Bachelor's thesis

The effect of gender diversity on firm performance and financial leverage

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Abstract

As a result of the introduction of the gender board quota by the Norwegian government in 2003, this thesis examines the effect of gender diversity on firm performance and financial leverage. Return on assets and Tobin's Q are used as measures of firm performance. In total, 75 Norwegian companies are investigated during the period from 2008 to 2018. A Two-Stage Least Squares regression is performed where the gender quota is used as an instrumental variable. The results show a negative relationship between gender diversity and return on assets. The relationship between gender diversity and Tobin's Q or leverage is also negatively correlated. However, those coefficients are significant at the 1% level. The biggest limitation of this study is the sample size. A bigger sample size would make the sample more representative to the outside world, and would, hence, result in more reliable findings.

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1 Introduction

This study will examine the effect of gender diversity in boardrooms on firm performance and the effect on the level of risk a firm takes. Norway was the first in the world to introduce a gender quota in 2005. The gender quota law holds for public limited companies (ASA). Boards that consist of three directors, must have at least one female and one male director to achieve a balance of genders. Additionally, boards with four to five members (which is the average board size among ASA) must have a minimum of two female directors. Boards with six to eight members should have three female directors, and a board with nine members should have four female directors. Lastly, for boards with 10 or more members, at least 40% of the directors must be female (Eckbo, Nygaard, & Thorburn, 2022). Only 9% of the directors were women at that time and all ASAs had to comply with this quota by 2008, or they would be forced to liquidation (Ahern & Dittmar, 2012).

In June 2023, Norway's government proposed a law where large and mid-size private Norwegian firms should also comply with the gender quota (Kletsy, Fouche, & Osmond, 2023). The gender quota is a means to break the glass ceiling preventing women from reaching top positions and a way to achieve a better gender balance in Norwegian boardrooms. According to McKinsey&Company (2017), women only create around 37% of the global GDP, even though women make up 50% of the world's working-age population. By 2025, bridging the gender gap may increase the global GDP by $12 trillion. Therefore, 240 million more workers would need to enter the labor force globally by 2025. Additionally, only 3.1% of women in EU Member States hold the highest position of president or chairman in 2005 (European Commission, 2012a).

One step in closing the gender gap is the implementation of this gender quota law. This new law was introduced for gender-political reasons and to boost gender diversity, and the introduction was unrelated to firm performance. However, it provides an interesting experimental environment to examine whether firm performance goes up or declines due to a mandated increase in the female ratio of boardrooms. Several research has already been done on the effect of a mandated board structure on firm performance. However, the results differ from a positive impact on firm performance to no impact or a negative effect. Even though the sociological benefits of higher gender diversity are extremely clear, namely, it fosters inclusivity, reduced bias, and stereotyping, promotes equal opportuni-

ties, and enriches social cohesion and understanding.

However, the economic effects are still ambiguous. As also mentioned by Rose (2007) and Ahern and Dittmar (2012), it is quite complicated to capture the effects of gender diversity on firm performance with an economic model. This complexity is also highlighted by Eckbo et al. (2022). Because there are a lot of contradictory findings on the effect of a gender quota on firm performance, it is an interesting topic to study. Therefore, this study will try to provide new evidence for this matter and look at data from 75 Norwegian companies in the time period 2008-2018. The central question of this paper is:

What is the effect of gender diversity in boardrooms on firm performance and financial leverage?

To be able to answer this research question, this paper will begin by summarizing previous literature on this topic. Criteria for a well-functioning board of directors will be discussed, followed by a section about the effect of CEO gender and the effect of gender diversity on firm performance and the risk level of companies. Then, the hypothesis of this research will be elaborated. Afterward, the data and methodology will be presented and explained in the results and conclusion section, together with the limitations.

2 Theoretical framework

2.1 Criteria for a well-functioning board of directors

The significance of corporate boards is frequently doubted as their everyday impact remains elusive. However, in times of crisis or failure, they can quickly become the focal point of attention (Adams et al., 2010). It is, for instance, difficult to determine whether knowledgeable board members contribute to the increase in firm value through their actions or if highly valued firms naturally attract more knowledgeable board members. This issue of endogeneity creates difficulty in identifying the specific characteristics of boards and board members that influence firm performance (Ahern & Dittmar, 2012).

Westphal (1998) and Romano (2005), for instance, state that boards are merely superficial, lacking any impact on the value of the firm. A Harvard Business School professor who aligns with this, once said that "too many boards of directors were mere 'ornaments on a corporate Christmas tree' - largely decorative, in other words, and serving little real business purpose" (Byrne, 2002). Helland and Sykuta (2004) agree to this and, hence, they believe that the mandated female board representation in Norwegian boardrooms would not change the economic performance of firms. But if we assume that owners choose their board to maximize firm value, implementing a legally required board structure results, on the other hand, in restricting the options accessible to owners. This leads to a decrease in firm value, according to Demsetz and Lehn (1985).

However, Zahra and Pearce (1989) further examined the influence of a board of directors on economic firm performance. They first state that boards are accountable for corporate leadership, without really interfering in day-to-day operations. This is namely the executive team's responsibility. Some of the board's duties are appointing and replacing the chief executive officer (CEO), representing the interests of the company's shareholders, giving senior management guidance and counsel, and acting as a control mechanism by keeping an eye on managerial and corporate performance.

Van den Berghe and Levrau (2004) identifies criteria for good boards of directors. The first one is the board size. Previous research has found a negative relationship between board size and firm market value. Larger boards may be less efficient and negatively influence

firm performance. Nevertheless, it is important to acknowledge the necessity of having an adequate number of directors to promote diversity of ideas and mitigate excessive control by the CEO. Furthermore, the composition of the board is of great importance. Diversity and complementarity are reported by Van den Berghe and Levrau (2004) as the most significant. Kreitz (2008) defines diversity as "any significant difference that distinguishes one individual from another which covers a broad range of obvious and hidden qualities". According to Van den Berghe and Levrau (2004), a well-rounded board of directors should consist of individuals with diverse personalities and varied educational, occupational, and functional backgrounds while ensuring their skills and expertise complement each other, and they should be able to apply their skills actively. They also find that it is essential for board members to possess a foundational understanding of accounting, law, and the industry they operate within. Furthermore, it is crucial to avoid a board composed solely of individuals who are identical in their thinking and backgrounds, as this approach is not effective and can even be risky. This is in line with Page (2007). He says that a company's value is more dependent on several individuals working together and utilizing their individuality than it is on lone thinkers with very high IQs. Groups that represent a variety of ideas outperform groups with experts that share the same ideas. Diversity outperforms homogeneity and produces better results.

Likewise, a report by the European Commission (2012a) also points out the importance of diversity on boards. It fosters creativity and innovation by bringing in individuals with complementary knowledge, skills, and experience. A more varied board of directors results in better firm performance, because, in contrast to homogenous boards, decisions are made after considering a more comprehensive range of options. This report also states that women make up more than half of the university graduates in Europe and that female talent would go unutilized if they were excluded from decision-making roles. Furthermore, having a higher number of female top managers can positively impact the career growth of women in lower positions, thereby directly boosting firm productivity and indirectly expanding the internal pool of candidates for top-level positions (Smith et al., 2006). Smith et al. (2006) further contributes that a diverse board can enhance the public image of a company and, consequently, enhance firm performance. Additionally, promoting diversity expands the talent pool for board members by considering women as potential candidates, thus increasing the likelihood of finding the most qualified individuals. Besides that, although making up only 51% of the population, women in Europe are

the primary drivers of more than 70% of consumer spending (McKinsey&Company, 2007; European Commission, 2012a). More women in top positions can thus provide a more complete insight into consumer choices and economic behavior, resulting in an increase in market share by developing goods and services that are more responsive to customers' wants and needs. A phenomenon called "market mirroring".

Another perspective on the role of boards, as highlighted by Zahra and Pearce (1989), is the Agency Theory. However, this approach has a limitation in that corporate boards, responsible for determining executive compensation, tend to prioritize the interests of shareholders independently from the executives whose salaries they set (Zahra & Pearce, 1989; Van den Berghe & Levrau, 2004; Bebchuk & Fried, 2005; Marinova, Plantenga, & Remery, 2016). This approach acknowledges that managers face an agency problem, where they may prioritize actions that serve their own self-interest rather than maximizing shareholder value. Therefore, providing managers with appropriate incentives becomes crucial due to the potential misalignment between managers' and shareholders' interests. One of the board of directors' tasks is to provide these incentives effectively. However, it is also important to recognize that just as managers may not always act in the best interest of shareholders, the same can be true for directors. However, the mandated appointment of female directors can mitigate the influence of the CEO on the board, reducing agency costs and ultimately leading to improved firm performance.

2.2 The effect of CEO gender on firm performance

Khan and Vieito (2013) evaluated whether firms managed by female CEOs exhibit the same performance as firms managed by male CEOs. By performing an OLS regression and using return on assets (ROA) as a measure of firm performance, they find that firms managed by females perform better. Peni (2014) used a sample of S&P 500 firms and also found a positive relationship between the presence of female CEOs and performance. Where she looked at Tobin's Q and ROA.

According to Adams and Funk (2012), there are substantial differences between women and men regarding their values and risk attitudes. Notably, male directors exhibit a stronger inclination toward achievement and power compared to their female counterparts, while placing relatively less emphasis on universalism and benevolence. Consequently,

men tend to prioritize self-enhancement values (such as power and achievement), while women tend to emphasize self-transcendence values.

2.3 The effect of gender diversity on firm performance

In the second half of the 1990s, Catalyst (2004) investigated 353 Fortune 500 companies and examined the relationship between gender diversity and financial performance by analyzing Return on Equity (RoE) and Total Return to Shareholders (TRS). The study found that the companies with the highest percentage of female executives on their top management teams outperformed those with the lowest percentage of female executives, with more than 30% in terms of RoE and TRS. Perryman et al. (2016)'s research also focused on the influence of gender diversity within top management teams on firm performance. Their findings revealed that companies with higher gender diversity exhibit reduced risk, and achieve better overall performance. Tobin's Q was used to evaluate firm performance.

Richard et al. (2006) examined this relationship in the US banking industry. Based on their findings, there is no significant correlation between the proportion of female workers and firm profitability. However, in organizations characterized by a top-heavy and hierarchical structure, where the number of managers is relatively high compared to the total employees, a positive relationship can be observed. Marinova et al. (2016) looked at Dutch and Danish boardrooms in 2007. Roughly 40% of these boardrooms included, by that time, at least one woman. However, the average representation of women within boards is merely 5.4%. They employ a two-stage least-squares estimation and use Tobin's Q as a measure of performance. Their results show no effect of gender diversity on Tobin's Q.

Rose (2007) looked at listed Danish firms and did not find any significant link between female board representation and performance. However, Smith et al. (2006) find an effect from none to positive when looking at the 2500 largest Danish firms over the period 1993-2001. They considered gross value added/net turnover, profit on ordinary operations/net turnover, ordinary result/net assets, and net result after tax/net assets. The performance measure of gross value added is affected more positively than other performance measurements. Furthermore, they conclude that findings depend on the qualification of the female managers. Female managers with a university degree have a much bigger effect on

firm performance than those who do not hold a university degree.

Wang and Kelan (2013) looked at Norwegian quoted companies in the period 2001 to 2010 to explore whether the gender quota changes the likelihood of women being appointed to top leadership roles as board chairs or corporate CEOs. They found that firms with older and better-educated female directors are more likely to appoint female board chairs. Ahern and Dittmar (2012) show that the number of females on board increased to more than 40% after the introduction of the law. However, the percentage of women who fulfilled the position of Chairperson or CEO only increased a bit from 2003 to 2009. In addition, they demonstrate that the imposition of the gender quota in Norway had a notable impact on the financial performance of firms. Specifically, the announcement of the quota law resulted in a substantial decrease in stock prices, and the subsequent years, there was a significant decline in Tobin's Q. These outcomes align with the notion that companies strategically select board members to maximize overall value as mentioned by Demsetz and Lehn (1985). Furthermore, the implementation of quotas led to the formation of boards comprising younger and less experienced individuals. As a result, there were observable increases in leverage and acquisitions, accompanied by a deterioration in operating performance (Ahern & Dittmar, 2012). Eckbo et al. (2022) critically revisit Ahern and Dittmar (2012)'s study. Hence, their findings offer fresh evidence indicating that the gender quota law implemented in Norway had no significant impact on firm valuation. Additionally, during the implementation of the law, there was a sufficient pool of competent female director candidates to avoid the adverse effects typically associated with quotas.

As also mentioned by Rose (2007) and Ahern and Dittmar (2012), it is quite complicated to capture the effects of gender diversity on firm performance with an economic model. This complexity is also highlighted by Eckbo et al. (2022). Because there are a lot of contradictory findings on the effect of a gender quota on firm performance, it is an interesting topic to study. Based on the above-discussed literature, the first two hypotheses are defined as follows:

H_1: *The higher the female ratio in board rooms, the higher the return on assets of a company.*

H_2: *The higher the female ratio in board rooms, the higher the Tobin's Q.*

These hypotheses are mostly based on the positive relation of female CEOs on firm performance found by Khan and Vieito (2013) and Peni (2014). If firms perform better with a female at the top, one would expect that more females on the board would also lead to a better-performing company. This thought is also in line with Catalyst (2004), Eckbo et al. (2022), and (Perryman et al., 2016). Besides that, as also mentioned by Smith et al. (2006), a more diverse board can enhance the public image of a corporation, and, thereby, enhance firm performance. Furthermore, gender quotas contribute to greater diversity and representation in leadership positions. By ensuring a more balanced gender composition, these laws enable a wider range of perspectives, experiences, and insights to be considered in decision-making processes. This can lead to more inclusive and comprehensive policies and practices, and this must eventually lead to better performance results.

2.4 Gender diversity on the risk level of firms

Faccio et al. (2016) further examined the influence of CEO gender on corporate risk-taking and arrived at the conclusion that companies led by women exhibit lower leverage, more stable earnings, and a greater likelihood of survival when compared to similar firms led by male CEOs. However, Ahern and Dittmar (2012) found that after the introduction of the law, companies experienced growth in size, engaged in more acquisitions, decreased cash holdings, and exhibited higher levels of leverage. Eckbo et al. (2022) disagrees with this and states that there were enough suitable women to avoid the quota's negative consequences, mentioned by Ahern and Dittmar (2012). Furthermore, Barber and Odean (2001) states that less overconfident CEOs tend to take on less risk. Women often display lower levels of overconfidence than males do. This argument is supported by Huang and Kisgen (2013). They find that male CEOs indeed, generally, exhibit higher levels of overconfidence than their female counterparts. Their results indicate that female CEOs are less likely than male executives to engage in acquisitions and less likely to issue debt. Perryman et al. (2016) also found that companies with higher gender diversity show lower levels of risk if they used leverage as a proxy for firm risk. Based on previous literature, and women's character traits, the third hypothesis is defined as follows:

H_3: *The higher the female ratio in board rooms, the lower the leverage of a company.*

3 Data

The introduction of the gender board quota significantly affected the board structure of companies. An independent committee typically chooses the board of directors. They are usually appointed for a term of two years. The shareholders have a big say in deciding who gets elected as a director (Eckbo et al., 2022). The exact requirements for the Norwegian gender quota law are presented in Table 1. Since every ASA in Norway must comply with the law since 2008 (otherwise they would have been forced to stop), this study will use the female ratio of the board as the explanatory variable.

Board size	Required number of female directors	Required % of female directors
3	1	33
4	2	50
5	2	40
6	3	50
7	3	43
8	3	38
9	4	44
10	4	40
>10	>4	≥ 40

Table 1: The gender quota law explained.

This paper tests the effects of gender diversity on ROA, Tobin's Q, and leverage using panel data. In total, 75 Norwegian companies are analyzed from 2008 to 2018. The sample contains 66 public limited companies (ASA) and nine private limited companies (AS) with 836 firm-year observations. The financial data was retrieved from Orbis. Orbis had financial data on 499 Norwegian AS companies, and 349 ASA companies for the years 2008 to 2018. There exist significantly more AS companies in Norway than the 499 companies that were used for this study. Nonetheless, this paper only looks at the TOP 500 AS companies, based on turnover. Two companies were duplicated in the dataset and, as a result, were excluded.

Next, BoardEx was used to provide the board and director information. Unfortunately, BoardEx did not have the board information for all 548 firms, leaving us with complete board information per year for 75 companies, mostly ASAs. The sample used in this study is not highly representative because Orbis data reveals that out of the 414,482 public and private limited companies in Norway in 2022, only 775 were ASAs and the rest were AS. However, for the 75 companies that are used for this paper, there is publicly available data on the number of directors, their names, and their function titles. Note that this thesis only takes into account the board of directors of a company. After collecting this dataset, the genders of the board members could be determined. They were found, primarily based on their first names, and by using LinkedIn and the company's websites. With this information, the main explanatory variable, the female board ratio per company, can be determined.

Then this study will examine both the effect of gender diversity on ROA, Tobin's Q, and leverage. The definitions of the variables can be seen in Table 2. Return on assets is used as a measure of firm performance by multiple studies before (Ahern & Dittmar, 2012; Eckbo et al., 2022; Faccio et al., 2016; Khan & Vieito, 2013; Matsa & Miller, 2013; Peni, 2014). Return on assets is the firm's operating profitability and is calculated as earnings before interest and taxes (EBIT)/total assets. A higher ROA indicates efficient utilization of assets and effective management of resources. Because of the common denominator (total assets), ROA allows for easy comparison of performance between different companies and industries.

Additionally, Tobin's Q is another commonly used measure of firm performance (Ahern & Dittmar, 2012; Eckbo et al., 2022; Marinova et al., 2016; Peni, 2014; Perryman et al., 2016). However, the performance of the firm is measured differently by ROA and Tobin's Q. ROA is an accounting measure of income, while Tobin's Q is an indicator of market wealth (Carter et al., 2003). It evaluates the market value of a company relative to its total assets by considering the difference between the total assets, book value of equity, and market value of equity. Tobin's Q can be calculated as (total assets - book value of equity + market value of equity) divided by total assets. When Tobin's Q is greater than one, it indicates that the market value of the shareholder or creditor investment exceeds the amortized historical cost of the assets.

The variable "Leverage" is defined as the ratio of the book value of total debt to total assets. Various studies use leverage as a proxy for firm risk (Amit & Livnat, 1988; Perryman et al., 2016). A higher level of financial leverage can be viewed as an indicator of firm performance, as it is to some level linked to an increased risk of financial distress or failure (Hutchinson et al., 2015; Lin & Chang, 2011). Besides that, leverage is also used by Eckbo et al. (2022) as a control variable.

Now, the firm characteristics and control variables will be discussed. Just like in Van den Berghe and Levrau (2004)'s paper, operating revenue is used as a proxy for the size of a company. Then, the sample also contains data on the total assets of the companies. According to Khan and Vieito (2013), total assets also influence the firm size and should therefore also be included as a control variable. This is also done by Eckbo et al. (2022). They also include the number of directors, and whether the company is an ASA or not. Also, the firm age of the companies is collected. The variable "Age" is defined as 2023 minus the year of incorporation.

All companies are allocated to 18 different industry sectors. To account for industry fixed effects, a dummy variable takes on the value 1 if the corresponding industry is present and 0 otherwise. This enables to control for industry-specific factors or trends that may impact the relationship between the variables. The "Agriculture" industry sector is used as the baseline category. Furthermore, time-fixed effects are controlled by including a dummy variable for each year from 2008 to 2018, which takes on the value 1 if the respective year is present and 0 otherwise. 2008 is seen as the reference category.

As shown in Table 3, the Mining/extraction sector contains the most firm-year observations, namely 154 of the 836 observations in total. However, the "Utilities" and "Tobacco" industries have the highest average ratio of females on board, over the years 2008 to 2018. The "Textiles" industry has the higher average ROA, and the "Communication" industry has the highest average Tobin's Q. The "Utilities" industry, on the other hand, also has the lowest average leverage.

Variable Name	Description
Female ratio	The share of women on the board of a company.
ROA	The return on assets of a company, calculated as (earnings before interest and taxes (EBIT) / total assets).
Q	Tobin's Q of a company, calculated as (total assets - book value of equity + market value of equity) / total assets.
Leverage	Ratio of the book value of total debt to total assets.
Operating revenue	Operating revenue of a company (in million USD).
Total assets	The book value of a company's total assets (in million USD).
Age	The age of the company (2023 - the year of incorporation).
Directors	The number of directors on the board.
ASA	The legal form of a company: 1 if the company is an ASA (public limited company), 0 otherwise. Note that all companies that are an ASA must comply with the gender quota law since 2008.
Year dummies	Categorical variables that range from 2008 to 2018, and equals 1 if the corresponding category is present, and 0 otherwise.
Industry dummies	Firms are allocated to 18 different industry sectors: Agriculture, financial services, business services, chemicals/petroleum, communications, computer software, construction, food/tobacco manufacturing, industrial/electronic machines, metal products, mining/extraction, property services, public administration/education/health, retail, textiles manufacturing, transport manufacturing, transport/freight/storage, and utilities.

Table 2: Definitions of the variables.

Industry sector	Average female share	Average ROA	Average Q	Average Leverage	# of observations
1. Agriculture	0.46	167.64	71.97	155.98	66
2. Financial services	0.40	177.06	73.23	199.17	99
3. Business services	0.37	180.25	61.70	163.18	44
4. Chemicals/petroleum	0.28	163.09	78.11	108.85	66
5. Communications	0.24	204.45	85.45	118.82	11
6. Computer software	0.38	156.48	65.52	122.79	33
7. Construction	0.45	220.05	75.82	210.45	22
8. Food/tobacco manufacturing	0.72	175.82	49.05	92.86	22
9. Industrial/electronic machines	0.42	157.41	62.61	135.61	66
10. Metal products	0.41	162.61	57.80	128.09	44
11. Mining/extraction	0.44	111.23	46.91	133.91	154
12. Property services	0.43	202.00	78.50	149.64	44
13. Public administration/education/health	0.28	134.00	78.73	197.27	11
14. Retail	0.39	226.27	75.82	140.82	11
15. Textiles manufacturing	0.47	257.55	69.82	181.73	11
16. Transport manufacturing	0.58	119.14	34.61	157.27	44
17. Transport/freight/storage	0.63	131.11	45.65	129.95	55
18. Utilities	0.72	131.12	54.70	76.82	33

Table 3: The average female share, ROA, Tobin's Q, leverage, and the number of observations for the different industries over the period 2008-2018.

4 Methodology

4.1 Ordinary Least Squares (OLS) regression

In this section, an Ordinary Least Squares (OLS) regression is conducted to examine the potential impact of gender diversity and other firm-specific characteristics on firm performance and firm leverage. Various studies also performed an OLS analysis to find this effect (Eckbo et al., 2022; Ahern & Dittmar, 2012; Lam et al., 2013). To do so, the statistical software STATA was used. Two measures of firm performance will be examined. The first part of this section will focus on the effect of gender diversity on ROA. The second part will focus on Tobin's Q, and, finally, this paper will look at financial leverage. To identify the effect of gender diversity on ROA, the following equation is estimated:

$$\text{ROA}_{i,t} = \alpha + \beta_1 \cdot \text{Female ratio}_{i,t} + \sum_{t=2009}^{2018} \beta_t \cdot \text{Year}_t + \theta_s + \varepsilon_{i,t} \tag{1}$$

Where i indexes firms and t indexes time. $\text{ROA}_{i,t}$ is the return on assets. $\text{Female ratio}_{i,t}$ is the share of women on board for firm i in year t. θ_s represent the industry-fixed effects and $\epsilon_{i,t}$ is the error term.

Accordingly, the control variables are added to the model. By adding relevant control variables, potential bias in the estimates of the other variables can be minimized. By accounting for other factors that could affect ROA, the relationship between ROA and the female ratio can be made more precise. As a result, there is less chance that other factors are affecting this relationship. The variables that will be added to the second model are operating revenue, total assets, the number of directors, Tobin's Q, leverage, and firm age. This results in the equation below:

$$\begin{aligned}\text{ROA}_{i,t} = \alpha &+ \beta_1 \cdot \text{Female ratio}_{i,t} + \beta_2 \cdot \text{Q}_{i,t} + \beta_3 \cdot \text{Leverage}_{i,t} + \beta_4 \cdot \text{Operating revenue}_{i,t} \\ &+ \beta_5 \cdot \text{Total assets}_{i,t} + \beta_6 \cdot \text{Age}_{i,t} + \beta_7 \cdot \text{Directors}_{i,t} \\ &+ \textstyle\sum_{t=2009}^{2018} \beta_t \cdot \text{Year}_t + \theta_s + \varepsilon_{i,t}\end{aligned} \tag{2}$$

The equations above are replicated for analyzing the effect of gender diversity on Tobin's Q and leverage. Equations (3) and (4) show the equations for Tobin's Q.

$$\mathrm{Q}_{i,t} = \alpha + \beta_1 \cdot \text{Female ratio}_{i,t} + \sum_{t=2009}^{2018} \beta_t \cdot \text{Year}_t + \theta_s + \varepsilon_{i,t} \tag{3}$$

$$\begin{aligned}\mathrm{Q}_{i,t} = \alpha &+ \beta_1 \cdot \text{Female ratio}_{i,t} + \beta_2 \cdot \text{ROA}_{i,t} + \beta_3 \cdot \text{Leverage}_{i,t} + \beta_4 \cdot \text{Operating revenue}_{i,t} \\ &+ \beta_5 \cdot \text{Total assets}_{i,t} + \beta_6 \cdot \text{Age}_{i,t} + \beta_7 \cdot \text{Directors}_{i,t} \\ &+ \textstyle\sum_{t=2009}^{2018} \beta_t \cdot \text{Year}_t + \theta_s + \varepsilon_{i,t}\end{aligned} \tag{4}$$

Below the equations for financial leverage are shown:

$$\text{Leverage}_{i,t} = \alpha + \beta_1 \cdot \text{Female ratio}_{i,t} + \sum_{t=2009}^{2018} \beta_t \cdot \text{Year}_t + \theta_s + \varepsilon_{i,t} \tag{5}$$

$$\begin{aligned}\text{Leverage}_{i,t} = \alpha &+ \beta_1 \cdot \text{Female ratio}_{i,t} + \beta_2 \cdot \text{ROA}_{i,t} + \beta_3 \cdot \mathrm{Q}_{i,t} + \beta_4 \cdot \text{Operating revenue}_{i,t} \\ &+ \beta_5 \cdot \text{Total assets}_{i,t} + \beta_6 \cdot \text{Age}_{i,t} + \beta_7 \cdot \text{Directors}_{i,t} \\ &+ \textstyle\sum_{t=2009}^{2018} \beta_t \cdot \text{Year}_t + \theta_s + \varepsilon_{i,t}\end{aligned} \tag{6}$$

4.2 Two-Stage Least Squares (2SLS) regression.

When analyzing the equations mentioned above for ROA and Tobin's Q, endogeneity problems can be addressed because of omitted variables and reverse causality. In the case of omitted variable bias, the explanatory variable "Female ratio" is correlated with the error term, which causes biased estimates. "Female ratio" could, for instance, be correlated with other firm characteristics like a strong management style, a strict business culture or that some companies are more progressive than other firms and as a result have a more diverse boardroom. These factors may not be included in the model, because

of unavailable data or because they are hard to quantify. But since these characteristics are not taken into account in the current model, the effect will be absorbed in the error term. Another concern for endogeneity is the presence of reverse causality. This problem is also addressed by Adams and Ferreira (2009) and Ahern and Dittmar (2012). Firms that perform better may also attract more females which increases gender diversity, but it can also work the other way around: firm performance increases because of a more diverse boardroom.

In the case that the variable "Female ratio" is an endogenous variable, the zero-conditional mean assumption is violated, and the regression results from equations (1) to (6) will give biased results. Therefore, an instrumental variable should be used to be able to estimate the causal relationship between the share of females on board and performance (Adams & Ferreira, 2009; Carter et al., 2003). As discussed by Adams and Ferreira (2009) and Eckbo et al. (2022), it is hard to find a reliable instrument, since the factors that are most correlated with the "Female ratio" are other firm characteristics that should already be in the model.

Ahern and Dittmar (2012) used the ratio of female directors in the year 2002, interacted with year dummies till 2009 as an instrumental variable. However, Eckbo et al. (2022) argues that this instrument fails the exclusion restriction. Adams and Ferreira (2009), on the other hand, define their instrument as 'the fraction of male directors on the board who sit on other boards on which there are female directors'. This instrument is explained by the fact that the absence of women on boards is due to the lack of network connections with other directors, which are primarily men. Another instrument that would have been suitable is the female ratio per industry. Arguing that firms are more likely to have a more diverse workforce when the female ratio is high in a certain industry. Another instrument could be the introduction of the gender quota law. As quotas are frequently influenced by outside variables like governmental policies or legal requirements, they can be used to capture exogenous variance in gender diversity. The fact that the quota law only regulates gender equality (and not any other component of corporate governance) and was the consequence of a political choice unrelated to company performance, is also crucial here for determining a suitable IV. Since this study only looks at data from 2008 to 2018, all public limited companies (ASAs) must, in theory, comply with the gender board quota law. Therefore, the variable ASA can be used as an instrument for the female

ratio. The introduction of the gender quota does influence the share of females in board rooms but does not directly influence ROA, Tobin's Q, or financial leverage.

$$\hat{\text{Female}} \text{ ratio} = \pi_0 + \pi_0 \cdot \text{ASA} + \epsilon_{i,t} \tag{7}$$

Then the equation of the second-stage instrumental variable (IV) regression for the effect on ROA is:

$$\begin{aligned} \text{ROA}_{i,t} = \alpha + \beta_1 \cdot \hat{\text{Female}} \text{ ratio}_{i,t} + \beta_2 \cdot \text{Q}_{i,t} + \beta_3 \cdot \text{Leverage}_{i,t} + \beta_4 \cdot \text{Operating revenue}_{i,t} \\ + \beta_5 \cdot \text{Total assets}_{i,t} + \beta_6 \cdot \text{Age}_{i,t} + \beta_7 \cdot \text{Directors}_{i,t} \\ + \sum_{t=2009}^{2018} \beta_t \cdot \text{Year}_t + \sum_{s=2}^{18} \beta_s \cdot \text{Industry}_i + \varepsilon_{i,t} \end{aligned} \tag{8}$$

A dummy "Industry" is included in the model to control for industry-fixed effects. The dummy equals 1 if a firm belongs to that industry, 0 otherwise. s indexes the industry/sector.

The same methodology is applied to find the effect of gender diversity on Tobin's Q and financial leverage. Both dependent variables also use the gender quota as an instrument for the "Female ratio".

5 Results

This section starts with showing the results of the Ordinary Least Squares regressions for all measurements of firm performance, and financial leverage. As discussed in Section 4, a Two-Stage Least Squares regression will also be performed because the zero conditional mean assumption is most likely violated, and therefore the OLS results will be biased and inconsistent. Before the results are presented, the descriptive statistics of the examined sample can be found in Table 4.

Variable Name	Mean	SD	Min	Max	Number of observations
Female ratio	0.45	0.24	0	1	836
ROA	-6.22	15.56	-95.61	43.92	833
Q	0.83	0.82	0.83	0.82	815
Leverage	0.69	0.35	0.0020	1.78	827
Operating revenue (in millions)	808.45	3092.90	0	79593.00	836
Total assets (in millions)	1771.28	11965.13	0	265559.30	836
Age	40.12	51.45	7	369	836
Directors	36.54	18.13	2	91	836
ASA	0.86	0.35	0	1	836

Table 4: Summary statistics of the variables.

5.1 The OLS regression results

The results of the OLS regressions are reported in Table 5.1. Both the effect of gender diversity in board rooms on ROA, Tobin's Q, and firm leverage are shown. Fixed effects are included in all six models. All models had a p-value of 0.0000 meaning that the industry-fixed effects had a substantial impact on the dependent variables.

First of all, it's crucial to understand that these results only show a link, not a causal effect. R-squared can be used as a goodness of fit measure and tells how well the model explains the data. A higher R^2 value indicates that the independent factors account for a greater percentage of the variance in the dependent variable. Model 2 of ROA has the highest R^2, namely 0.41, meaning that the independent variables in this model can account for 41% of the variance in ROA. Overall, it can be concluded that the second model of each performance measure (ROA, Tobin's Q, and Leverage) explains the dependent variable better than the first model did.

The constant term can be interpreted as the expected value of ROA, Tobin's Q, or leverage if all independent variables are equal to zero and held constant. All constant terms are positive and significant at the 1% level. However, when looking at the explanatory variable, the "Female ratio", it is notable that only the coefficient of the "Female ratio" in model 1 of Tobin's Q is significant at the 10% level. If the female ratio in board rooms would go up by 0.1, then Tobin's Q of a company would, on average, go up by 0.015. The coefficient of the "Female ratio" is also positive in "Q model 2", however, not significant. Both coefficients of the "Female ratio" in the ROA models and Leverage models are negative (not significant), suggesting a negative relationship between gender diversity in board rooms and ROA, or firm leverage. Tobin's Q has a significant effect on both ROA and Leverage. If Tobin's Q would increase by 1, then ROA would increase by 0.19, and Leverage would go down by 0.29, on average. Column (5) shows that the coefficient of "Leverage" negatively affects Tobin's Q. It can also be concluded that ROA positively affects Tobin's Q and firm leverage. Both coefficients are significant at the 5% level. The "Leverage" coefficients are also significant.

The coefficients of "Operating revenue" and "Total assets" are very small. This is because this data was in million US Dollars. However, taking the natural logarithm resulted in 66 missing variables because the natural logarithm of 0 is not defined. However, an increase of 1000 USD in operating revenue leads, on average, to an increase of 3 in return on assets. The same holds for total assets: if total assets go up by 10,000$ then ROA goes down by 2, on average. However, this coefficient is not significant. The coefficients of "Age", on the other hand, are all significant. If the firm's age goes up by one year, then ROA increases by 0.12, on average, and Tobin's Q and Leverage decrease by 0.12 and 0.22, respectively. Lastly, it is remarkable that only the year dummies after 20212 are significant. The global financial crisis that began in 2007–2008 may help to explain this. Year dummies can be interpreted as follows: if you look at column (1), ROA_{2012} is, on average, 137.52 higher than in 2008. The results can be seen in Table 5.1 on the next page.

Independent variables	ROA model 1	ROA model 2	Q model 1	Q model 2	Leverage model 1	Leverage model 2
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female ratio	-0.37	-0.42	0.15*	0.11	-0.19	-0.12
	(0.31)	(0.30)	(0.09)	(0.08)	(0.29)	(0.29)
ROA				0.04***		0.17***
				(0.01)		(0.03)
Q		0.49***				-0.29**
		(0.13)				(0.12)
Leverage		0.19***		-0.025**		
		(0.04)		(0.10)		
Operating revenue		2.94e-3**		-2.78e-4		5.50e-4
		(0.00)		(0.00)		(0.00)
Total assets		-2.28e-4		6.98e-5		1.16e-4
		(0.00)		(0.00)		(0.00)
Age		0.12*		-0.12***		-0.22***
		(0.07)		(0.02)		(0.06)
Directors		-0.26		-0.08		0.11
		(0.18)		(0.05)		(0.17)
2009	2.55	1.00	1.55	1.56	2.60	2.58
	(13.61)	(13.25)	(3.77)	(3.62)	(12.75)	(12.48)
2010	7.85	4.07	6.17	5.90	3.13	3.29
	(13.61)	(13.28)	(3.77)	(3.63)	(12.75)	(12.51)
2011	15.38	11.67	6.06	5.52	11.38	10.46

	(13.61)	(13.29)	(3.77)	(3.64)	(12.75)	(12.52)
2012	137.52***	110.46***	7.07*	5.13	126.71***	105.33***
	(13.62)	(14.11)	(3.77)	(4.00)	(12.76)	(13.28)
2013	135.61***	107.21***	10.10**	8.12**	122.97***	102.60***
	(13.61)	(14.09)	(3.77)	(3.99)	(12.75)	(13.26)
2014	134.36***	106.57***	12.21**	10.07**	117.82***	98.45***
	(13.62)	(14.06)	(3.77)	(3.97)	(12.75)	(13.27)
2015	124.85***	92.71***	17.03***	15.48***	127.29***	110.77***
	(13.61)	(14.27)	(3.77)	(3.97)	(12.75)	(13.23)
2016	142.65***	111.25***	18.97***	16.47***	117.23***	97.96***
	(13.62)	(14.20)	(3.77)	(3.99)	(12.75)	(13.44)
2017	148.25***	114.00***	22.77***	20.27***	120.36***	101.46***
	(13.61)	(14.32)	(3.77)	(4.01)	(12.75)	(13.55)
2018	151.53***	109.01***	27.05***	25.25***	136.09***	116.55***
	(13.61)	(14.75)	(3.77)	(4.08)	(12.75)	(13.76)
Constant	74.34***	41.41***	45.93***	53.91***	68.25***	74.36***
	(12.23)	(16.04)	(3.39)	(3.98)	(11.46)	(14.95)
Industry fixed effects:	Yes	Yes	Yes	Yes	Yes	Yes
R^2 :	0.35	0.41	0.09	0.19	0.33	0.37
Number of observations:	836	836	836	836	836	836

Table 5.1: The results of the OLS regression. Column (1) shows the independent variables. Columns (3) and (4) report the results of the female ratio on return on assets. Columns (4) and (5) show the results of the female ratio on Tobin's Q. And, Columns (6) and (7) show the effect on Leverage. Standard errors are reported in parentheses, *p<0.1, **p<0.05, ***p<0.01

5.2 The 2SLS regression results

After the OLS analysis, a Two-Stage Least Squares analysis is conducted using the gender quota as an instrumental variable. Since the law mandated that all public limited companies (ASAs) must meet the female board quota starting in 2008, "ASA" is being used as an instrument. "ASA" can be used as a variable to define the gender quota because this sample only includes data from 2008 to 2018 and companies that are not public (where ASA is equal to 0) do not have to comply with the 40% gender quota.

The results of the IV regression are reported in Table 5.2. Columns (2), (3), and (4) show the first stage of the 2SLS regression with ASA as an instrument for the female ratio in board rooms. Columns (5), (6), and (7) report the results of the IV regression. This table does not show the industry dummies, because it became too lengthy otherwise. The regression results of the industry dummies can be found in the Appendix, see Table 7. The first stage results show a positive and significant ASA coefficient, this means that there is a positive relationship between the instrument (ASA) and the endogenous variable (Female ratio). The F-statistics corresponding to the first stages of ROA, Tobin's Q, and Leverage as dependent variables are 7.92, 7.42, and 7.96, respectively. This suggests that "ASA" is a valid instrument to address the endogeneity problem.

However, when looking at the explanatory variable "Female ratio", it is shown that the coefficients Tobin's Q and Leverage are significant at the 1% level. Therefore, it can be concluded that gender diversity has a negative relationship with Tobin's Q and Leverage. If the female ratio in board rooms would go up by 0.1, then Tobin's Q would, on average, go down by 0.44 and firm leverage would go down by 0.56. The coefficient of the "Female ratio" in column (5) is not significant. However, it does suggest a negative relationship as well. Besides that, Tobin's Q has a positive and significant effect on return on assets, as can be seen in column (5). Return on assets is also positively correlated with firm leverage (see column (7)). The "Age" coefficients to predict Tobin's Q and Leverage are also significant at the 1% level: if a company gets one year older, Tobin's Q and Leverage, on average, go up by 0.17 and 0.26, respectively. Furthermore, all variables can be interpreted the same way as in section 5.1.

Independent variables (1)	ROA (2)	Q (3)	Leverage (4)	ROA (5)	Q (6)	Leverage (7)
Female ratio				-0.93	-4.44***	-5.59***
				(1.28)	(0.90)	(1.47)
ROA		-3.32e3	-4.59e-3		0.01	0.14***
		(0.00)	(0.00)		(0.02)	(0.04)
Q	0.06***		0.06***	0.50***		0.18
	(0.02)		(0,02)	(0.13)		(0.15)
Leverage	1.80e-3	5.21e-4		0.19***	-0.04	
	(0.00)	(0.00)		(0.04)	(0.02)	
Operating revenue	5.91e-5	-5.62e-5	7.49e-5	2.95e-3**	-4.17e-4	8.59e-4
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Total assets	-9.83e-06	-6.37e-6	-1.05e-5	-2.27e-4	4.76e-5	8.03e-5
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age	0.01	0.02	0.01	-0.11*	0.17***	0.26***
	(0.01)	(0.01)	(0.01)	(0.07)	(0.04)	(0.07)
Directors	-0.07**	-0.07***	-0.07***	-0.28	-0.33**	-0.19
	(0.02)	(0.02)	(0.02)	(0.19)	(0.12)	(0.21)
2009	0.07	0.17	0.08	1.08	2.40	3.39
	(1.51)	(1.52)	(1.50)	(12.99)	(7.76)	(14.76)
2010	-0.10	0.29	-0.06	4.15	7.30	4.26
	(1.51)	(1.52)	(1.51)	(13.02)	(7.77)	(14.79)
2011	-0.71	-0.30	-0.62	11.45	4.39	8.36
	(1.51)	(1.52)	(1.51)	(13.04)	(7.78)	(14.82)

2012	0.70	1.74	1.56	111.27***	15.71*	116.39***
	(1.61)	(1.68)	(1.60)	(13.97)	(8.81)	(15.96)
2013	-0.54	0.66	0.30	107.44***	13.74	107.38***
	(.61)	(1.67)	(1.60)	(13.82)	(8.59)	(15.73)
2014	-1.49	-0.19	-0.66	106.34***	11.76	98.35***
	(1.61)	(1.66)	(1.60)	(13.80)	(8.50)	(15.69)
2015	-0.72	0.84	0.07	93.00***	21.89	115.59***
	(1.63)	(1.66)	(1.60)	(14.01)	(8.59)	(15.69)
2016	-0.75	0.97	0.10	111.54***	23.47**	103.49***
	(1.63)	(1.67)	(1.63)	(13.94)	(8.65)	(15.96)
2017	-1.24	0.72	-0.36	114.12***	26.25**	105.30***
	(1.64)	(1.68)	(1.64)	(14.05)	(8.66)	(16.06)
2018	-1.87	0.38	-0.97	108.95***	29.89**	118,06***
	(1.70)	(1.71)	(1.67)	(14.46)	(8.77)	(16.27)
ASA	8.19***	6.43***	8.02***			
	(1.21)	(1.14)	(1.20)			
Constant	4.89	-1.78	5.49	293.78**	-143.37*	-281.05*
	(14.94)	(14.95)	(14.91)	(129.39)	(76.22)	(147,11)
Industry dummies:	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.25	0.24	0.25	0.47	n.a.	0.19
Number of observations:	836	836	836	836	836	836

Table 5.2: The 2SLS regression results. Columns (2), (3), and (4) show the first-stage results. Columns (5), (6), and (7) show the results of the second stage. Standard errors are reported in parentheses, *p<0.1, **p<0.05, ***p<0.01.

6 Conclusion and discussion

The central question of this thesis was: "What is the effect of gender diversity in boardrooms on firm performance and financial leverage?". To answer this, two measures of firm performance are used: return on assets and Tobin's Q. Besides that, it also examined the effect of gender diversity on firm leverage. A lot of research has already been done on this topic. However, the results have been inconsistent so far. Therefore, this thesis' goal is to contribute a clear overview of the already existing literature and to add new evidence to the already existing findings. Hence, three hypotheses are tested. First of all, it was expected that the higher the female ratio in board rooms, the higher the ROA of a company. Secondly, a more diverse boardroom probably results in a higher Tobin's Q. These hypotheses were mostly based on the positive relation of female CEOs on firm performance, found by Khan and Vieito (2013) and Peni (2014). However, when looking at the sociological benefits of a more diverse boardroom, one would also expect an increase in firm performance due to a wider range of perspectives that are considered in decision-making processes or due to the enhanced public image of a company. The last hypothesis states that a higher female ratio will lower the firm's leverage. Women seem to be less overconfident than men, and therefore, take on less risk, engage less in acquisitions, and are less likely to issue debt (Huang & Kisgen, 2013).

These hypotheses are tested by performing an Ordinary Least Squares and a Two-Stage Least Squares regression in STATA. The sample contains data from 2008 to 2018 on 75 Norwegian companies, of which 66 are ASA and nine are AS. The OLS results show no significant effects of the female ratio on ROA and Leverage. However, it reports that Tobin's Q will, on average, increase by 0.015 if the female ratio goes up by 0.1. This result is significant at the 10% level. Furthermore, it shows that the relationship between the female ratio in boardrooms and ROA or firm leverage is negative.

However, it is quite likely that the OLS results are biased. Hence, an Instrumental Variable (IV) regression is also performed. The implementation of the gender quota for boardrooms in Norway is used as IV. Since the law was fully implemented by 2008 and only holds for ASAs, the variable "ASA" can be used as an instrument. The 2SLS regression shows that if the "Female ratio" increases by 0.1, Tobin's goes down by 0.44 and that Leverage decreases with 0.56, both significant at the 1% level. Besides that, this IV model

also shows a negative relation between gender diversity and return on assets. Considering these findings, the first and second hypotheses must be rejected. Both models show a negative relationship between gender diversity in boardrooms and ROA and Tobin's Q. However, the third hypothesis is supported by the findings. It can be concluded that there is a negative relationship between gender diversity and financial leverage.

Even though, the Two-Stage Least Squares reported significant results for the effect of gender diversity on Tobin's Q and Leverage, this research still faces limitations that could be improved for future research. First of all, when critically assessing the data, it can be concluded that the sample size was quite small. The sample only contained 75 companies of which nine were private. No additional data about the boards of directors for more companies was available. We do acknowledge, however, that this sample does not accurately reflect the real world. A larger sample size would decrease the influence of random variation within the sample, and hence boost the reliability of the findings. Besides, including more AS companies in the sample would already give more representative results. The majority of the companies in this sample were public, even though in real life, there exist significantly more private companies than public companies. Just like Matsa and Miller (2013), a way to make the sample larger is, for instance, by matching every ASA with the five closest private limited companies based on industry, assets, employees, and operating profits.

Furthermore, this research only looked at gender diversity and the years after the implementation of the gender quota law. It would have been interesting to extend the research of Ahern and Dittmar (2012) and Eckbo et al. (2022) and look at the difference in firm performance before and after the implementation of the law. Now, since Norway will probably also introduce a gender quota for limited private companies, there will be a new experimental setting to examine the effect of a quota on an even larger group of companies. Lastly, the difference in the effects of a gender quota between public and private companies is another interesting field to explore then. Perhaps private companies already tried to enhance their gender diversity in their boardrooms due to the mandated quota for ASAs.

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7 Appendix

See Table 7 on the next page.

Independent variables (1)	ROA (2)	Q (3)	Leverage (4)	ROA (5)	Q (6)	Leverage (7)
Female ratio				-0.93	-4.44***	-5.59***
				(1.28)	(0.90)	(1.47)
ROA		-3.32e3	-4.59e-3		0.01	0.14***
		(0.00)	(0.00)		(0.02)	(0.04)
Q	0.06***		0.06***	0.50***		0.18
	(0.02)		(0,02)	(0.13)		(0.15)
Leverage	1.80e-3	5.21e-4		0.19***	-0.04	
	(0.00)	(0.00)		(0.04)	(0.02)	
Operating revenue	5.91e-5	-5.62e-5	7.49e-5	2.95e-3**	-4.17e-4	8.59e-4
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Total assets	-9.83e-06	-6.37e-6	-1.05e-5	-2.27e-4	4.76e-5	8.03e-5
	(0.01)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Age	0.01	0.02	0.01	-0.11*	0.17***	0.26***
	(0.01)	(0.01)	(0.01)	(0.07)	(0.04)	(0.07)
Directors	-0.07**	-0.07***	-0.07***	-0.28	-0.33**	-0.19
	(0.02)	(0.02)	(0.02)	(0.19)	(0.12)	(0.21)
2009	0.07	0.17	0.08	1.08	2.40	3.39
	(1.51)	(1.52)	(1.50)	(12.99)	(7.76)	(14.76)
2010	-0.10	0.29	-0.06	4.15	7.30	4.26
	(1.51)	(1.52)	(1.51)	(13.02)	(7.77)	(14.79)
2011	-0.71	-0.30	-0.62	11.45	4.39	8.36
	(1.51)	(1.52)	(1.51)	(13.04)	(7.78)	(14.82)

2012	0.70	1.74	1.56	111.27***	15.71*	116.39***
	(1.61)	(1.68)	(1.60)	(13.97)	(8.81)	(15.96)
2013	-0.54	0.66	0.30	107.44***	13.74	107.38***
	(.61)	(1.67)	(1.60)	(13.82)	(8.59)	(15.73)
2014	-1.49	-0.19	-0.66	106.34***	11.76	98.35***
	(1.61)	(1.66)	(1.60)	(13.80)	(8.50)	(15.69)
2015	-0.72	0.84	0.07	93.00***	21.89	115.59***
	(1.63)	(1.66)	(1.60)	(14.01)	(8.59)	(15.69)
2016	-0.75	0.97	0.10	111.54***	23.47**	103.49***
	(1.63)	(1.67)	(1.63)	(13.94)	(8.65)	(15.96)
2017	-1.24	0.72	-0.36	114.12***	26.25**	105.30***
	(1.64)	(1.68)	(1.64)	(14.05)	(8.66)	(16.06)
2018	-1.87	0.38	-0.97	108.95***	29.89**	118,06***
	(1.70)	(1.71)	(1.67)	(14.46)	(8.77)	(16.27)
Financial services	-6.00***	-5.11**	-5.81***	4.18e-3	-8.37***	25.82*
	(1.58)	(1.58)	(1.56)	(13.47)	(8.13)	(15.24)
Business services	-10.67***	-10.64***	-10.54***	11.46	-48.46**	-49.90**
	(1.89)	(1.91)	(1.89)	(20.30)	(12.96)	(23.04)
Chemicals/petroleum	-9.94***	-8.82***	-9.97***	-3.07	-20.92	-77.77***
	(1.74)	(1.73)	(1.74)	(15.92)	(9.86)	(17.95)
Communications	-16.41***	-16.41***	-16.40***	21.45	-75.83**	-152.46***
	(3.10)	(3.13)	(3.09)	(36.97)	(23.83)	(41.85)
Computer software	-13.56***	-13.15***	-13.58***	-8.13	-52.02***	-91.08***

	(2.06)	(2.08)	(2.06)	(21.48)	(13.78)	(24.37)
Construction	-5.12**	-4.63*	-4.79**	35.89	-15.79	19.78
	(2.30)	(2.33)	(2.30)	(20.80)	(12.57)	23.56)
Food/tobacco manufacturing	0.84	0.36	0.86	32.59	-9.18	-45.69*
	(2.38)	(2.39)	(2.37)	(20.73)	(12.31)	(23.52)
Industrial/electronic machines	-10.41***	-9.88***	-10.40***	-11.10	-34.92**	-52.67**
	(1.73)	(1.74)	(1.73)	(16.84)	(10.66)	(19.17)
Metal products	-11.40***	-10.78***	-11.39***	-10.57	-37.38**	-57.69**
	(2.03)	(2.04)	(2.03)	(20.11)	(12.68)	(22.90)
Mining/extraction	-5.05**	-5.89***	-5.25***	-41.27**	-37.20***	-37.56**
	(1.48)	(1.49)	(1.48)	(12.99)	(7.98)	(14.90)
Property services	-3.39*	-2.54	-3.21*	34.33**	-0.09	-18.77
	(1.84)	(1.85)	(1.85)	(15.71)	(9.40)	(17.87)
Public administration/education/health	-21.59***	-20.39***	-21.59***	-59.64*	-67.22**	-48.95
	(3.10)	(3.11)	(3.09)	(34.06)	(22.00)	(39.13)
Retail	-16.12***	-14.94***	-15.81***	48.19	-51.81**	-90.92**
	(3.09)	(3.12)	(3.10)	(30.20)	(18.80)	(34.16)
Textiles manufacturing	-8.59**	-7.57**	-8.06**	80.21**	-23.93	-12.34
	(3.10)	(3.14)	(3.11)	(26.72)	(16.11)	(30.41)
Transport manufacturing	-3.74*	-5.16**	-3.85**	-30.44*	-44.21***	-10.18
	(1.92)	(1.91)	(1.93)	(16.38)	(9.60)	(18.68)
Transport/freight/storage	0.71	-0.59	0.53	-23.53	-22.24**	-18.28
	(1.75)	(1.74)	(1.75)	(15.08)	(8.87)	(17.14)
Utilities	2.49	2.35	2.29	-7.92	8.98	-42.05**

	(2.08)	(2.10)	(2.07)	(18.86)	(11.39)	(21.28)
ASA	8.19***	6.43***	8.02***			
	(1.21)	(1.14)	(1.20)			
Constant	4.89	-1.78	5.49	293.78**	-143.37*	-281.05*
	(14.94)	(14.95)	(14.91)	(129.39)	(76.22)	(147,11)
Industry dummies:	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.25	0.24	0.25	0.47	n.a.	0.19
Number of observations:	836	836	836	836	836	836

Table 7: The 2SLS regression results. Columns (2), (3), and (4) show the first-stage results. Columns (5), (6), and (7) show the results of the second stage. This table includes the industry dummies. Standard errors are reported in parentheses, *p<0.1, **p<0.05, ***p<0.01.