD industry

BvD industry	*Freq.*	*Percent*
Agriculture, Horticulture & Livestock	871	0.83
Banking, Insurance & Financial Services	16,688	15.97
Biotechnology and Life Sciences	1,698	1.62
Business Services	15,577	14.90
Chemicals, Petroleum, Rubber & Plastic	6,064	5.80
Communications	2,829	2.71
Computer Hardware	397	0.38
Computer Software	3,122	2.99
Construction	2,662	2.55
Food & Tobacco Manufacturing	2,502	2.39
Industrial, Electric & Electronic Machinery	10,665	10.20
Leather, Stone, Clay & Glass products	838	0.80
Media & Broadcasting	1,678	1.61
Metals & Metal Products	2,006	1.92
Mining & Extraction	4,297	4.11
Miscellaneous Manufacturing	1,230	1.18
Printing & Publishing	1,161	1.11
Property Services	7,131	6.82
Public Administration, Education, Health Social Services	2,447	2.34
Retail	3,037	2.91
Textiles & Clothing Manufacturing	1,416	1.35
Transport Manufacturing	1,814	1.74
Transport, Freight & Storage	2,218	2.12
Travel, Personal & Leisure	3,007	2.88
Utilities	2,513	2.40
Waste Management & Treatment	238	0.23
Wholesale	5,283	5.05
Wood, Furniture & Paper Manufacturing	1,136	1.09

Panel C. Sample composition by country

Country	*Freq.*	*Percent*
Austria	1,048	0.98
Belgium	2,092	1.96
Czech Republic	845	0.79
Denmark	2,680	2.51
Finland	2,532	2.37
France	10,628	9.97
Germany	9,980	9.36
Greece	2,619	2.46
Iceland	1,354	1.27
Italy	6,077	5.70
Luxembourg	1,106	1.04
Netherlands	2,423	2.27
Norway	4,250	3.99
Poland	11,107	10.42
Spain	7,035	6.60
Sweden	13,178	12.36
UK	27,675	25.95
Total	106,629	100.00

APPENDIX 4
Correlation Table

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
1	*Mean Net*	1.000																					
2	*Median Net*	0.987*	1.000																				
3	*Max Net*	0.822*	0.768*	1.000																			
4	*Female Ratio*	0.101*	0.098*	0.075*	1.000																		
5	*Leverage*	0.084*	0.083*	0.066*	0.038*	1.000																	
6	*Strategic Ownership*	-0.168*	-0.165*	-0.130*	-0.053*	0.008	1.000																
7	*Tobin's Q*	-0.015*	-0.014*	-0.016*	-0.023*	-0.114*	-0.019*	1.000															
8	*ROA*	0.061*	0.061*	0.041*	0.082*	-0.027*	0.061*	-0.136*	1.000														
9	*Cash*	-0.041*	-0.041*	-0.030*	-0.061*	-0.206*	-0.021*	0.343*	-0.225*	1.000													
10	*Return*	-0.015*	-0.014*	-0.018*	-0.007	-0.034*	0.030*	0.228*	0.182*	0.052*	1.000												
11	*Size*	0.319*	0.315*	0.244*	0.187*	0.244*	-0.104*	-0.334*	0.326*	-0.308*	0.006	1.000											
12	*GDP Growth*	-0.018*	-0.017*	-0.017*	0.008	-0.052*	0.003	0.030*	0.019*	0.007	-0.075*	-0.042*	1.000										
13	*% Females in Pop*	-0.034*	-0.033*	-0.027*	-0.030*	-0.030*	0.104*	-0.105*	0.111*	-0.086*	0.013*	-0.011*	0.004	1.000									
14	*GGP Index*	0.034*	0.032*	0.027*	0.183*	0.047*	-0.059*	0.107*	-0.097*	0.100*	-0.010*	0.014*	0.055*	-0.701*	1.000								
15	*Family*	-0.020*	-0.019*	-0.013*	-0.007	-0.070*	-0.014*	0.067*	-0.045*	0.045*	0.014*	-0.189*	0.019*	0.027*	-0.047*	1.000							
16	*Financial Company*	0.168*	0.165*	0.132*	0.092*	0.038*	-0.163*	0.003	-0.011*	0.011*	-0.014*	0.247*	0.032*	-0.161*	0.179*	0.091*	1.000						
17	*Female CEO*	0.043*	0.042*	0.031*	0.145*	0.010	-0.009	-0.023*	0.026*	-0.020*	-0.010	0.144*	0.001	0.004	0.073*	-0.041*	0.029*	1.000					
18	*Female Chair*	0.015*	0.015*	0.007	0.179*	-0.015*	0.019*	-0.019*	0.017*	0.004	0.004	0.085*	-0.002	0.011*	0.029*	-0.051*	0.005	0.145*	1.000				
19	*Female Ind. NED*	0.101*	0.099*	0.080*	0.443*	0.018*	-0.227*	-0.014*	0.050*	-0.054*	-0.015*	0.142*	0.036*	-0.081*	-0.030*	0.085*	0.103*	-0.017*	-0.009*	1.000			
20	*Std_return*	-0.025*	-0.026*	-0.010*	-0.066*	-0.046*	-0.021*	0.137*	-0.271*	0.130*	0.071*	-0.311*	-0.066*	0.015*	-0.011*	0.068*	-0.046*	-0.019*	-0.018*	-0.048*	1.000		
21	*Bid-ask spread ratio*	-0.306*	-0.303*	-0.227*	-0.175*	-0.127*	0.131*	0.050*	-0.208*	0.096*	-0.040*	-0.623*	0.016*	0.049*	-0.132*	0.149*	-0.205*	-0.114*	-0.084*	-0.071*	0.244*	1.000	
22	*ZeroFemSh*	0.007*	0.007*	0.007*	-0.090*	-0.023*	-0.010*	-0.006	0.073*	-0.002	-0.041*	0.019*	0.303*	0.389*	-0.338*	0.051*	0.016*	-0.022*	-0.066*	-0.005	-0.026*	-0.035*	1.000
23	*ZeroFemSh_stl*	-0.032*	-0.030*	-0.030*	-0.116*	-0.031*	-0.021*	-0.019*	0.046*	-0.014*	-0.077*	0.001	0.294*	0.103*	-0.260*	0.090*	-0.004	-0.051*	-0.056*	0.086*	0.002	-0.013*	0.525*