THE CHANGING OF THE BOARDS: THE IMPACT ON FIRM VALUATION OF MANDATED FEMALE BOARD REPRESENTATION[*]

Kenneth R. Ahern and Amy K. Dittmar

In 2003, a new law required that 40% of Norwegian firms' directors be women—at the time only 9% of directors were women. We use the prequota cross-sectional variation in female board representation to instrument for exogenous changes to corporate boards following the quota. We find that the constraint imposed by the quota caused a significant drop in the stock price at the announcement of the law and a large decline in Tobin's Q over the following years, consistent with the idea that firms choose boards to maximize value. The quota led to younger and less experienced boards, increases in leverage and acquisitions, and deterioration in operating performance. *JEL* Codes: G34, G38, J48, J20.

I. Introduction

Though an extensive literature exists on the relation between board structure and firm value, the endogenous nature of corporate boards has limited our understanding of even the most basic questions (Adams, Hermalin, and Weisbach 2010). For instance, in equilibrium it is difficult to distinguish if knowledgeable board members increase firm value through their actions or if highly valued firms simply attract knowledgeable board members. Generally, this endogeneity problem makes it hard to distinguish which characteristics of boards and board members affect firm

value. Furthermore, some research argues that boards are merely cosmetic, with no effect on firm value (Westphal 1998; Romano 2005). The disagreement about fundamental issues in corporate governance can only be resolved with clear empirical evidence that is not confounded by endogeneity.

In this article, we present new evidence on the relationship between firm value and board characteristics by exploiting a natural experiment in board structure created by an unprecedented exogenous change to corporate boards. In December 2003, the Norwegian Parliament passed a first-of-its-kind law requiring all public-limited firms to have at least 40% representation of women on their boards of directors by July 2005; at the time women held only 9% of board seats. After voluntary compliance failed, the law became compulsory January 1, 2006, with a two-year transition period. Firms that did not comply by January 2008 would be forced to dissolve. Notices to comply were given to 77 delinquent firms in January 2008, and by April all public limited firms were in compliance with the law. Figure I presents the time series of this dramatic transformation in the composition of Norwegian boards of directors. Though more women were elected to boards,

FIGURE I

Percentage of Women Directors and CEOs of Norwegian Public Limited Firms

Data are from the annual reports of the 248 Norwegian public limited firms (Allmennaksjeselskap) in our sample. Only shareholder-elected directors and CEOs are included in the sample. To be included, firms must have publicly traded stocks and available stock price data in the Compustat Global database. See the Online Appendix for data on all public limited and private limited firms from 2003 to 2009.

the numbers of female directors serving as chairman and CEO remained steadfast at less than 5%, consistent with press reports of the unpopularity of the law among existing board members and executives (Goldsmith 2002).

The first question we ask is whether firm values improve or decline as a result of the new board structure mandated by the law. A finding of any effect, positive or negative, would be important evidence that boards affect value. First, if firms choose their board structures to maximize firm value, imposing binding legal constraints on their choices will lead to declines in values (Demsetz and Lehn 1985). In contrast, the new law may lead to increases in value if firms choose their board structures to maximize the private benefits of management, an argument known as the "captured boards" hypothesis (Bebchuk and Fried 2005). To the extent that the forced addition of female directors reduces a CEO's influence over the board, the captured boards hypothesis predicts that firm values will increase because agency costs are reduced. A third hypothesis predicts that the diversity enforced by the law change itself would increase firm value (Page 2007). Finally, if boards are merely window-dressing, the forced changes in board characteristics will have no effect on firm value (Helland and Sykuta 2004).

To estimate the impact of the quota on firm value, we use the prequota cross-sectional variation in female board representation as an exogenous instrument for the variation in board changes mandated by the quota. Since all public limited firms were required to meet a quota of at least 40% female directors, those firms that had a greater proportion of female directors prior to the quota faced a smaller constraint than the firms with fewer female directors.

In a panel of 248 publicly listed Norwegian firms from 2001 to 2009, we find a large negative impact of the mandated board changes on firm value. First, we run an event study on the stock price reaction to the initial announcement of the quota. As discussed in detail, the announcement of the law was made in an unusual manner, which created a highly unanticipated news event. On the days around the announcement, we find that the average industry-adjusted stock return for firms with no female directors was −3.54%, compared to −0.02% for firms with at least one female director. The difference of 3.52% is economically and statistically significant. These findings are robust to controls for board size, firm size, and are significantly different

than benchmark industry-adjusted returns of firms in the United States and other Scandinavian countries.

Second, instrumental variables estimates indicate that the quota caused a substantially large negative effect on Tobin's Q. A forced 10% increase of women representation on the board led to a 12.4% decline in Tobin's Q from the average. Reduced-form estimates suggest that relative to 2003 benchmarks, firms with at least one female director in 2002 had Q values in 2007 that were 0.26 higher than firms with no female directors in 2002; a substantial difference when compared to the average Q of 1.53. Placebo tests reveal no relationship between prequota female board representation and subsequent changes in firm value for U.S. firms. The results suggest that the constraint imposed by the law had a large negative effect on firm value, commensurate with the massive reorganization of corporate boards imposed by the gender quota.

To better understand the causes of the value loss, we next investigate how the quota impacted the characteristics of the boards of directors. Fama and Jensen (1983) propose that boards add value by monitoring and advising the CEO. Existing research posits that board size may be important for monitoring and advising (Jensen 1993; Yermack 1996). Other papers emphasize the role of insiders on a board (Hermalin and Weisbach 1991; Harris and Raviv 2008). We argue that personal characteristics of board members such as age, education, and professional experience are also likely to directly affect a director's ability to monitor and advise. Given the large demand shock imposed by the quota, we expect that the new female directors were different along many of these dimensions. With a few exceptions (e.g., Güner, Malmendier, and Tate 2008), these characteristics have received relatively little attention in prior work on boards, but they are clearly relevant to the advisory role of directors.

We find that the new female directors were in fact substantially different than the existing male directors. New female directors had significantly less CEO experience and were younger, more highly educated, and more likely to be employed as a nonexecutive manager, compared to retained male directors. In particular, 31.2% of new female directors had prior CEO experience compared to 69.4% of retained male directors. The average new female director was more than eight years younger than existing male directors. Interestingly, we do not find that board size changed as a result of the quota. We interpret this to mean

that though firms could have met the quota by simply adding new female directors, it was optimal to maintain the size of the board at the cost of replacing male directors.

We next seek to understand the mechanisms through which the board may have affected firm value. Using the prequota variation in female directors as an instrument, we find that the quota led firms to increase in size, undertake more acquisitions, increase leverage, and reduce cash holdings. Because boards of directors are likely to be involved with acquisition decisions and major changes to financial policies, and because boards became younger and less experienced, our results are consistent with a deterioration in the capabilities of the board. However, the quota setting does not allow us to rule out all other explanations. For instance, the retained men directors may behave differently after the appointment of new women, the new women may have different preferences than men, or the act of forced board changes may have disrupted boards' operations, even in the long run.

Finally, given the quota's large negative consequences for firm value, we expect that some firms may avoid the law by becoming a private limited firm or incorporating outside of Norway. We find that the number of public limited firms in Norway in 2009 is less than 70% of the number in 2001. In contrast, the number of private limited firms, not affected by the quota, increases by over 30%. In firm-level tests, we find a strong negative relationship between the probability of delisting after the quota is passed and the number of women on the board before the quota is passed, controlling for firm size, risky investments, and industry effects.

This article contributes to two fields of research: corporate governance and political mandates. Its primary contribution is to present clean evidence on the value of boards using a natural experiment. Other papers examine the effect of regulatory changes to boards due to the Sarbanes-Oxley Act of 2002 (Chhaochharia and Grinstein 2007; Duchin, Matsusaka, Ozbas 2010), the Cadbury Committee Report in the United Kingdom (Dahya and McConnell 2007), and the 1976 German codetermination law (Petry 2009). Two recent papers also examine related aspects of the Norwegian gender quota. Nygaard (2011) examines announcement returns at the date when the law became mandatory in 2005 and shows that returns depended on information asymmetry between investors and insiders. He argues that the new women made boards better monitors, but only in firms where information asymmetry was low. Consistent

with our results, Nygaard shows that firms with above-median representation of women on the board in 2005 have higher event returns than firms with below-median representation. Also consistent with our results, Matsa and Miller (2011) show that operating performance declined and costs increased from the voluntary compliance period (2003–2006) to the mandatory compliance period (2006–2009). In contrast to the prequota variation in female directors used in this article, Matsa and Miller primarily use a firm's form of legal organization (public versus private) in 2006 to proxy for exogenous variation in board changes mandated by the quota. Based on existing survey evidence, they argue that newly appointed female directors increased costs because they are more altruistic and long-term–oriented than male directors. However, as discussed, the quota does not provide a way to separately identify gender effects from the large changes to the age and experience of boards that we document.

Next, by providing some of the first evidence on gender mandates in corporate governance, this article also expands on previous research on mandates for under-represented minorities in political settings. Pande (2003) finds that local governments in India redistribute wealth toward the ethnic minority groups that are elected by mandate. Similarly, Chattopadhyay and Duflo (2004) find that gender mandates for political representation in India lead to greater infrastructure spending preferred by women. Though the Norwegian quota does not allow us to separately identify whether changes in corporate policies are driven by gender preferences or experience differences, we find no evidence that women CEOs are more likely to be appointed following the board quota. Our article is also related to Beaman et al. (2009), which finds that gender mandates in India change voters' perceptions of female leaders. Women are more likely to run and win an unregulated election if previous female leaders were elected by mandate. Though persistently low percentages of female CEOs and chairpersons suggest that the quota has not changed perceptions of business women in Norway, it is too early to be definitive. Finally, our results inform the policy debate surrounding the increased movement of national legislatures toward boardroom gender quotas. Table I presents a summary of laws that regulate the gender of directors by country. As of May 2011, Spain, Iceland, and France have passed gender quota laws, and Belgium, the Netherlands, and Italy have pending quota laws. Quotas are being or have been seriously discussed in Sweden, Germany,

TABLE I
BOARDROOM GENDER QUOTA LAWS AND RECOMMENDATIONS BY COUNTRY

Country	Year quota passed	Mandatory quota	Quota compliance year	Gender equality in governance code	Average percent of women on boards in 2010
Norway	2003	40%	2008	2009	39
Spain	2007	40%	2015	2006	10
Iceland	2010	40%	2013		16
Finland	2010[a]	1 Woman	2010	2010	26
France	2011	40%	2017	2010	12
Belgium	Pending[a]	33%	N/A	2009	10
Netherlands	Pending[b]	30%	2015	2010	15
Italy	Pending[c]	30%	2015		5
Sweden	Discussion[d]			2004	26
Germany	Discussion[e]			2009	13
United Kingdom	Discussion[f]			2010	9
Canada	Discussion[g]				14
Denmark				2008	18
Luxembourg				2009	4
Australia				2009	8
United States				2009	16
Austria				2010	9
Poland				2010	12

Notes: Pending indicates that a law has passed at least one stage of the legislative process. *Discussion* indicates that media sources cite politicians debating a quota. *Gender equality in governance code* indicates the year in which the country's code of good governance recommended gender equality. *Average percent of women on the board of directors in 2010* for European countries is taken from the European Commission Database on Women & Men in Decision Making. For non-European countries the data are from Catalyst. Data for *Year quota passed* is from European Commission (2011), unless otherwise noted: a: Legislative Document No. 5-603/1 of the Belgian Senate, b: Vijselaar (2011), c: PIRC (2011), d: Sweden had discussions in 2003 (Lindahl 2003), e: Fox (2011), f: 2011 Lord Davies Report, g: Bitti (2010). Note that Finland's quota is in the governance code and requires firms to have at least one woman director or to explain why they do not.

the United Kingdom, and Canada. Additionally, many countries have recently incorporated recommendations for gender equality in their corporate governance codes or disclosure regulations. In developed economies around the world, boardroom gender quotas are quickly becoming the norm, not the exception. Our results suggest that though these rules are effective at creating gender diversity, there is a substantial cost to shareholders if the new female directors lack the experience of the exiting male directors. Thus, our article highlights the importance of understanding why there are relatively few women with comparable top-level management experience as men, which is addressed in Bertrand, Goldin, and Katz (2010) and Herr and Wolfram (2010).

The paper proceeds as follows. Section II describes the board and governance structures in Norway. Section III describes the data and methods. Section IV investigates if the gender quotas had any effect on firm value. Section V presents results on mechanisms through which board structure impacts value. Section VI concludes.

II. CORPORATE GOVERNANCE IN NORWAY

There are two different forms of limited liability stock companies in Norway. A private limited liability company is an Aksjeselskap, abbreviated AS. A public limited company is an Allmennaksjeselskap, abbreviated ASA. The key differences between the two forms are that ASA firms are much larger (with minimum capital requirements 10 times larger than the requirement for AS firms), require no consent to trade shares, and hence may list shares on a public stock exchange. The other key difference is that only ASAs are subject to the gender quota that is the focus of this article. As described in the introduction, the quota was first passed on a voluntary basis in December 2003, then made mandatory in January 2006, with full compliance required by January 2008. The law specifically states the number of board members by gender and effectively imposes a requirement that firms achieve approximately 40% board representation by women.[1]

1. Specifically, if a firm has two or three members, both sexes should be represented; four or five members, both sexes must have two representatives from each sex; six to eight members, both sexes must have three representatives from each sex; nine members must have four representatives of each sex; and more than nine members must have 40% of each sex.

By all accounts, the quota was implemented without the consent of business leaders. First, the stated purpose in the language of the law was to reach a balanced participation to increase "equality between the sexes," to create a "fairer society" (Øie 2007), not to improve or change the performance of the firms. Furthermore, the government acknowledged that there may be less information about potential female directors and thus board choice may be constrained. In response, it created a database of women interested in being a board member "to make women's competence more visible."[2] Second, press reports indicate that business leaders reacted angrily to the new law, complaining that there was a lack of qualified women directors (Criscione 2002). Additional evidence suggests that the law was imposed exogenously. From 2003 to 2009, the percentage of female board members in private firms increased by only 3 percentage points, compared to an increase of 37 percentage points for public limited firms. Moreover, the percentages of female chairpersons and CEOs remained roughly constant for both private limited firms and for public firms.[3] Thus, the language of the law, press reports, and the hiring practices of firms make it clear that the law was exogenously introduced and created substantial constraints.

Though the evidence suggests that the quota was exogenously imposed, we also want to know whether the results of this article are relevant for firms in other developed nations. First, we compare Norwegian boards of directors to the boards of firms in the United States. Norwegian boards are roughly the same size as U.S. boards, but tend to have more independent directors. The average board in Norway has between five and six members. This is slightly smaller than the average board size of 7.5 for a large sample of U.S. firms reported in Linck, Netter, and Yang (2008), but roughly equal to their small firm subsample average of 5.9 members. Additionally, though higher than the United States, the concentration of ownership in Norway is lower than any other country in Europe with the exception of the United Kingdom (Bøhren and Strøm 2006).

One difference between Norwegian and U.S. boards is that in Norwegian firms with over 200 employees, the employees have

2. See the Norwegian Ministry of Children, Equality, and Social Inclusion website: http://www.regjeringen.no/en/dep/bld/Topics/equality/rules-on-gender-representation-on-compan.html.
3. Statistics are from aggregated data provided by Statistics Norway. Tabulations are in Online Appendix Table I.

the right to elect one-third of the board. However, the quota rules apply separately to each group of board members. This means a firm cannot pack the employee-elected board with women to avoid appointing shareholder-elected women directors.

In addition to these firm-specific characteristics, country measures also indicate that Norway has strong corporate governance. Despite not being a common law country, Norway's anti-director index is four out of six (La Porta et al. 1998). This is relative to an average of four for English-origin countries and five for the United States and the United Kingdom. Furthermore, both Norway and the United States get a 10 in the Rule of Law index, measuring law and order traditions in the country. Political risk is also quite low in Norway, similar to the United States and United Kingdom. Using the risk of expropriation measure of La Porta et al. (1998), Norway scores a 9.88 (higher is better) compared to 9.98 for the United States and 9.71 for the United Kingdom. Using the measures from the International Country Risk Guide, similar to Pinkowitz, Stulz, and Williamson (2006), Norway has less political risk and corruption than both the United States and the United Kingdom with a political risk (corruption) measure of 84.55 (9.58), relative to 79.62 (8.26) in the United States and 80.36 (8.31) in the United Kingdom. In addition, Nenova (2003) presents evidence that the laws governing takeovers in Norway are similar to the laws in the United Kingdom.

Though Norway is similar to the United States and United Kingdom in terms of governance, it differs in its gender and labor policies. Norway has very progressive gender policies, ranking number 3 in the United Nations Gender-Related Development Index of 2008, compared to a rank of 10 for the United Kingdom and 16 for the United States. These policies are evident in the 2008 Norwegian Equal Pay Commission which recommends that new parents get 57 weeks leave (with 80% pay compensation) or 47 weeks (with full compensation) with an equal division into three periods, one for the mother, one for the father, and one for the mother and father to share. Morover, Norway has one of the highest shares of women in Parliament. Following voluntary party quotas introduced in the 1970s, Norwegian women hold 62% of legislative seats in 2008, compared to the United States with 20% and the United Kingdom with 25%. In light of Norway's progressive stance on gender equality, it is not surprising that it was the first nation to implement such large gender quotas on corporate boards. It also means that we expect smaller

effects from the quota in Norway than we would in another country.

III. Data and Summary Statistics

The gender quota law for corporate boards applies to all public limited firms in Norway. However, to identify the effect of the law on firm value, we must have publicly observable share prices. Since the gender quota was informally announced in 2002, passed in 2003, and was officially enforced in 2008, we collect the names of all public limited Norwegian firms that traded on the Oslo Stock Exchange (OSE) anytime from 2001 to 2009. Though we restrict our attention to firms that were listed prior to the passage of the law for our main tests, we collect data for all firm-years over 2001 to 2009 to provide a complete picture of the transformation of Norwegian boardrooms.

We collect board of director and CEO information from the firms' annual reports. For each board member and CEO, we record the person's name, gender, nationality, age, board title, education, prior experience as a CEO, current external job and employer, and year first elected to the board. We identify the gender of the board member and CEO using the following rules. First, we use a photograph of the person in the annual report. If a photo is not available, we search whether the biographical information uses identifying pronouns such as *she* and *her*, or *he* and *his*. If these are not available, we base our gender identification on the first name of the person, using the First Names database from Statistics Norway. For every name recorded in Norway, this database lists how many men and how many women have the first name. We collect data on both employee- and shareholder-elected board members since each are separately subject to the quota, though we restrict our attention throughout the paper to shareholder-elected board members where the law would have likely imposed a larger constraint. Our qualitative results are unchanged if we include the employee-elected members of the board.

If an annual report is not available, we search the Register of Business Enterprises from the Brønnøysund Register which provides names of the board of directors, the chairperson, and the CEO. For missing birth years, we search the Skattelister, a publicly available database of tax records for every taxpayer in Norway. We supplement our data using the Boardex database where available, though its coverage is much less complete. We

backfill demographic information when available for later dates and from the reports of other firms. For comparison groups in some of our tests, we use data from Boardex to record board members of firms in Denmark, Finland, Sweden, and the United States. If more than half of a firm's board has missing data for any variable, we drop the firm-year observation for the variable. We aggregate the director-level data to the firm level to calculate the number of board members, the percentage of female board members, the average age, board tenure, percentage of members in different types of external job roles, and the percentage of members with an MBA, a postbaccalaureate degree, and prior CEO experience. We provide more details on our data collection methods in the Online Appendix.

Accounting and market data for Norway and the other comparison countries are from CompuStat Global and CRSP (for U.S. market data). We convert all currencies to U.S. dollars using monthly exchange rates from CompuStat Global Currency and Global Financial Data databases. All dollar amounts are then converted to December 2008 dollars using each country's monthly Consumer Price Index. We include financial and utility firms in our sample for completeness, but our results hold if they are omitted.[4]

Following prior research on firm value and governance, we compute yearly Tobin's Q as our main measure of firm value (Yermack, 1996; Coles, Daniel, and Naveen, 2008). Tobin's Q is computed as the sum of total assets and market equity less common book equity divided by total assets. Market equity is the aggregate market value (price times shares outstanding) for all share classes listed on Compustat Global Securities database.[5] We focus on Tobin's Q rather than accounting measures because of a major accounting change during the transition period of the quota. Before 2005, most firms listed on the OSE followed Norwegian Generally Accepted Accounting Principles (NGAAP). In 2005, Norwegian firms with listed shares were required to report using International Financial Reporting Standards (IFRS).[6]

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4. Norwegian savings banks (Sparebanken) are not included in our final sample because they are not public limited firms, though they do have traded shares on the OSE.

5. Only 7 firms out of 177 had multiple classes of stock in 2001, decreasing afterward.

6. Nonlisted public firms and private firms could choose to use IFRS or NGAAP.

The change in accounting rules makes accounting-based performance measures, such as ROA, less reliable than market value performance measures, such as Q (Gjerde, Knivsfla, and Sættem, 2008). However, in additional tests we also analyze accounting variables, such as leverage and asset turnover, controlling for the accounting standards used. All variable definitions are provided in Appendix A.

Following these procedures yields one of the most comprehensive databases used for academic research on directors in a single country. The sample consists of 1,230 firm-year observations over 2001 to 2009 for 248 unique Norwegian firms. Not including employee-elected board members or CEOs, there are 12,203 person-year observations from 519 female and 1,484 male shareholder-elected directors. The number of firms in any one year varies from 113 in 2009 to 163 in 2007, as firms may merge, delist, or go public over our sample period.

To illustrate how our sample compares to the population of firms in Norway, in December 2007 (when the grace period for the quota ended), there were 437 public limited companies in Norway, according to Statistics Norway, all of which were subject to the gender quota, though not all had listed shares. In 2007, the OSE had 241 firms traded on its exchange, including foreign listings and Norwegian savings banks that were not subject to the quota. We were able to collect board, accounting, and stock price data for 163 firms in 2007. This means we have data on at least 68% of the firms traded on the OSE subject to the quota and 37% of the universe of firms affected by the law change. Due to the difficulty of finding older annual reports, the coverage for earlier years is less, though still substantial with at least 60% coverage of OSE firms in 2002. In addition, our data set includes the gender of every board member and age data for 90% of the board member-years in our sample. In the comparison samples, there are 178 firms from Denmark, Finland, or Sweden, and 2,853 unique firms from the United States.

III.A. Summary Statistics

Table II presents cross-sectional mean values of firm and board characteristics from 2001 to 2009. Panel A details shareholder-elected board characteristics, Panel B details outside occupations of the board members, and Panel C details firm accounting variables.

TABLE II

FIRM AND BOARD OF DIRECTORS SUMMARY STATISTICS BY YEAR

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Panel A. Board characteristics									
Number of members	5.54	5.53	5.39	5.32	5.39	5.60	5.63	5.57	5.29
Female (%)	5.42	7.47	10.97	14.29	21.64	28.75	40.80	41.39	42.62
CEO experience (%)	73.62	64.86	68.21	66.01	61.52	59.05	55.69	55.55	58.44
MBA (%)	22.45	23.69	25.71	25.65	26.39	27.88	25.82	24.62	21.63
Higher education (%)	25.38	26.15	28.14	29.42	25.69	28.15	29.60	27.42	28.67
Age	50.47	51.25	51.47	51.79	50.86	50.75	50.91	51.34	52.26
Tenure (years)[a]	4.33	3.03	2.46	2.40	2.17	2.32	2.10	2.23	2.58
Insider (%)	2.22	2.21	2.87	4.96	2.72	1.54	2.31	1.65	1.80
Std. dev (age)	7.87	8.15	8.08	8.23	8.17	8.02	8.07	8.24	7.67
Std. dev. (tenure)[a]	2.25	1.60	1.36	1.36	1.50	1.80	1.75	1.82	1.76
Percent retained from prior year		78.22	80.23	82.26	78.68	80.04	71.41	76.35	78.30
Norwegian (%)	89.24	92.75	90.46	90.17	91.15	91.72	91.46	89.80	89.59
Same name as other on board (%)	4.55	5.19	4.09	3.83	3.16	2.99	3.10	3.84	5.16
Board or CEO positions/person	2.44	2.38	2.52	2.82	2.80	3.34	3.71	3.11	2.94
Positions/board size	1.94	2.03	2.13	2.55	2.44	2.80	3.20	2.71	2.63

TABLE II
(CONTINUED)

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Panel B. Outside occupation of shareholder elected directors (%)									
Vice president	6.19	6.34	5.02	4.20	5.76	7.14	8.91	8.83	9.06
Consultant	8.87	13.65	9.72	7.14	6.72	8.29	9.79	10.22	9.32
Board member	22.70	20.60	23.19	21.09	21.33	17.58	14.80	11.73	19.25
Professor	2.15	1.35	1.55	1.92	2.39	1.67	1.36	1.22	1.13
CEO	25.20	25.95	26.34	26.43	24.56	25.49	23.39	26.37	24.36
Attorney	2.10	0.54	2.02	4.70	3.94	3.93	3.86	4.44	4.30
Nonexecutive manager	5.38	5.05	4.60	4.91	6.36	6.43	7.76	6.71	6.77
CFO	3.87	3.99	4.40	3.87	3.40	5.95	6.04	6.14	3.94
Partner/principal	17.38	17.07	17.13	16.48	19.55	17.55	17.87	18.84	16.39
Accountant	0.00	0.00	0.00	0.79	0.33	0.00	0.16	0.00	0.00
Other	3.47	3.27	2.70	3.71	3.09	4.48	3.84	3.86	3.53

TABLE II
(CONTINUED)

	2001	2002	2003	2004	2005	2006	2007	2008	2009
Panel C. Firm characteristics									
Tobin's Q	1.44	1.21	1.54	1.67	1.88	1.88	1.71	1.11	1.35
Log(assets)	4.88	4.98	4.95	5.03	5.14	5.44	5.71	5.57	5.92
Log(employees)	−0.66	−0.62	−0.70	−0.67	−1.01	−0.90	−0.80	−0.73	−0.40
Leverage (%)	56.97	56.44	54.04	53.95	51.85	53.38	54.03	57.24	57.27
Current debt/equity (%)	15.26	17.28	13.67	12.51	21.34	22.49	19.89	35.71	21.07
Cash/assets (%)	13.13	14.05	16.01	16.75	17.15	19.61	17.08	14.09	14.30
Capex/assets (%)	7.58	5.86	4.94	5.97	6.22	7.44	8.53	9.43	6.20
Acquisitions/assets (%)	0.56	0.51	0.65	1.24	1.27	2.19	2.86	1.15	0.40
R&D/assets (%)	0.96	0.96	0.87	1.15	0.58	1.06	2.05	2.24	2.15
Observations	127	119	113	131	151	155	163	148	113

Notes: This table presents averages of firm characteristics and averages of average board of director characteristics across firms for Norwegian companies that were listed on the Oslo Stock Exchange, where available. All variable definitions are in Appendix A. Outside occupations are not mutually exclusive and so do not add to 100%. [a]: Tenure variables (Average tenure and standard deviation (tenure)) are from both annual reports and the authors' calculations using observed appointments to the board. Because we are able to calculate tenure for fewer directors in the earlier years and because tenure is less commonly reported in earlier annual reports, the tenure variables are much less populated in the earlier years than they are in the later years.

Panel A shows that the average size of the board is roughly constant at about 5.5 members. If we include employee-elected directors, the average is 6.5 members, comparable to similar-sized firms in the United States, as previously discussed. The relatively constant size of boards is particularly interesting and suggests that firms replace, rather than add, board members to comply with the law. As shown in Figure I, the proportion of female board members increases dramatically for our sample firms, with sizable increases after 2004 and the largest increase from 2006 to 2007, when the grace period for compliance ended. From 2007 to 2009, the percent of women remains roughly constant at 41%. The dramatic change in board membership during this period is also reflected in the reduction in the percent of board members retained from the prior year, falling from an average of about 80% during 2002 to 2004 to 72% in 2007. Similarly, the average tenure of board members falls from 2.5 years in 2003 to a low of 2.1 in 2007, which then rebounds in 2008 and 2009 as director turnover reduces.[7]

The characteristics of the boards are changing in other ways as well. First, the proportion of directors with CEO experience on an average board declines from a relatively constant 67% to a low of 55% in 2008. The fraction of board members that are insiders decreases from 2.2% in 2001 to 1.8% by 2009. The number of additional board positions held by directors increases over the sample period, with the largest increase occurring in 2006 and the number peaking in 2007. Panel A also shows that the average age of an average board member, the fraction of board members that are nationals of Norway, and the fraction of board members that share a common name to another member of the board are all relatively constant in the total sample.

In Online Appendix Table II, we present board member characteristics separated by gender and find that the aggregate trends do not hold for men and women directors separately. In particular, the upward trend in the number of board positions is driven by increased female participation, while the number of positions held by male directors is relatively constant. We also find that female directors are consistently younger than male directors (by four to six years) and the average age of male directors increases over the

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7. Since tenure is reported infrequently in earlier annual reports and our calculations of tenure based on appointment year are limited to appointments in 2001 or later, tenure is poorly populated in earlier years in the sample.

time period, offsetting the younger age of the increased number of female board members. The percentage of female board members that are Norwegian declines from 96% in 2001 to 93% in 2009. The number of women with a shared last name as another board member increases from a low of 0.97% in 2003 to a high of 3.82% in 2009, statistically indistinguishable from the 5% of men with shared names. This suggests that some firms may have appointed family members to comply with the law.[8]

Panel B of Table II presents the outside occupations of the board members as listed in the annual reports. CEOs and directors are the most common occupation of board members in an average firm, reported by roughly 25% and 20% of the average board. The next most common profession is principal or partner, accounting for about 17% of board members. There are significant time trends in the characteristics of directors over this period, especially during the period when boards are changing most dramatically, including an increasing proportion of members who are employed as vice presidents, attorneys, or nonexecutive managers, and a decreasing proportion of CEOs and directors. In the gender-specific statistics in the Online Appendix, we find that these trends are driven primarily by female board members, who have less CEO experience, on average.

Finally, in Panel C, we report that Tobin's Q ranges from a low of 1.11 during the global recession in 2008 to a high of 1.88 in 2005, with a mean of 1.53, comparable to the average Tobin's Q for U.S. firms of 1.79 (Coles, Daniel, and Naveen 2008). The book assets of firms are growing over time, though the number of employees of an average firm first declines from 2001 to 2005 and then rebounds to end at its highest level in 2009. Leverage remains relatively constant, though the amount of short-term debt rises over time. Cash holdings follow a hump-shaped pattern, peaking in 2006. Last, capital expenditures, acquisitions, and R&D all follow a significant upward trend.

In general, these statistics show several changes in director characteristics during our sample period. By the end of the 2000s, the average board has less CEO experience, fewer insiders, and more nonexecutive managers. The gender differences in these characteristics and the coincidence of timing between these changes and the implementation of the quota suggest that

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8. These female directors are most likely wives or unmarried daughters or sisters of existing directors, as about 80% of married women in Norway use their husbands' surnames (Noack and Wiik 2008).

the quota dramatically changed not only the gender but other characteristics of the board.

IV. DOES THE STRUCTURE OF THE BOARD OF DIRECTORS AFFECT FIRM VALUE?

Our first set of tests investigates whether the gender quota has an effect on firm value. To identify a causal relationship between the quota and value, we take two complementary approaches. First, we calculate an event study on the stock price reaction at the day of the first announcement of the law. Second, we estimate the effect of the quota on Tobin's Q using firms' prequota female board representation as a measure of the exogenous change in boards required by the quota. The first approach identifies the immediate stock price reaction, whereas the second approach provides a long-run view of the impact of the quota on firm value.

IV.A. *Stock Price Effects of the Announcement of the Gender Quota*

The first announcement of the quota was made on February 22, 2002. The public announcement was the top story in Norway's largest newspaper, *Verdens Gang* (VG) with the headline (translated from Norwegian) "Sick and Tired of the Old Men's Club!" In the article, the then minister of Trade and Industry, Ansgar Gabrielsen, stated that the government would impose a 40% quota for female directors. Though the issue had been discussed in Parliament in prior years, this public announcement was highly unanticipated. We know this from later interviews where Gabrielsen describes his strategy to implement the law. According to an interview in the *Sunday Times* of London on June 8, 2008, "Gabrielsen had bumped into Alf Bjarne Johnsen [of VG] in February 2002, and on the spur of the moment, he offered the veteran journalist the biggest story of his career if he would come to his office to meet with him within the hour" (Toomey 2008). Though Gabrielsen had not consulted with other key members of the Norwegian government before making the announcement, he goes on to state that it was purposefully done:

> "If I had told them before, the initiative would have been killed by one committee after another," he says. "No, I had to employ terrorist tactics. Sometimes you

have to create an earthquake, a tsunami, to get things to change," he says, laughing at his own daring. "If a left-wing feminist had come out with something like that it would have been dismissed as just another scream in the night," he continues. "But because I said it, I knew that people would take notice."

We emphasize the way this regulatory change was announced because it is unusual to find an unanticipated announcement of such a large change in government policy. The quote from Gabrielsen also reinforces the evidence that the law change was not brought about by firms, thus reverse causality (from firm value to the implementation of the law) is highly unlikely.

To estimate the stock price reaction to the announcement of the quota, we calculate industry-adjusted abnormal returns by subtracting the average return of U.S. firms in the same industry in the five days surrounding the announcement.[9] We take the sum of the five days of abnormal returns as our measure of the stock impact. We use U.S. data for industry returns because global investors were unlikely to anticipate that the law would directly affect U.S. firms, as opposed to other Scandinavian countries where investors may have anticipated that similar laws would be passed. Additionally, the United States provides a larger number of comparison firms in each industry to use as benchmarks. To interpret the impact of the announcement, we compare the difference of the stock price reaction for firms that will face larger constraints as a result of the law versus firms with smaller constraints, namely, firms with no women on their board versus firms with at least one woman on their board at the date of the announcement.

The results of the event study are presented in Table III. Our sample includes 94 firms with available stock price data at the announcement and with board data in 2001, the most recent year-end before the announcement. Sixty-eight of these firms have no female directors and 26 have at least one female director. In Panel A, we report an average industry-adjusted

9. Industry classifications are from the Global Industry Classification Standard. For industry-adjustments, we use industry returns at the GICS Industry level. If fewer than five firms exist in an industry, we use the GICS Group level. If fewer than five firms exist in the group, we use the GICS Sector level. Using a five-day window allows us to capture price changes for thinly traded stocks. The five day announcement period includes two days before the announcement date to make sure we capture any news leakage or insider trading.

TABLE III

STOCK RETURNS AT THE INITIAL ANNOUNCEMENT OF THE BOARDROOM
GENDER QUOTA

Panel A. Abnormal announcement returns (%) of Norwegian firms

	All firms	No women directors	Women directors > 0	Difference
	(1)	(2)	(3)	(2)–(3)
Mean	−2.573***	−3.547***	−0.024	−3.523***
	(0.001)	(0.001)	(0.977)	(0.008)
Median	−1.804**	−2.521**	−0.928	−1.593*
	(0.017)	(0.010)	(0.845)	(0.054)
Observations	94	68	26	

TABLE III
(CONTINUED)

Panel B. OLS regressions on abnormal announcement returns (%)

	Norwegian and U.S. firms				Scandinavian firms	
	(1)	(2)	(3)	(4)	(5)	(6)
Norwegian dummy	−4.347***	−4.146***	−3.803**	−3.574**	−4.026**	−3.773**
	(1.468)	(1.404)	(1.571)	(1.525)	(1.671)	(1.644)
Women directors > 0	0.046		−0.214		−1.536	
	(0.320)		(0.381)		(1.041)	
Percentage women directors		0.594		−0.390		−9.457
		(1.928)		(2.319)		(6.344)
Norwegian × women directors > 0	3.477**		3.252*		4.775**	
	(1.648)		(1.658)		(1.897)	
Norwegian × percentage women directors		14.342*		12.517		23.724**
		(7.589)		(7.861)		(10.746)
Board size			−0.052	−0.060	0.246	0.287
			(0.068)	(0.065)	(0.314)	(0.323)
Log(assets)			0.362**	0.350**	0.021	−0.039
			(0.149)	(0.150)	(0.305)	(0.321)
Constant	0.799***	0.776***	−1.206	−1.137	−0.920	−0.954
	(0.271)	(0.265)	(1.093)	(1.088)	(1.687)	(1.715)
Adjusted R^2	0.025	0.024	0.030	0.029	0.056	0.053
Observations	1,252	1,252	1,224	1,224	205	205

Notes: Abnormal returns are the sum of industry-adjusted returns (using U.S. industry returns) over the five days surrounding the date of the first announcement of the gender quota on February 22, 2002. *Women directors* >0 is a dummy variable equal to 1 if the firm has at least 1 woman director. *Percentage women directors* is the percentage of the shareholder-elected board members that are women. *Board size* is the number of board members. Board data are taken from the 2001 annual reports. Regressions are cross-section OLS regressions on abnormal returns of firms located in the countries indicated at the top of each column. Scandinavian firms include firms in Norway, Denmark, Finland, and Sweden. Statistical significance is reported as *p*-values in Panel A (*t*-tests for the mean and sign and rank-sum tests for the medians) and robust standard errors clustered by industry in Panel B. * Significant at 10%; ** 5%; *** 1%.

abnormal return for all Norwegian firms of -2.57% and a median of -1.8%, both statistically different from zero. The next columns in the table reveal that these negative returns are driven by firms with no female directors. These firms, which would be the most severely affected by the proposed quota, experience average losses of 3.5% in the days surrounding the announcement, compared to an abnormal return that is indistinguishable from zero for those firms with at least one female director. The difference in means and medians for the two samples are both statistically significant.

Next, in Panel B, we present additional evidence on the market reaction to the quota by comparing the announcement returns of Norwegian firms to foreign firms, where all returns are industry-adjusted as described. In columns (1) through (4), we run differences-in-differences tests of the announcement returns for Norwegian and U.S. firms by gender representation. The coefficient on the dummy variable for Norwegian firms is negative and significant, ranging from -3.6% to -4.3%. This indicates that an average Norwegian firm suffered a substantial market value loss at the announcement, compared to U.S. firms in the same industry. We do not find a statistically significant main effect for either measure of female board representation (the percentage of female directors on the board, or a dummy variable for the presence of at least one female board member). However, the differences-in-differences interaction terms between the Norwegian dummy and the female representation measures are positive and significant. These results imply that the presence of female directors did not affect U.S. firms but had substantial effects on Norwegian firms' returns. Norwegian firms with no female directors at the announcement experienced returns that are 3.5 percentage points lower than U.S. firms that also have no female directors. The effect holds after controlling for firm size and number of board members. For robustness, in columns (5) and (6) of Table III, we present results from a similar analysis but use Scandinavian firms as a control group. As before, the Norwegian firms experience a significant decline in value relative to firms in Denmark, Finland, and Sweden, driven by Norwegian firms with no female directors. In tests reported in the Online Appendix, we find that the market response is relatively constant across firms that have at least one woman director, independent of the proportion of women directors.

Nygaard (2011) studies the announcement returns on December 9, 2005, the date when the Norwegian government

implemented the mandatory requirement of the quota. In contrast to the earlier date that we study, Nygaard finds an overall positive announcement return for Norwegian firms compared to the MSCI World benchmark index. Because the positive return is driven by firms with low information asymmetry and few women, Nygaard attributes the positive reaction to better monitoring, as predicted in recent theoretical models where outside directors (proxied by new women) are better monitors only when they have access to information (Harris and Raviv 2008). We have reasons to doubt this interpretation. First, because the quota did not place restrictions on the independence of directors, it is not clear why an entrenched CEO would need to appoint women directors that were any more shareholder-oriented than the exiting men directors. Second, it is hard to interpret the 2005 returns because the announcement was likely anticipated, in contrast to the initial announcement in 2002. However, though unreported in Nygaard, the weighted average of his announcement returns estimates across high and low information asymmetry shows that firms with below-median female participation had returns of 0.90% and firms with above-median participation had returns of 1.15%, consistent with our results.

In sum, the unusual nature of the 2002 announcement provides a clean test of the market's expectation of the effect of the quota on firm value. Our findings show a large decline in value for Norwegian firms with no female directors, compared to U.S. firms and other Scandinavian firms. This provides evidence that the quota imposed significant and costly constraints on Norwegian firms. In the next section, we investigate how the ex ante representation of women on the board of directors affects the dynamics of value changes in the years following the passage of the quota law.

IV.B.   *The Impact of the Quota on Tobin's Q*

In this section, we examine the impact of the quota on long-run firm value over the period when firms implemented the mandated board changes. Though the gender quota provides an exogenous shock that put severe constraints on firms' choices of directors, firms could have chosen to respond in various ways. For one, managers could strategically time when they complied with the law. Managers may have chosen to add female directors as scapegoats in advance of poor performance. Existing male

directors may have chosen to give up their position so a female director could be appointed immediately before he thought the firm would underperform. Alternatively, firms could choose to relocate to a foreign country or go private to avoid the law. Thus, endogenous firm decisions will confound the observed time series relationship between board changes and firm value.

To address this endogeneity, we use an instrumental variable approach similar to the approach of Stevenson (2010). Stevenson studies the effect of Title IX gender parity quotas for high school sports on girls' higher education and labor outcomes, where states have some freedom over the timing of compliance. To address this endogeneity, Stevenson uses the prelaw variation in boys' athletic participation across states as an instrument for changes in girls' athletic participation due to the law. We follow her approach and use the prequota variation in female board representation across firms as an instrument to capture exogenous variation in mandated changes in the proportion of female board members over time. Because all firms had to meet the same 40% quota, firms that had more women when the quota was passed were required to make a smaller change to their boards to comply with the law compared to firms that had fewer women.

We use the 2002 annual reports to measure exogenous variation in the mandated board change, a full year before the quota was passed in December 2003. Though we could use an earlier year to measure exogenous variation, doing so is costly; as we look further back in time, the quality and amount of data deteriorates and the number of firms surviving during the postquota period diminishes. To verify that the gender of the boards was not yet impacted in 2002, we compare the gender composition of the boards in 2001 to 2002 and find that the majority of the firms had the same gender composition in both years.

Though the change in a firm's board required by the law will vary by the prequota percentage of female directors, it is important to acknowledge that the prequota percentage of female board members is not randomly assigned. Therefore, we must be concerned about spurious correlations if the prequota percentage of women in 2002 is correlated with subsequent changes in firm value, unrelated to the changes in the board. To examine this issue, we compare the attributes of the 80 firms with no women directors in 2002 to the 42 firms with at least one female director (these results are tabulated in Appendix B). Across a host of firm characteristics, including financial policies, investment behavior,

performance measures, and cost structures, we find that only firm size is substantially different between the two sets of firms, where larger firms are more likely to have at least one female director. Corresponding to this, firms with larger boards are also likely to have a female director as well. We also find some variation in the outside occupation of directors by the presence of women. Notably, Tobin's Q, operating performance, and investment policies are not statistically different between firms with or without female directors.

Next, we compare the industry distribution between the two sets of firms. On a sector-by-sector basis, both sets of firms are equally likely to be in any sector, except that firms in the information technology sector are more likely to have no female board members. Fisher's exact test of the difference in the distributions of industries by female representation finds no statistical difference between the likelihood of a firm to be in any one particular sector based on its percentage of female directors in 2002. Since the only major prequota difference we identify between firms with no female directors and those with at least one female director is firm size, it is likely that a large part of the determinants of female board representation will be captured by firm fixed effects. Nevertheless, we are still concerned that industry effects could confound our tests. Therefore, we industry-adjust all of our accounting and market variables using industry medians based on U.S. firms for all remaining tests.[10] In addition, later tests control for differential time trends by prequota female representation.

To identify the effect of the gender quota on firm value, we estimate the following equation:

$$(1) \qquad Q_{i,t} = \alpha + \beta \ \textit{percent female directors}_{i,t} + \theta_i + \tau_t + \varepsilon_{i,t},$$

where i indexes firms and t indexes time. $Q_{i,t}$ is industry-adjusted Tobin's Q, *percent female directors*$_{i,t}$ is the percentage of female board members for firm i in year t, θ_i are firm fixed effects, and τ_t are time fixed effects for years 2003 to 2009. The firm fixed effects control for any observed or unobserved firm characteristics that are constant over time that may affect a firm's Q. The year effects

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10. Similar to the event study, we subtract the median value of each variable of U.S. firms in the same GICS Industry level. If fewer than five firms exist in an industry, we use the GICS Group level. If fewer than five firms exist in the group, we use the GICS Sector level.

control for any aggregate fluctuations of Q, such as recessions or expansions. To instrument for *percent female directors*, we use the firm's percentage of female directors in 2002 interacted with year dummies.[11] We could add additional time-varying controls to the specification in equation (1), but given the endogenous nature of corporate choices, we would run the risk of including bad controls, in the sense of Angrist and Pischke (2009), where the control variable is itself an outcome of the quota change. For example, R&D expenditures may affect Tobin's Q, but R&D expenditures may also change as a result of the quota. Therefore, we only include firm fixed effects in our specifications, though all of our tests are robust to the inclusion of log(assets), which is arguably an endogenous choice of the firms (in later tests we show that an increase in firm size is in fact an outcome of the quota). Finally, in all of the firm fixed effects regressions, we cluster standard errors within the firm. This accounts for the serial correlation in the time-series of within-firm variation commonly observed in differences-in-differences variables (Bertrand, Duflo, and Mullainathan 2004).

Panel A of Table IV presents the results of the instrumental variables estimates of the effect of female board representation on Tobin's Q. The coefficient on *percent female directors* in column (1) is negative and significant. The point estimate implies that a 10% increase in the percentage of female directors leads to a decline in Tobin's Q of 0.19, compared to the mean of 1.53 across all firms and years. This is a large effect on the value of firms, commensurate with the large announcement effects reported in the previous section. In columns (2) and (3), we run placebo tests using only firms located in Denmark, Finland, or Sweden or only firms in the United States. Because the legal systems in Scandinavian countries are similar, we may expect to see a small effect for the other Scandinavian countries if managers and investors anticipated that a similar law would be passed in their home country, following Norway's lead. In fact, as shown in Table I and as seen in news articles, the possibility of a quota was soon discussed by governments in some of these countries (Lindahl 2003). We should expect to see no effect for U.S. firms. We find that in both cases the instrumental variable estimate is insignificant.

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11. The Online Appendix contains robustness checks using the count of women rather than the percentage.

TABLE IV

EFFECTS OF BOARD MEMBER GENDER QUOTAS ON TOBIN'S Q

	Norway	Placebo tests	
		Denmark, Finland, and Sweden	U.S.
	(1)	(2)	(3)
Panel A. Instrumental variables regressions: dependent variable = industry-adjusted Q			
Percent women directors$_t$	−1.938***	−3.635	−0.264
	(0.586)	(2.352)	(0.465)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
F-statistic	29.790	20.240	2.690
Observations	603	634	2,706
Panel B. Reduced-form regressions: dependent variable = industry-adjusted Q			
2004 dummy × percent of women in 2002	−0.340	−0.008	−0.027
	(0.228)	(0.397)	(0.078)
2005 dummy × percent of women in 2002	−0.261	0.292	0.077
	(0.416)	(0.556)	(0.096)
2006 dummy × percent of women in 2002	0.535	1.443**	0.080
	(0.492)	(0.737)	(0.092)
2007 dummy × percent of women in 2002	1.124**	1.112	0.028
	(0.512)	(0.926)	(0.112)
2008 dummy × percent of women in 2002	1.352***	0.902	−0.085
	(0.492)	(0.717)	(0.129)

TABLE IV
(CONTINUED)

| | Norway | Placebo tests | |
		Denmark, Finland, and Sweden	U.S.
	(1)	(2)	(3)
2009 dummy × percent of women in 2002	1.080*	1.246*	−0.053
	(0.555)	(0.690)	(0.148)
Year fixed effects	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes
F-statistic	15.840	18.130	2.430
Observations	605	721	2,999

Panel C. First-stage regressions: dependent variable = percent women directors$_t$

	Norway	Denmark, Finland, and Sweden	U.S.
2004 dummy	0.047***	0.041***	0.010***
	(0.012)	(0.009)	(0.003)
2005 dummy	0.128***	0.059***	0.024***
	(0.017)	(0.011)	(0.004)
2006 dummy	0.212***	0.095***	0.037***
	(0.017)	(0.013)	(0.005)
2007 dummy	0.354***	0.092***	0.041***
	(0.013)	(0.014)	(0.005)
2008 dummy	0.368***	0.110***	0.049***
	(0.014)	(0.015)	(0.005)

TABLE IV
(CONTINUED)

	Placebo tests		
	Norway	Denmark, Finland, and Sweden	U.S.
	(1)	(2)	(3)
2009 dummy	0.368***	0.114***	0.055***
	(0.014)	(0.033)	(0.006)
2004 dummy × percent of women in 2002	−0.117	−0.177**	−0.050**
	(0.073)	(0.077)	(0.025)
2005 dummy × percent of women in 2002	−0.274***	−0.188	−0.139***
	(0.091)	(0.119)	(0.036)
2006 dummy × percent of women in 2002	−0.419***	−0.412***	−0.190***
	(0.087)	(0.116)	(0.046)
2007 dummy × percent of women in 2002	−0.793***	−0.286**	−0.195***
	(0.089)	(0.115)	(0.047)
2008 dummy × percent of women in 2002	−0.807***	−0.344***	−0.250***
	(0.082)	(0.116)	(0.044)
2009 dummy × percent of women in 2002	−0.799***	−0.546*	−0.277***
	(0.091)	(0.293)	(0.051)
Firm fixed effects	Yes	Yes	Yes
F-statistic	19.670	6.150	8.400
Observations	603	634	2,706

Notes: Data are yearly observations from 2003 to 2009. *Percent women directors* is a predicted variable estimated in the first stage regressions. *Percent of women in 2002* records the percentage of shareholder-elected directors that were women as reported in the firm's 2002 annual report. Year 2003 variables are omitted. Standard errors are clustered by firm and are reported in parentheses. * Significant at 10%; ** 5%; *** 1%.

Panel B presents the reduced-form estimates of the effect of the quota on Tobin's Q. In the sample of Norwegian firms, we find that Q is significantly greater in 2007, 2008, and 2009 for firms that had more female directors in 2002. Given that the average percentage of female board members for firms with at least one woman in 2002 was 22.8%, the reduced-form coefficients imply that relative to 2003, those firms with at least one female director in 2002 had average industry-adjusted Q values in 2007 that were 0.26 higher than those firms with no female directors in 2002. In 2008, the difference is 0.31 and in 2009 it is 0.25. Again, these are sizable differences in firm value. In the placebo tests, we find evidence that higher 2002 female representation led to an increase in Tobin's Q in 2006 and 2009 for firms in other Scandinavian countries (similar to Norway), but we find no effect for firms in the United States. This is consistent with the idea that firms in Scandinavia may have responded to the Norwegian quota in anticipation of a similar quota in their own country.

The reduced-form results indicate that the negative impact of the quota on firm value persists over time. Compared to 2003 firm values, firm valuations in 2007 through 2009 remain substantially lower for those firms most impacted by the quota. Unreported Wald tests of the differences of the coefficients for the 2007, 2008, and 2009 interaction terms are insignificant. This means that the value losses are not increasing after the mandatory deadline of the quota, but neither are the value losses being erased. The persistence in the value loss suggests that declines in firm value are not simply temporary overreactions by the stock market. Instead, the imposition of the quota appears to have affected the fundamentals of Norwegian firms.

Finally, Panel C of Table IV presents the first-stage regression results, which reveal the time-series average changes in female representation. As expected, the 2002 female board member representation is a strong predictor of the changes to female representation in Norwegian firms, with a large F-statistic indicating strong explanatory power. It is also interesting to note that the same pattern is observed for foreign firms, though the magnitudes are much smaller. Though the two placebo tests have low F-statistics, the point estimates imply that firms with fewer female board members are more likely to increase the number of female directors compared to firms with more female directors.

This may simply reflect a reversion to the mean or it may indicate that firms choose to meet an informal quota of female board members, albeit low.

We verify that our results are robust to controls for differential industry trends, triple-differenced estimates across Scandinavian countries to account for possible omitted common time trends correlated with gender diversity, and controls for differential time trends based on prequota female representation. In these tests, we calculate Q back to 1999 to reduce bias in the trend estimates, following Wolfers (2006). These results are available in the online appendix.

In summary, the results in this section indicate that the gender quota imposed substantial costs on shareholders of Norwegian firms and are consistent with the theory that boards are chosen to increase shareholder wealth. Firms with no female directors at the announcement of the gender quota lost over 3 percentage points in value compared to those with at least one female director. The instrumental variables estimates suggest that the forced addition of new female directors on boards led to value losses of upwards of 20% for the firms with large constraints. Reduced-form estimates confirm the prior results and demonstrate that the value losses are persistent across time. We recognize that these magnitudes may appear large and are therefore conservative in our interpretation. However, it should not be forgotten how substantial is the change in board composition. These firms are undergoing a massive reorganization of their shareholder representatives, where over 30% of the members of their board of directors are changing, on average. Given the unprecedented nature of the change required by the gender law, we have no clear comparison to which we can directly measure these magnitudes.

V. How Does Board Structure Affect Firm Value?

In this section, we attempt to identify the changes to board characteristics that may lead to the loss of firm value. We first look at the differences in the characteristics of new versus exiting directors. Second, we investigate how the quota affected other aspects of the board besides gender. We then look at the quota's effect on changes in firms' financial and investment policies, performance, and costs. Finally, we investigate changes in incorporation status to avoid the quota.

V.A. *The Difference Between New, Retained, and Exiting Directors by Gender*

As shown in Table II, the average size of corporate boards in Norway remained steady from 2001 to 2009, even as female representation changed dramatically. This implies that existing male directors were exiting the board in large numbers. Which men are kept as board members and which exit? How do the retained members compare to the new female members? Though the law only mandated a gender quota, it is likely that the new female directors will have different backgrounds than the existing men. For example, Figure I shows that the fraction of CEOs that are women in Norway is around 5% or less. Since many board members are current or past CEOs, the new female directors are likely to have less CEO experience than the existing male directors. Therefore, though the quota only mandated gender representation, it may have imposed de facto limits on other director characteristics, simply because the pool of female and male candidate directors differ on additional dimensions.

To better understand the change in the characteristics of board members induced by the quota, we compare the average backgrounds of new, retained, and exiting board members by their gender in Table V. There is a meaningfully large difference in CEO experience of female versus male directors, whether the director is new, retained, or exiting. Only 31.1% of the new female directors have CEO experience, compared to 65.2% of the exiting and 69.41% of the retained male directors. New female directors also have less CEO experience than retained female directors (43%). All of these differences are significantly different from zero, though the comparison between new and retained female directors test statistic is not reported. Similarly, the new female directors are statistically and substantially younger on average (45.8 years) than the exiting male directors (52.9 years), the retained male directors (54.1 years), and the retained female directors (48.2 years). Both of these characteristics indicate that existing male directors were replaced by new female directors who had less top-level experience. The new female directors are also less likely insiders (1.4%) as compared to retained (5.3%) and exiting (7.1%) men directors, but similar to retained and exiting women directors.

Other characteristics are more or less the same between the exiting male and new female directors. The likelihood of having an

TABLE V
CHARACTERISTICS OF NEW, RETAINED, AND EXITING DIRECTORS BY GENDER

	New		Retained		Exiting		Differences		
	Women	Men	Women	Men	Women	Men	(1)–(4)	(1)–(6)	(4)–(6)
	(1)	(2)	(3)	(4)	(5)	(6)			
Panel A. Demographics									
CEO Exp. (%)	31.18	63.86	42.97	69.41	36.02	65.17	−38.24***	−34.00***	4.24*
							(−15.527)	(−11.284)	(1.930)
MBA (%)	26.09	25.82	28.06	24.31	25.82	24.81	1.78	1.27	−0.50
							(0.759)	(0.446)	(−0.241)
Higher educ. (%)	33.09	19.46	35.41	24.97	30.06	23.27	8.13***	9.83***	1.70
							(3.264)	(3.329)	(0.832)
Age	45.84	50.37	48.24	54.08	47.58	52.94	−8.24***	−7.10***	1.14***
							(−23.615)	(−16.079)	(3.252)
Tenure	0.00	0.00	2.19	3.94	1.37	2.54	−3.94***	−2.54***	1.40***
							(−38.983)	(−16.000)	(7.744)
Insider (%)	1.42	4.36	0.88	5.33	1.50	7.05	−3.91***	−5.63***	−1.72
							(−4.322)	(−3.785)	(−1.208)
Norwegian (%)	87.55	85.53	90.28	90.04	88.28	87.88	−2.49	−0.33	2.16
							(−1.152)	(−0.135)	(1.488)
Same last name	3.33	4.62	4.06	6.98	2.81	4.35	−3.65***	−1.01	2.64***
							(−4.325)	(−1.069)	(3.599)

TABLE V
(CONTINUED)

	New		Retained		Exiting		Differences		
	Women	Men	Women	Men	Women	Men			
	(1)	(2)	(3)	(4)	(5)	(6)	(1)–(4)	(1)–(6)	(4)–(6)
Panel B. Primary outside occupation (%)									
VP	13.48	6.81	10.72	5.83	14.29	4.96	7.64***	8.51***	0.87
							(3.603)	(3.670)	(0.694)
Consultant	14.18	9.81	6.90	9.45	9.02	9.66	4.74**	4.52*	−0.21
							(2.145)	(1.759)	(−0.126)
Board member	9.93	16.89	15.71	20.36	11.28	19.32	−10.43***	−9.39***	1.03
							(−5.081)	(−3.485)	(0.457)
Professor	2.13	1.09	3.23	1.33	3.01	1.31	0.80	0.82	0.03
							(0.877)	(0.792)	(0.040)
CEO	16.31	28.34	21.59	27.14	19.55	25.85	−10.83***	−9.54***	1.29
							(−4.380)	(−3.035)	(0.516)
Attorney	5.32	2.18	4.70	3.30	4.51	3.39	2.02	1.92	−0.10
							(1.432)	(1.182)	(−0.094)

TABLE V
(CONTINUED)

	New		Retained		Exiting		Differences		
	Women	Men	Women	Men	Women	Men			
	(1)	(2)	(3)	(4)	(5)	(6)	(1)–(4)	(1)–(6)	(4)–(6)
Nonexec. mgr.	14.54	4.63	9.25	2.54	14.29	4.70	12.00***	9.84***	−2.16*
							(5.609)	(4.160)	(−1.876)
CFO	7.09	4.90	6.17	3.23	9.02	3.13	3.86**	3.96**	0.10
							(2.419)	(2.234)	(0.101)
Partner/principal	9.93	20.16	13.22	19.78	7.52	18.54	−9.86***	−8.61***	1.25
							(−4.815)	(−3.223)	(0.560)
Accountant	0.35	0.00	0.15	0.13	0.00	0.00	0.23	0.35	0.13
							(0.623)	(1.000)	(1.415)
Other	5.32	0.82	7.49	1.52	6.02	2.09	3.80***	3.23**	−0.57
							(2.764)	(2.117)	(−0.714)
Observations	600	865	1,182	3,723	285	1,150			

Notes: Averages of personal characteristics of shareholder-elected directors in Norwegian firms from 2001 to 2009. *New* refers to directors that are new hires to a board. *Retained* are directors that were on the board in the prior year. *Exiting* are directors that were on the board in the prior year, but not in the following year. Observations are person-years. Statistical significance is reported by *t*-statistics in parentheses from two-sample tests assuming unequal variances. Statistical significance at the 1%, 5%, and 10% levels is indicated by ***, **, and *. All variables are defined in Appendix A.

MBA degree is roughly constant for all categories at about 25%, though new female directors are more likely to be higher educated than either retained or exiting male directors. The fraction of Norwegian directors is lower for new directors than retained or exiting directors, but not significantly so. The likelihood that a new female director shares the same last name as another board member is roughly equal for new women as it is for exiting men, though retained male directors are more likely to share a last name than are new female directors.

In Panel B, we provide the same analysis for the job titles reported as the directors' primary occupations. We find further evidence that the new female directors have different types of experience than the existing men. First, new female directors are more likely to be a vice president, a nonexecutive manager, or a consultant, compared to retained and existing male directors. New female directors are also statistically less likely to be a CEO, a full-time board member, or a partner or principal than are exiting male directors. These differences are quite large. For instance, 27% of retained male directors are CEOs, compared to just 16% for new female directors. Over 14% of new female directors are nonexecutive managers, compared to just 2.5% of retained male directors.

It is also useful to compare the men that left the board to the men that were retained. The outcome of this choice gives an alternative view of the characteristics that are valued by boards, where firms are not necessarily constrained. First, retained men are more likely to have CEO experience, to be older, to have longer board tenures, and are less likely to be a nonexecutive manager than are exiting men directors. These results provide further evidence that firms seek board members with experience at top-level positions, precisely what the new female directors lack. Finally, not surprisingly, directors who share a common last name are most common among the retained men, indicative of family-run firms.

We interpret the results in this table as additional evidence that the small supply of female directors led to boards that are substantially different on multiple dimensions, notably boards that have younger directors with less high-level experience. We acknowledge that we cannot determine if this is by choice or by necessity. Without having a sample of all possible candidate directors, we cannot determine if firms are choosing to appoint younger women with less CEO experience. However, the evidence

that the retained men are also more likely to be older and to
have top-level experience suggests that these characteristics are
valuable to firms and they are not likely to willingly choose to
appoint less experienced and younger directors, male or female.

V.B.   *The Effect of the Quota on Board Characteristics*

We next use the same instrumental variables approach as in
section Table IV.B. to provide causal evidence of how the quota
impacted characteristics of Norwegian boards. First, in Panel A of
Table VI, we run instrumental variable regressions of the effect
of the mandated increase in women on the size, experience, age,
and education of the board. The reduced-form coefficients are pre-
sented in Online Appendix Table A.V. Board size and the fraction
of board members with an MBA are unaffected. The change in
the percentage of directors with degrees of higher education is
larger for firms that faced a greater constraint from the quota,
though only in the reduced-form estimates. Consistent with the
previous findings, the CEO experience and age of board members
are both significantly reduced as a result of the gender quota. The
estimates imply that a 20% increase in female representation on
the board leads to a decline in the fraction of directors with CEO
experience of nearly 12%. It is interesting to note that although
board size is unchanged, we find strong evidence in columns (1)
and (2) of Panel A of Table VI that industry-adjusted log(assets)
and log(employees) both increase as a result of the quota.

We also test whether the gender quota had an effect on CEOs.
Because one of the main roles of the board of directors is to
monitor and advise the CEO, a significant change in the board
may alter the decision to replace a CEO, the likelihood of hiring
a female CEO, or the compensation received by the CEO. We run
these tests as linear probability models since binary choice models
are not well specified if the explanatory variables are mainly
dummy variables. In columns (8) through (10) of Table VI, we do
not find strong evidence for any of these possible outcomes.

We also run IV regressions on the likelihood that a board
has at least one member that has one of the outside occupations
listed in Table V. We run these tests as linear probability models,
as before. Consistent with our previous results, we find that the
gender quota led to a lower likelihood that at least one director is
employed as a CEO. We also find weak evidence that the quota led
to a smaller likelihood of having a consultant or a lawyer and a

TABLE VI

INSTRUMENTAL VARIABLES ESTIMATES OF THE EFFECT OF THE GENDER QUOTA ON FIRM CHARACTERISTICS

Panel A. Firm size and corporate leadership

	Log (assets)	Log (empl.)	Board size	CEO exper.	Age	MBA	Higher educ.	New CEO	Woman CEO	CEO comp.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Percent women	2.00**	2.10**	0.49	−59.80**	−7.115*	−9.72	34.30	−25.70	25.90	2.33
	(0.81)	(0.86)	(1.07)	(23.70)	(3.65)	(33.20)	(22.10)	(37.70)	(21.60)	(1.87)
Observations	639	479	640	605	640	578	578	637	640	325

Panel B. Financial and investment policies

	Leverage		Current debt/equity		Cash/ assets		Capex/ assets		Acquisitions/ assets		R&D/ assets	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Percent women	0.32**	0.24	0.53*	1.37	−0.10	−0.27**	−0.04	−0.08	0.07***	0.23***	0.01	0.04
	(0.15)	(0.23)	(0.30)	(1.08)	(0.10)	(0.11)	(0.05)	(0.06)	(0.03)	(0.07)	(0.02)	(0.03)
Intl. accounting std.	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Observations	642	422	638	418	633	421	633	415	627	412	642	422

TABLE VI
(CONTINUED)

Panel C. Performance and costs

	M&A returns	Daily returns	ROA		Asset turnover		SGA/ sales		COGS sales	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Percent women	0.01	−0.45**	−0.07	−0.21	−0.34	−1.24*	0.05	0.17*	1.21	5.01
	(0.03)	(0.22)	(0.11)	(0.17)	(0.48)	(0.64)	(0.11)	(0.10)	(1.40)	(3.74)
Intl. accounting std.	No	No	No	Yes	No	Yes	No	Yes	No	Yes
Observations	635	550	610	414	642	422	575	404	577	406

Notes: Dependent variables are listed at the top of each column. Data include Norwegian firm-years from 2003 to 2009. *Percent women* is a predicted variable, estimated in a first-stage regression using the percent of women board members in 2002 interacted with year dummies. First-stage estimates are not reported for brevity. All accounting variables are industry-adjusted, using U.S. industry values; definitions of all variables are available in Appendix A. *CEO exper, MBA, Higher educ.,* indicate the fraction of shareholder-elected directors that have prior experience as a CEO, have an MBA, or have another postbaccalaureate degree. *New CEO* and *Woman CEO* are dummy variables to indicate if a new or woman CEO was appointed. *CEO comp.* is total compensation paid to the CEO from the Boardex database. *M&A Returns* is the yearly sum of five-day abnormal announcement returns per firm; a zero is recorded for firm-years with no acquisitions. All regressions include year and firm fixed effects. *Intl. accounting std.* indicates whether firm-years included in the sample are restricted to accounting disclosures that follow international accounting standards. Standard errors are clustered by firm and reported in parentheses. * Significant at 10%; ** 5%; *** 1%.

greater likelihood of having a partner or a professor on the board. These results are presented in Online Appendix Table A.VI.

To test for the possibility that the quota led to an increase in captured directors, we calculate the fraction of board members that were appointed prior to the current CEO. Hermalin and Weisbach (1998) argue that as a CEO becomes more entrenched, she will appoint new directors that are acquiescent. To calculate the fraction of pre-CEO directors, we require a change in the CEO to identify which directors were appointed prior to the current CEO. For firms with board data in 2002, there are 331 firm-years over 2003 to 2009 where we can identify the fraction of the board that was appointed prior to the CEO, out of 641 total firm-years. Therefore, there may be selection bias in our tests because CEO changes are not randomly assigned. In unreported results, we run the same IV and reduced-form models as in our previous tests where the percentage of directors appointed prior to the current CEO is the dependent variable. The IV estimate is insignificant (coefficient $= -0.083$, p-value $= 0.870$, standard error $= 0.503$) and the reduced-form coefficients are insignificant in all years as well. This evidence supports our argument that the quota did not increase the ability to hire captured directors and that the value loss is unlikely to be related to increased managerial entrenchment.[12]

Next, we investigate the importance of directors for firm value by exploiting the variation in the timing of compliance with the quota. Recent theory and evidence argues that firms have heterogeneous needs for director expertise (Raheja 2005; Adams and Ferreira 2007; Harris and Raviv 2008). For instance, R&D-intensive firms may prefer insiders with firm-specific knowledge. Larger, diversified firms may require a larger number of directors with more varied backgrounds. In a model where firms have heterogeneous demand for directors, we expect that the firms that have the greatest need to find replacement directors with equivalent backgrounds as existing directors would be the first to comply with the quota. In contrast, those firms where directors are more easily replaced may choose to comply with the law later.

To test the determinants for early compliance, we run logit tests where the dependent variable equals 1 if the firm complied

12. We also test whether the quota led to boards with women directors who sat on many other board simultaneously. In unreported tests, we find no evidence of this.

with the law by December 2006 and 0 if the firm complied afterward. For brevity, we present these results in Online Appendix Table A.VII. Not surprisingly, we find that the percentage of female board members in 2002 is positively and significantly related to early compliance with the law. We also find that the average age and CEO experience of board members is positively and significantly related to early compliance. In addition, firms with higher R&D expenditures are more likely to comply early with the law, though firm size is unrelated. Firms where board members share a common last name and where the CEO is on the board are significantly less likely to comply early with the law. To be certain that these effects are not simply picking up a positive correlation between the prequota percentage of women and other firm characteristics, we run the same tests using only those firms with no female directors in 2002. This ensures that each firm has an equally difficult time meeting the quota based solely on gender and isolates the other characteristics of directors. The qualitative results are unchanged in these tests.

These results are consistent with the idea that firms have heterogeneous demands for directors. Those firms that value age and experience appear to have acted quickly to find replacement directors, anticipating the shortage of equally qualified women directors. Additionally, firms that require specialized expertise, proxied by R&D expenditures, also found replacements early. In contrast, firms where the management and the board of directors are interconnected complied later. This may reflect that the quota will have less impact on these firms, since CEOs and family members will continue to influence the direction of the firm, even after they are replaced on the board.

An alternative hypothesis to explain the negative effect of the quota on firm values is that the forced change in boards itself, independent of director characteristics, led boards to be dysfunctional. Though the gender quota does not allow a clean test of this hypothesis, we attempt to provide some evidence using the prequota tenure of directors. Under the assumption that longer-serving boards will be more disrupted by the quota than boards with newer members, we record prequota tenure using the percent of directors in 2002 that were on the board in 2001.[13] In

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13. As mentioned previously, tenure is infrequently reported in early annual reports, so we must rely on our own calculations based on observed appointments. To calculate longer tenure histories, we search the Brønnøysund Register back to

unreported results, we do not find any significant differences of the quotas impact based on prequota tenure. Combined with the long-run persistence of the value loss, we view these results as suggestive evidence against a disruption hypothesis.

Overall, we interpret the results in this section to provide further evidence that directors are chosen to maximize shareholder wealth. Though the quota only mandated gender diversity, it de facto constrained the ability of firms to find replacement directors with the same sought-after characteristics of the replaced directors. This constraint may explain why we find negative effects from the quota, but Bennedsen, Perez-Gonzalez, and Wolfenzon (2007) find no value effects from director deaths in U.S. firms, where a shortage of similarly qualified replacement directors is unlikely. Further, our finding that the sought-after characteristics were age and top-level management experience is consistent with the hypothesis that directors add value through monitoring and advising. We acknowledge, however, that we cannot rule out all competing hypotheses. For instance, we cannot know whether the actions of the less experienced women directors led to value losses, or instead, whether the retained men changed their behavior when forced to work with women (Eckel and Grossman 2008). In addition, since multiple characteristics of directors changed simultaneously, the quota does not provide a way to separate gender from experience differences.

V.C. *The Effect of the Gender Quota on Firm Policies*

In this section, we investigate a number of channels through which the change in board member characteristics may have led to a loss in value. If the new board lacks the expertise or experience of the prequota board, the management may make fundamentally different decisions about financial and investment policies. The policy choices we study are not exhaustive but capture many of the most important decisions faced by a firm.

In Panel B of Table VI, we run identical IV regressions as before using the prequota variation in female representation as our exogenous instrument, but where the dependent variable is a financial policy choice or an investment choice. As mentioned previously, Norwegian firms were required to change from local to international accounting standards (IFRS) in 2005. Therefore, for

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1999, its earliest year. However, the register data also has a reporting bias, so we rely on the shorter but more accurate tenure calculations from annual reports.

robustness, we run each of our tests with both the full sample and the subset of firm-years where firms reported using international standards, as some firms voluntarily reported using IFRS prior to 2005. The change in accounting standards have a greater affect on income statement variables, such as return on assets and costs/sales than they have on balance sheet items, such as leverage and cash holdings (Gjerde, Knivsfla, and Sættem 2008). This implies that differences in results for performance measures and costs between the full sample and the IFRS sample are more likely related to accounting differences, whereas differences in results for financial and investment policies are more likely related to other differences between the two samples.

In columns (1)–(6), we examine the impact of the quota on financial policy. We find that by all three measures, firms increase their financial risk. Specifically, both leverage (total liabilities/assets) and current debt/equity increased as a result of the quota, though this result is not significant in the international accounting standards subsample. In addition to the increase in debt levels, we also find that the quota led to a decline in cash holdings, but again not in both samples. The coefficient estimates imply changes of substantial economic significance. For a 20% increase in female board representation, leverage increases by 6.4 percentage points, compared to a mean of 55%. Cash as a fraction of assets declines by 5.4 percentage points for the same change in the board, compared to an average of 15.9%. In the reduced-form estimates reported in Online Appendix Table A.VIII, we find that the increase in debt and decrease in cash occur in the later years of the sample, during the same period when we find significant value declines. However, we interpret these results with caution, as they are not always robust across accounting standards samples, though we expect that the accounting change would have less effect for these variables than for income statement based variables.

In columns (7)–(12), we investigate the investment policies of the firm. We find strong evidence that the firms most affected by the quota undertook significantly more acquisitions than those less affected. This is consistent with the increase in debt and reduction in cash, since our acquisition variable is the cash outflow for acquisitions in that year. The magnitude of the coefficient estimates imply meaningful increases of 1 to 4 percentage points of acquisitions relative to assets for a 20% increase in female representation. Similar to financial leverage, the significantly higher levels of acquisition expenditures are

found in the later years in the sample, corresponding to years when firm value declined substantially. Other studies have linked acquisitions to value losses (Moeller, Schlingemann, and Stulz 2004). The increase in acquisitions is also consistent with the result that the quota led to increases in firm size and employment. We find evidence of a modest decrease in capital expenditures and a modest increase in R&D in the reduced-form estimates but not in the IV regressions. Since directors are more likely to be directly involved in decisions about major acquisitions than about R&D expenditures or capital expenditures, these results are consistent with the findings in the prior section. In particular, we would expect that a change in the percentage of board members with top-level management experience would have a greater impact on acquisition policies than other investment policies.

The next set of outcomes we investigate are performance measures and costs structures in Panel C of Table VI and Online Appendix Table A.IX. First, using acquisition data from SDC, we find no effect of the quota on the yearly aggregated industry-adjusted abnormal announcement returns and only weakly higher estimates in the reduced-form estimates. Next, we find that the change in the board following the gender quota led to lower daily industry-adjusted returns. We also find lower asset turnover (sales/assets), a measure of firm efficiency, in both the IV and reduced-form models. Decreases in asset turnover are consistent with lower market valuations. In the reduced-form models, we find weak evidence that both fixed costs (SGA/sales) and variables costs (COGS/sales) increased as a result of the quota-induced board changes, with significant increases in fixed costs in the IV results as well. For operating profit, we find no significant effects in the IV regression, but negative effects in the reduced-form models. Again, we interpret these results with caution, as they are not always significant in both IV and reduced-form regressions, though the results are significant in the IFRS sub-sample, where we expect these variables to be more accurately measured.

As a final robustness check, we calculate difference-in-difference-in-differences regressions using firms in other Scandinavian countries as a further control sample. These results are reported in Online Appendix Tables A.X and A.XI. We find strong differential cross-country effects on firm size, asset turnover, cash/assets, and acquisition expenditures, consistent with our

prior results.[14] The triple-difference estimates help alleviate the concern that our results are driven by an omitted trend that is correlated with gender and also similar across Scandinavian firms.

As mentioned previously, a recent paper by Matsa and Miller provides evidence on accounting performance that is largely consistent with our results. In contrast to our approach, Matsa and Miller (2011) largely focus on differences in firms' legal organizations in 2006 (public versus private) as the source of variation to capture the impact of the quota. Using a triple-difference approach with matched Scandinavian firms, and comparing the voluntary compliance period to the mandatory compliance period, they show that operating profits declined and costs increased, confirming our results, though leverage and acquisition activity did not, in contrast to our results. They also present evidence similar to ours using the fraction of women directors as an instrument for the quota's impact, though the fraction is recorded in 2006, instead of 2002. Despite important differences between our approaches, measurement issues likely drive the few differences in their results. For instance, Matsa and Miller measure acquisitions as the fraction of firms in their subsamples that made at least one acquisition over a three-year period, whereas we measure firm-year acquisition expenditures over assets. In addition, they do not control for differences in accounting standards across countries nor the shift from local standards to IFRS in 2005. Given that their outcome measures are all accounting-based, this makes it difficult to compare their results to ours.

In sum, the results of our analyses provide evidence that the gender quota changed the characteristics of directors in multiple dimensions. Directors became younger and less experienced at top managerial levels. In addition, the quota led to substantial changes in firm policies. Firms grew through debt-financed acquisitions, while efficiency decreased. These results are consistent with the idea that experienced board members act as valuable monitors and advisors for CEOs and that firms seek directors who have particular backgrounds to maximize shareholder wealth.

It is important to note, however, that we cannot directly test for a causal relationship between the effect of any one of these

14. Data limitations in other countries prevent us from running triple-differenced tests on board characteristics.

changes to the board and firm value. The exogenous shock used in this article is based purely on the gender quota and the subsequent firm choices are endogenous. Because the quota caused the demographics of directors to change in multiple dimensions, including gender, age, and experience, our estimates capture all of these effects and potentially others. Therefore, though we would like to directly test the marginal impact on value caused by gender versus experience, or experience versus age, these tests could not provide any causal evidence and their interpretations would be unclear. We therefore rely on the direct tests of the impact of the quota on value, board characteristics, and firm policies to illustrate how the quota led to the appointment of directors that were different than previous directors. These results are consistent with the hypothesis that the drop in firm value was caused by less experienced boards, but many of our findings are also consistent with the hypothesis that the value loss was caused by differences in preferences among male and female directors.

Nevertheless, in tests reported in Online Appendix XII, we run OLS regressions of Tobin's Q on board characteristics and find that the negative effect of gender becomes insignificant when age and experience are included, which could imply that the effect is not driven by gender changes. However, we are careful to place little emphasis on such tests due to their inherent endogeneity. In addition, we cannot be sure that omitted variables do not confound these tests and affect their estimated magnitudes. For instance, age may be correlated with risk aversion and experience may proxy for a director's social connections. However, our main results do provide strong casual evidence of the effect of the quota on value, board characteristics, and firm policies individually.

V.D.   The Effect of the Gender Quota on Incorporation Rates

Given the large negative effects of the gender quota on firm value, we would expect to see firms try to avoid the law altogether. There are at least two ways firms could do this. First, existing firms could change their form of legal organization to private limited, rather than public limited. Second, firms could incorporate in another country. In this section, we provide evidence that both changes occurred following the introduction of the law.

Using data from Statistics Norway, Figure II presents the time series of the number of all public limited and private limited firms in Norway from 2001 to 2009. There are, of course, many more private limited firms, so we normalize the time series to 1 in 2001. We also present the time series of total employment in Norway over this time period for comparison.

The figure shows that there is a steady decline in public limited firms starting in 2003 and continuing throughout the period. By 2009, there are less than 70% as many public limited firms in Norway as there were in 2001. In contrast, the number of private limited firms increases beginning in 2003 and continues throughout, ending in 2009 with over 30% more private limited firms than existed in 2001. These changes occurred at a time when employment was increasing, with the exception of 2009. This indicates that while the economy was growing, firms were more likely to choose to organize as a private limited firm rather than a public limited firm starting in the years after the announcement of the gender quota law, which only affects public limited firms. These data do not allow us to identify firms that
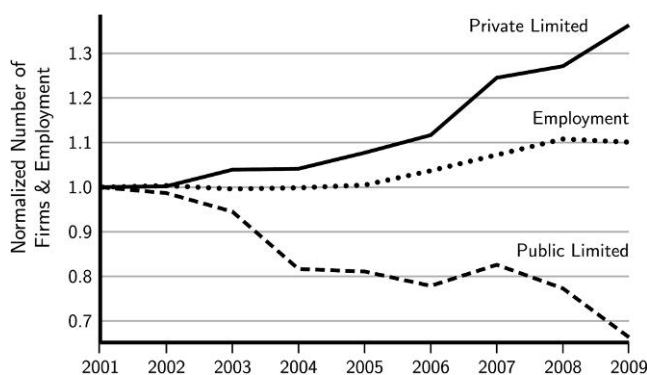

FIGURE II

Number of Firms by Organizational Status in Norway

Numbers of firms include firms of any size. In 2001, there were 529 public limited firms (Allmennaksjeselskap) and 118,533 private limited firms (Aksjeselskap). In 2009, there were 351 public limited firms and 161,584 private limited firms. If firms were restricted to have 50 or more employees, the pattern would be the same with 126 and 2,816 public and private firms in 2001 and 69 and 3,536 firms in 2009. Employment was 2.28 million persons in 2001 and 2.51 million persons in 2009. Each series is normalized to start at 1 in 2001. Data are from Statistics Norway (Statisisk sentralbyrå).

changed incorporation status but reflect the net change in incorporation status, including new incorporations, reincorporations, and terminations.

Next, we investigate the likelihood of delisting by our sample firms, based on their prequota percentage of female directors in 2002. We expect that if the quota imposed substantial costs on firms, those firms where the costs of compliance were highest would be the most likely to delist. Not all delistings entail going private, however, so we identify the reason for delisting. To do so, we read newspaper articles to classify delistings into five categories: (1) went private or changed the country of incorporation, (2) acquired by a private or foreign firm, (3) acquired by a Norwegian public firm, (4) bankruptcy, or (5) other or no reason can be determined. Notice that reasons 1 and 2 allowed the firm to continue its operations but avoid the quota, whereas 3 does not.

Of the 119 firms in 2002, 49 delisted by the end of 2009. Of the 80 firms with no female directors in 2002, 37 (46.3%) delisted, compared to 12 delistings out of 39 firms (30.8%) with at least one female director. The most common reason for delisting was an acquisition by a private or foreign firm (25), followed by going private or relocation (13), and an acquisition by a Norwegian public company (6). However, of the 38 firms that avoided the quota through an acquisition by a private or foreign firm, or by going private or relocating, 81.6% had no female directors in 2002. In contrast, of the firms that delisted following an acquisition by a public Norwegian firm, and thus did not avoid the quota, only 50% had no female directors in 2002.

These statistics provide evidence that the firms most affected by the quota chose to avoid the law through a change in incorporation. Table VII presents additional multivariate evidence controlling for other factors that are likely to affect the decision to delist. Using the sample of 2002 firms, we run logit tests on the likelihood of delisting any time in 2003 to 2009. In columns (1)–(3), the dependent variable records if the firm delisted for any reason. In columns (4)–(6), the dependent variable is 1 if the firm delisted and avoided the quota (reasons 1 and 2), and 0 otherwise. In all specifications, the prequota percentage of female directors is negatively and significantly related to the likelihood of delisting, indicating that those firms more affected by the quota were more likely to delist over 2003 to 2009. We also find that

TABLE VII
LIKELIHOOD OF DELISTING BY BOARD GENDER

	Dependent Variable: Delist for any reason			Dependent Variable: Avoid quota through delisting		
	(1)	(2)	(3)	(4)	(5)	(6)
Percent women directors	−6.604***	−8.959***	−9.763***	−7.919***	−9.143***	−10.460***
	(1.724)	(2.151)	(1.801)	(2.725)	(3.376)	(3.998)
Board size	−0.093	−0.194	−0.250	−0.306*	−0.374	−0.472*
	(0.146)	(0.176)	(0.212)	(0.179)	(0.244)	(0.256)
Board age	−0.018	−0.086**	−0.082*	−0.025	−0.070	−0.073
	(0.022)	(0.039)	(0.045)	(0.027)	(0.047)	(0.048)
Board CEO experience	−1.304**	−1.511***	−2.159***	−0.809***	−0.903***	−1.834***
	(0.659)	(0.534)	(0.758)	(0.257)	(0.313)	(0.563)
Log(assets)		0.378**	0.488***		0.247	0.439
		(0.173)	(0.131)		(0.295)	(0.358)
R&D/assets		4.421	5.912		−0.803	−2.401
		(7.974)	(12.681)		(6.685)	(9.027)
Industry: industrials			0.419			−0.115
			(0.257)			(0.111)
Industry: consumer discretionary			−0.109			−0.699***
			(0.245)			(0.252)

TABLE VII
(CONTINUED)

	Dependent Variable: Delist for any reason			Dependent Variable: Avoid quota through delisting		
	(1)	(2)	(3)	(4)	(5)	(6)
Industry: consumer staples			0.871***			1.284***
			(0.258)			(0.370)
Industry: health care			−1.141***			−1.852***
			(0.138)			(0.419)
Industry: information technology			−0.466			0.590
			(1.863)			(1.377)
Industry: utilities			0.858***			0.761
			(0.281)			(0.559)
Constant			4.332***			4.753**
			(1.550)			(1.961)
Observations	95	95	91	95	95	91
Pseudo R^2	0.112	0.144	0.191	0.131	0.144	0.215

Notes: Logit regression estimates where the dependent variable equals 1 if the firm delisted from 2003 to 2009 and 0 otherwise in columns (1)–(3), or equals 1 if the firm avoided the quota through delisting (acquisition by a private/foreign firm, went private, or changed location) or 0 otherwise (didn't delist, went bankrupt, or no reason can be determined). Variables are based on 2002 data only. Omitted industry sector is energy. Standard errors in parentheses are robust to industry sector clusters. Statistical significance at the 1%, 5%, and 10% levels is indicated by ***, **, and *. All variables are defined in Appendix A.

firms are more likely to delist if they have a younger board with less CEO experience. This complements our prior finding that firms are more likely to comply early if they have an older board with more CEO experience. These results hold controlling for firm size, the level of risky investment (proxied by R&D expenditures), and industry.

In sum, our analysis in this section suggests that the gender quota imposed large enough costs on firms that those most affected avoided the law by changing their legal status. We find evidence consistent with this both at the aggregate country level as well as at the firm level. Though we do not control for this attrition bias in our main tests, it is most likely that if we could retain those firms that avoided the law in our sample, our main results would be strengthened.

VI. Conclusions

In this article we exploit a natural experiment in Norway to identify the impact of corporate boards on firm value. Using the predetermined variation in the percentage of women on corporate boards to measure the exogenous change in boards mandated by a gender quota first passed in 2003, we find that the quota led to a substantial decline in Tobin's Q. We also document a significantly different stock price reaction to the announcement of the law for those firms with at least one female director (-0.02%) compared to firms with no female directors (-3.54%). These results are consistent with the hypothesis that boards are chosen to maximize shareholder value and that imposing a severe constraint on the choice of directors leads to economically large declines in value.

Next, we show that the limited pool of new female directors led multiple characteristics of boards to change as a result of the quota. New women directors had significantly less CEO experience and were younger than the existing men directors. Using the exogenous nature of our setting, we then show that, consistent with the value loss, the quota led firms to grow in size, make more acquisitions, and realize worse accounting returns. These results are consistent with boards of directors that are less effective monitors and advisors, though we are careful to note that our setting does not allow us to separately identify the causal effect of age, experience, or gender on firm value.

Our results are relevant to academics, investors, and policy makers. This article presents the first evidence on the effect of the groundbreaking quota rules adopted in Norway. Other countries have recently passed or are currently considering similar laws. For example, Spain, Iceland, and France have all passed similar quota laws. Our results quantify the costs of such laws borne by shareholders and point to the potential causes of the value decline. In addition, we present evidence that firms avoid the quota by relocating or changing incorporation status. These results may provide policy makers guidance on how to maintain value while providing greater gender equality in the boardroom.

This article also extends prior research on similar gender mandates in political settings. Just as government policies are affected by new legislators elected by mandate, we study how newly appointed female directors affect firm policies and firm value. Prior research investigating electoral quotas may provide clues to how the boardroom quotas will affect firms and workers in the future. For instance, will an increase in female board members change the hiring practices or compensation for rank-and-file employees, similar to the change in government spending following electoral quotas? Will perceptions of female corporate leaders change, and if so, will this change the career paths of young women? The search for answers to these and many other interesting questions are important avenues for future research.

APPENDIX A: VARIABLE DEFINITIONS

Accounting ratios

Asset turnover	Revenues/Total assets
CAPEX/Assets	Capital expenditures/Total assets
COGS/Sales	Cost of goods sold/Total revenues
Leverage	Book liabilities/Total assets
M&A Returns	Yearly aggregated abnormal announcement returns over the 5 days surrounding the announcement for all mergers and acquisitions where abnormal returns are calculated by subtracting the MSCI country index of the firm's country from the raw return
R&D/Assets	R&D/Total assets
ROA	Operating income before depreciation/Total assets
SGA/Sales	Selling, general, & administrative expense/Total revenues
Tobin's Q	Total assets − common equity + market equity/Total assets

Board of directors variables

% Retained from prior year	Percentage of board members in year t that were board members in the same firm in year $t − 1$
Age	The average age of the board of directors
Board position/person	Average of the total number of CEO and board positions held in any given year per director
CEO compensation	The value of total compensation paid to a CEO as recorded in the Boardex database
CEO Exp. (%)	Percentage of board members that have work experience as a CEO or owner
Female (%)	Percentage of board members that are female
Higher Educ. (%)	Percentage of board members that have a postbaccalaureate degree including MA, MS, MD, JD, and PhD, excluding MSc degrees from Norway since these are not typically equivalent to U.S. master's degrees, especially before 2001
Insider	Percentage of board members that are employed full-time by the same firm
MBA (%)	Percentage of board members that have an MBA
Same last name	Percentage of board members that have the same last name as another board member or the CEO in the same year
Size	Total number of directors
Tenure	Average number of years since board members have been appointed

APPENDIX A: VARIABLE DEFINITIONS

(CONTINUED)

Board of directors external primary occupation

VP	Vice president of any kind (i.e., senior VP, executive VP, etc.)
Consultant	Consultant, advisor, counselor, *bedriftsrådgive*
Board member	Member, chair, deputy chair
Professor	Professor
CEO	CEO, president, managing director, general manager, adm. director
Attorney	Attorney, lawyer, advocate
Non-Exec. Manager	Manager, head of (sales, HR, etc.), management, COO, marketing, general secretary
CFO	CFO, finance director, treasurer, financial director, investment manager
Partner/Principal	Partner, owner, principal, self-employed, independent, founder, investor
Accountant	Accountant, payroll, controller, controlling
Other	Any job position not classified above

APPENDIX B: PREQUOTA CHARACTERISTICS

FIRM CHARACTERISTICS BY SHARE OF FEMALE DIRECTORS IN 2002

	No women directors	Women directors > 0	Difference	Standard error
	(1)	(2)	(3)	(4)
Panel A. Firm characteristics				
Tobin's Q	1.238	1.141	0.097	0.122
Log(assets)	4.433	6.073	−1.639***	0.368
Log(employees)	−1.230	0.643	−1.873***	0.328
Leverage	0.545	0.611	−0.066*	0.038
Current debt/equity	0.177	0.156	0.021	0.072
Cash/assets	0.150	0.118	0.033	0.027
Capex/assets	0.054	0.071	−0.017	0.012
Acquisitions/assets	0.004	0.007	−0.004	0.004
R&D/assets	0.010	0.007	0.003	0.006
Last year returns	−0.131	−0.118	−0.013	0.063
ROA	−0.171	−0.060	−0.111	0.069
Asset turnover	1.079	1.048	0.031	0.140
SGA/sales	0.020	0.003	0.017	0.012
COGS/sales	0.104	0.084	0.019	0.052

APPENDIX B
(CONTINUED)

	No women directors	Women directors > 0	Difference	Standard error
	(1)	(2)	(3)	(4)
Panel B. Board characteristics				
Board size	5.100	6.410	−1.310***	0.311
Percent women directors	0.000	22.802	−22.802***	1.774
Percent with CEO experience	63.613	67.093	−3.479	7.428
MBAs	22.006	27.434	−5.428	5.740
Higher education	25.250	28.161	−2.911	6.976
Age	50.694	52.392	−1.697*	0.974
Tenure	3.097	2.914	0.183	0.924
Insider	2.424	1.905	0.519	2.573
Norwegian	94.058	90.177	3.880	3.014
Percent same name	5.673	4.188	1.485	2.413
Occupation: vice president	5.606	7.405	−1.799	3.771
Consultant	6.970	13.444	−6.475	6.580
Board member	17.424	28.595	−11.171*	6.006
Professor	0.000	3.333	−3.333	2.271
CEO	37.235	19.389	17.846**	8.661
Attorney	0.909	0.000	0.909	0.909
Nonexec. Mgr.	6.212	0.000	6.212**	2.837
CFO	3.750	4.333	−0.583	3.375
Partner/principal	15.492	19.373	−3.881	6.117
Other	3.977	2.222	1.755	3.199

APPENDIX B
(CONTINUED)

	No women directors	Women directors > 0	Difference	Standard error
	(1)	(2)	(3)	(4)
Panel C. Industrial sectors (%)				
Materials	5.000	7.143	−2.143	4.711
Industrials	18.750	26.190	−7.440	8.151
Consumer discretionary	11.250	23.810	−12.560	7.542
Consumer staples	6.250	4.762	1.488	4.299
Health care	6.250	4.762	1.488	4.299
Financials	1.250	0.000	1.250	1.250
Information technology	28.750	11.905	16.845**	7.177
Telecommunications	0.000	2.381	−2.381	2.381
Utilities	1.250	2.381	−1.131	2.689
Observations	80	42		

Notes. Averages of firm characteristics and averages of average board of director characteristics across firms for Norwegian companies that were listed on the Oslo Stock Exchange. All variable definitions are in Appendix A. Outside occupations are not mutually exclusive and so do not add to 100%. * Significant at 10%; ** Significant 5%; *** Significant 1%.

Ross School of Business, University of Michigan

Supplementary Material

An Online Appendix for this article can be found at QJE online (qje.oxfordjournals.org).

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