Mandatory gender balance and board independence

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by*[a]

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Abstract

We find that forcing radical gender balance on corporate boards is associated with increased board independence and reduced firm value. A mandatory 40-percent gender quota shifts the average fraction of independent directors from 46 to 67 percent because female directors are much more often independent directors than males are. This shock to board independence via gender quotas is strongest in small, young, profitable, non-listed firms with powerful stockholders and few female directors. Such firms also lose the most value, presumably because they need advice from dependent directors the most and monitoring by independent directors the least.

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1. Introduction

The low proportion of females on corporate boards has attracted widespread attention from practitioners, regulators, researchers, and the media (Farrell and Hersch 2005; McKinsey & Company 2007; Terjesen et al. 2009; Langli 2011; Adams and Kirchmaier 2013). Norway was the first country to act politically on this issue by mandating gender balance in the boardroom. The gender balance law (GBL) was proposed to the surprise of many in 2002, passed by Parliament in 2003, and became mandatory in 2008. The 40-percent gender quota increased the average fraction of directorships filled by females from 11 percent when the GBL was passed to 42 percent when it became mandatory five years later. Since then, non-complying firms face the penalty of liquidation.[1]

This paper shows that such a large and unexpected shock to gender balance produces a large shock to another board characteristic as well. In particular, we find evidence suggesting that the GBL strongly increases board independence, and that this upward shift also reduces firm value. While regulators consider independence the key characteristic of successful boards (Bhagat and Black 1998; Adams et al. 2010), the argument that more independence is always beneficial has no support in the research literature. As predicted theoretically (Adams and Ferreira 2007) and documented empirically (Linck et al. 2008; Duchin et al. 2010), optimal board independence requires a tradeoff between the value of monitoring provided by independent (outside) directors and the value of advice provided by dependent (inside) directors. This inherent conflict between monitoring and advice suggests that board quality will suffer if mandatory gender balance in the boardroom forces independence above the optimal level.

[1] France, Germany, Holland, Iceland, and Spain are implementing gender quotas in 2014–2016, and similar proposals have been made in Australia, Belgium, Canada, the EU Commission, and Italy. Gender quotas for state firms are used in Ireland, South Africa, and Switzerland. Prime Minister Cameron recently said, "There is clear evidence that ending Britain's male-dominated business culture would improve performance, and that Britain's economic recovery is being held back by a lack of women in the boardroom" (*The Guardian* 2012).

Our findings support this logic. First, the average fraction of independent directors rises by 21 percentage points from when the GBL was passed until it became mandatory. Second, the effect of this regulatory shock on board independence via gender quotas varies in the cross-section. The firms affected the most are those that need independence the least. Such firms have low need for the monitoring provided by independent directors and high need for the advice provided by dependent directors. We find that these firms tend to be small, young, non-listed, profitable, owned by powerful stockholders, and to have few female directors before the quota became mandatory. The statistical and economic significance is particularly strong for the fraction of female directors. Third, the largest value loss occurs in firms that had to change their board the most radically. Performance is weaker the more the gender mix deviates from what it was before the GBL and the more independence deviates from what is predicted by firm characteristics that motivate the use of independent directors.

These findings mean that although the GBL regulates just one board characteristic per se (gender balance), the law has a strong side effect on another characteristic that is important for board quality (independence). Because independence is a much more widespread property among female director candidates than among males, a forced shift towards more gender balance shifts the balance of board skills from advice towards monitoring.

One may wonder whether this increased board independence is driven not by the GBL, but rather by the governance code. The code was introduced two years before the GBL became mandatory and recommends that half the directors be independent. However, while the GBL applies to both listed and non-listed firms, the code applies only to the listed. We exploit this difference in exposure and find the same upward shift in independence regardless of listing status. Hence, the increased independence is due to the GBL and not to the governance code.

This result also suggests that, unlike what has been argued, the widespread independence found among female directors in countries with no GBL does not reflect merely a simple way to comply with the code (Beecher-Monas 2007). Because we show that female directors are as often independent in firms not exposed to the code as they are in firms exposed to it, it seems the pool of dependent female candidates is so small that one cannot select both many females and many dependent females simultaneously. Correspondingly, choosing female directors in a GBL environment very often means having to choose independent directors, even though that was not the intention.

We also find that stockholders do not fill the gender quota in ways that would have increased independence less dramatically. First, just adding female directors to the existing board would have increased independence less than replacing dependent males by independent females. While extensive use of this option would have increased board size by about 50 percent in our sample, the actual increase is only 5 percent. Second, while others have shown that females with multiple directorships are less independent (Fields and Keys 2003), we find no evidence that women with multiple directorships are chosen more often after the GBL.

Our evidence is consistent with earlier findings that Norwegian firms without female directors lost on average 3.5 percent in market value when the planned GBL was announced (Ahern and Dittmar 2012). The market-to-book ratio fell by 15 percent, and the underperformance continued the next five years. The number of female directorships increased by 260 percent, while the number of male directorships dropped by 38 percent. Whereas 31 percent of the new females had CEO experience, this was the case for 69 percent of the retained males.

The key finding of our paper is that large, mandatory gender quotas may produce excessive board independence and lost firm value when the incoming females must be chosen from a talent pool with limited experience with the firm and its environment. Hence, the value loss is

not driven by the abrupt shift in gender balance per se, but by the strong correlation between gender and relevant director skills. The key reason for this correlation is that men and women with equal formal education choose different career paths (Adams and Kirchmaier 2013). This choice does matter for the ability to build director skills. For instance, women hold 15 percent of the executive positions in Fortune 500 firms (www.catalyst.org). They hold 16 percent of the executive positions and only 5 percent of the CEO positions in Norwegian listed firms (www.kpmg.no). Furthermore, women make up 69 percent of the labor force in state-owned Norwegian firms, but only 36 percent in other firms (Jensberg et al. 2012).

We present our models and predictions in Section 2. The data and summary statistics are discussed in Section 3, while Section 4 presents the base-case results. Section 5 analyzes alternative board independence measures and alternative determinants of independence. We summarize and conclude in Section 6.

2. Predictions

Board independence is affected by regulatory and non-regulatory determinants. Our paper focuses on the former, which are exogenous restrictions on board composition. Specifically, we analyze how board independence is influenced by mandatory law through the GBL and by soft law through the governance code. Our base-case model is the following:

$$
\begin{aligned}
(1) \qquad \textit{Board independence}_{it} &= \alpha + \beta^{A} X^{Reg} + \beta^{B} X^{Non\text{-}reg} \\
&= \alpha + \beta_1 \textit{Female directors}_{it} + \beta_2 \textit{Listed}_{it} + \beta_3 \textit{Female directors}_{it} * \textit{Listed}_{it} \\
&\quad + \beta_4 \textit{Inside ownership}_{it} + \beta_5 \textit{Outside ownership}_{it} + \beta_6 \textit{Past performance}_{it} \\
&\quad + \beta_7 \textit{Leverage}_{it} + \beta_8 \textit{Risk}_{it} + \beta_9 \textit{Firm size}_{it} + \beta_{10} \textit{Firm age}_{it} + u_{it}
\end{aligned}
$$

The regulatory determinants in the vector X^{Reg} are specified in the second row of (1), while the non-regulatory determinants in the vector $X^{Non\text{-}reg}$ are in the bottom two rows. The starting

point is the tradeoff theory, in which optimal board independence reflects the value-maximizing combination of monitoring and advice. We outline the tradeoff theory and operationalize board independence in Section 2.1. We predict how board independence relates to regulatory determinants in Section 2.2, and to non-regulatory determinants in Section 2.3. Finally, we specify the expected relationship between forced independence and the firm's performance in Section 2.4. Table 1 defines our empirical proxies.

Table 1

2.1 Board independence

Independent directors may create firm value due to potential conflicts of interest between the manager who runs the firm and the owners who delegate control rights to the manager (Jensen and Meckling 1976). The more serious the resulting separation between ownership and control, the more value directors may create by monitoring management more efficiently inside the boardroom than non-director owners can do from the outside.

Different director types have different incentives to fill this monitoring function. Compared to directors with professional ties to the firm or personal ties to the manager, directors without such ties have less to lose by challenging the manager. The former director type is called dependent or inside, while the latter is called independent or outside (Hermalin and Weisbach 1998; Adams et al. 2010). The independent director's monitoring incentives in a specific board are stronger if the value of her or his human capital primarily comes from reputation for offering monitoring services on any board.

The board's second function is to advise management. High advisory skills require deep insight into the firm, its customers, suppliers, competitors, and industry. Dependent directors have such skills because of their closeness to the firm, while independent directors often lack them because of their arms-length distance from the firm (Bhagat and Black 1998, 2002).

Because dependent directors may lose reputation by monitoring (control) and build reputation by advising (support), they have lower incentives to monitor and stronger incentives to advise than independent directors do.

This setting implies that the value of the board's monitoring function stems from reduced agency costs in the relationship between owners and managers ("monitoring prevents bad projects"). In contrast, the value of advice stems from the ability to generate new strategies that management can develop and implement ("advice creates good projects").

Finally, one would expect that managers operating in this environment dislike being intensively monitored. The reason is that monitoring reduces managements' discretion over the firm's resources as represented by the free cash flow (Jensen 1986). Therefore, management may respond to more monitoring by providing the board with less information. In contrast, managers like advice, because more advice may increase the free cash flow.

Adams and Ferreira (2007) formalize this setting and show that optimal board independence involves a tradeoff between the value of monitoring provided by independent directors and the value of advice provided by dependent directors. Two of their results are particularly important for our context. First, superoptimal (too much) independence reflects a board where the advisory skills are too weak relative to the monitoring skills. There is too much control and too little support. Firm value is lost because the board generates too few new ideas and restricts management too strongly.

The second important result of Adams and Ferreira is that too much independence does not just push the board's advisory skill below its optimal level. Excessive independence may also reduce the board's ability to monitor. Such a loss of both advisory value and monitoring value occurs when managers respond to being monitored by reducing the information flow. This

response creates a problem because an uninformed board cannot fulfill its two roles. Hence, greater independence caused by new regulation may reduce board quality because the board gets too low advisory skills and also too little information for advice and monitoring. This imbalance means the radical change in board composition caused by the GBL may not just produce boards with suboptimal focus on advice and superoptimal focus on monitoring. The intensive monitoring may also have low quality because the board is generally uninformed.

We measure board independence in line with earlier research, which classifies directors as either inside, grey, or outside (Baysinger and Butler 1985; Weisbach 1988; MacAvoy and Millstein 1999; Adams and Ferreira 2009b). Inside directors are full-time employees, former employees, or employees of closely related firms. Grey (affiliated) directors have professional relationships with management, or are likely to have business relationships with the firm, such as investment bankers and lawyers. Outside directors are neither inside nor grey.

We measure board independence in the base case as the fraction of outside directors, which is the standard measure in the literature. The robustness tests will alternatively define board independence by the fraction of outside minus the fraction of inside directors (Bhagat and Black 2002), the fraction of outside and grey directors (Linck et al. 2008; Ahern and Dittmar 2012), and whether or not the CEO is on the board (Carter and Lorsch 2004). Unlike the others, this latter measure is not based on our manual classification and hand-collected data.

These four independence measures may all be criticized for overestimating true independence. The reason is that the measures ignore social (i.e., non-business) relationships between the directors and the CEO (Hwang and Kim 2009; Cohen et al. 2012). This is probably a minor problem in our sample, where men fill 96 percent of the CEO positions. This fact suggests that if anything, measures that ignore social ties will overestimate independence more for men than for women. Consequently, the true difference in independence between men and women

is even larger than what we measure. This bias strengthens the power of our test, where the null hypothesis is that independence and gender are unrelated.[2]

2.2 Regulatory determinants

We expect that board independence in (1) relates positively to the fraction of female directors. This fraction is driven by the GBL, which mandates that at least 40 percent of board positions be filled by female directors.[3] The prediction is supported by Farrell and Hersch (2005), who examine the characteristics of female directors in 300 firms on the Fortune 1000 list from 1990 to 1999. The use of female directors increased by 7 percentage units during those ten years, and more than 90 percent of the incoming females were classified as outside directors. The authors argue that because women have limited experience as managers and stockholders, one would expect board independence to increase when female directors replace males. Adams and Ferreira (2009b) support this logic by arguing that, because women seldom belong to the so-called old boys' network, they are more often true arm's-length monitors and hence genuinely independent. The authors estimate that, while large firms in the United States had about 10 percent of their board positions filled by females in 2004, 84 percent of them were classified as outside directors.[4]

We expect a positive relationship in (1) between having independent directors and being listed. This is because every sample firm is exposed to the GBL, but only the listed are subject

[2] One may make the opposite argument if the GBL induces females to hold multiple directorships more often than males. As we will document, however, there is no such tendency in our data.

[3] The exact 40-percent quota applies to boards with more than nine members. The quota for smaller boards is specified as a minimum number of directors per gender. There must be at least one director of each gender if the board has two or three members, at least two if there are four or five members, at least three if there are six to eight members, and at least four of each gender if the board has nine members. These thresholds imply that the minimum fraction of each gender may vary between 33 percent and 50 percent in a cross-section of compliers.

[4] Gender may matter for board behavior through other channels than independence (Fields and Keys 2003; Beecher-Monas 2007). Females may use less earnings management (Gul et al. 2007), adopt more democratic and trust-building leadership styles (Cohen et al. 2001; Klenke 2003; Trinidad and Normore 2005), have higher ethical standard (Betz et al. 1989; Mason and Mudrack 1996; Clikeman et al. 2001), and take less risk (Riley and Chow 1992; Powell and Ansic 1997; Sundén and Surette 1998). Adams and Funk (2009) recently challenged the latter argument by finding that female directors in Sweden are slightly less risk averse than males are.

to the independence code. Nevertheless, listed firms may comply with both the GBL and the code in one move by appointing female directors who are also independent.[5] To account for this possibility, we relate the GBL and the code by interacting the fraction of female directors and the firm's listing status. This interaction term allows us to determine whether the GBL drives independence differently in firms that must also comply with the code. If listed firms choose female directors to comply with both the code and the GBL, we expect a positive coefficient for the interaction term in (1). Conversely, the coefficient will be negative if female directors are more often independent in non-listed firms than in listed ones. This latter case would occur if dependent female directors prefer to sit on listed firms' boards, possibly because of higher visibility and pay. Such preferences would produce a higher fraction of independent female candidates in the talent pool for the non-listed firms than for listed ones.

2.3 Non-regulatory determinants

We group the non-regulatory determinants of board independence in (1) into board, ownership, and general firm characteristics. Because partly overlapping characteristics in the same model may cause multicollinearity problems, our base-case model uses only a subset of the non-regulatory determinants in Table 1 that are commonly used in the literature.

Board independence tends to decline as inside ownership increases (Bhagat and Black 2002; Linck et al. 2008). This finding can be rationalized by the argument that monitoring has less value when the interests of directors and stockholders are aligned (Raheja 2005). We measure inside ownership by the aggregate equity fraction held by the firm's officers and directors.[6]

[5] The code was implemented in 2006, stating, "The majority of the stockholder-elected members of the board should be independent of the company's executive personnel and material business contacts." Moreover, at least two stockholder-elected directors should be independent of the main stockholder (*www.nues.no*). The corporate law states that one third of the board must be elected by and from the employees in firms with more than 200 employees. Employee-elected directors are probably dependent by nature (Dravis 2007).

[6] The term "inside owner" is very different from the term "inside director." An inside owner is a stockholder who is also on the board or on the management team. An inside (dependent) director is a board member with close ties to management.

The equity fraction is measured as ultimate ownership, which is the investor's direct equity holding in the firm plus any indirect holdings through corporate intermediaries. We predict that board independence and inside ownership are negatively correlated.

The principal's power and incentives to monitor the agent increase with outside ownership concentration (Shleifer and Vishny 1997). This fact means that powerful owners outside the boardroom have strong incentives to ensure that their directors monitor management on the owners' behalf. Hence, board independence may relate positively to outside ownership concentration. On the other hand, large outside owners may monitor management through other channels than the board. Such monitoring can happen both in the stockholder meeting and through informal contact with management. Using such channels reduces the demand for monitoring directors. Hence, we do not specify the expected relationship between board independence and outside ownership in (1), which we measure by the Herfindahl index based on every ultimate ownership stake in the firm.

Research predicts theoretically and finds empirically that firms may respond to poor past performance by appointing a higher fraction of independent directors (Hermalin and Weisbach 1991; Bhagat and Black 2002). The rationale is that a CEO who dislikes monitoring is supposed to have less say on board composition the weaker the firm's past performance. We measure past performance as the average return on assets over the last three years, predicting an inverse relationship between board independence and past performance. By using past rather than contemporaneous performance, we also avoid potential reverse causation going from independence to performance in (1). We address that possibility separately by analyzing whether the shock to independence triggered by the GBL influenced performance after the law was passed.

Complex firms are thought to have a high need for monitoring and have also been found to have more independent boards (Coles et al. 2008; Linck et al. 2008). We measure firm complexity by firm size and by firm age, expecting higher values of both characteristics to correlate positively with board independence in (1).

Managers of firms with high debt have less free cash flow to waste on value-destroying projects. Therefore, high debt, and the resulting monitoring by creditors, is a substitute for the monitoring carried out by an independent board (Jensen 1986). We predict an inverse relationship between board independence and leverage.

Finally, the optimal fraction of independent directors decreases as the cost of monitoring increases (Adams and Ferreira 2007). Such monitoring costs are particularly high when firms with strong information asymmetry are monitored by independent directors (Maug 1997). Moreover, empirical research has found that information asymmetry is higher the more volatile (risky) the firm's stock returns (Fama and Jensen 1983). Because we have stock return data only for the listed firms in our sample, we use the standard deviation of book return on assets to proxy for risk. We expect board independence to correlate negatively with risk.

2.4 Forced independence and firm value

Suppose board independence is optimally installed before the GBL, and that the firm cannot fill the gender quota without increasing independence. The tradeoff model of Adams and Ferreira (2007) predicts that the GBL will reduce the firm's value, and that the value loss will be greater the more post-GBL independence deviates from the pre-GBL level. We use two approaches to explore this relationship. First, we relate the firm's performance post GBL to how much the board's independence differs from what it was pre GBL. We expect that the larger the deviation, the weaker the post-GBL performance.

The second approach starts by estimating the annual residuals $\hat{u}_{it}$ from (1) post GBL. Subsequently, we regress the firm's performance in this period on these estimated residuals:

$$(2) \qquad Performance_{it} = \alpha + \beta_1 \hat{u}_{it} + \omega_{it}$$

We expect a negative β_1 in (2). This inverse relationship reflects that performance is weaker the more the actual independence deviates from the level determined by the characteristics in (1) that necessitate a tradeoff between the need for monitoring and the need for advice.

Under both approaches, we also test the models on a control group of similar firms that are not exposed to the GBL. Unlike for the exposed firms, we expect that the performance of the unexposed firms is unrelated to the use of female directors or independent directors. The reason is that the unexposed firms can freely choose these board characteristics.[7]

Summarizing Section 2, we predict that the board will have more independent directors when the firm is listed, has many female directors, low inside ownership concentration, low past performance, low leverage, low risk, and when the firm is large and old. The more the GBL forces the board's independence away from its optimum, the more firm value will be lost.

3. Data and summary statistics

Our sample is all firms exposed to the GBL, and the data set is an unbalanced panel from 2003 to 2008.[8] Norwegian firms with limited liability are legally obliged to publish

[7] Since (2) regresses performance on the residuals from (1), we ignore past performance in (1). Because we lack data to manually classify directors in the unexposed firms, we measure their boards' independence by whether the CEO is also a director in the firm.

[8] Except for the data on director independence, the data source is the CCGR database (www.bi.edu/ccgr), which includes every Norwegian limited-liability firm from 1994 to the present. Experian (www.experian.no) provides the CCGR with the accounting data and the corporate governance data. The data used to manually classify directors as inside, grey, and outside are from Brønnøysundregistrene (www.brreg.no) and Proff (www.proff.no).

accounting statements every year. The firm must also report the identity and equity holdings of its owners, directors, and CEO. Failure to do so within 17 months after fiscal year-end triggers automatic liquidation by the court. The law mandates a standardized set of accounting statements certified by a public auditor, regardless of the firm's listing status, size, and industry.

Table 2 shows mean values of the variables.[9] Because the governance code applies only to listed firms, we also split the sample by listing status to uncover whether this property influences board composition.

Table 2

Board independence as measured by the fraction of outside directors is 59 percent on average during the sample period. This fraction is 64 percent in the listed firms and 50 percent in the non-listed, respectively. Because non-listed firms are not subject to the governance code, their lower independence is as expected from a regulatory perspective. The difference may also reflect that optimal independence is lower in non-listed firms because monitoring has less value. This rationale is supported by other figures in the table suggesting that potential agency problems between owners and managers are smaller in non-listed firms. First, ownership is more concentrated, implying stronger incentives and power to discipline management. The largest stockholder in the non-listed firms holds on average 63 percent of the equity, compared to 29 percent in the listed. Second, boards of non-listed firms have more owner presence. Officers and directors hold on average 16 percent of the equity in the non-listed firms and 8 percent in the listed.

We obtain supplementary information on director characteristics by manually searching the annual reports. Our sample is all firms organized as ASA (*allmennaksjeselskap*), which are the firms exposed to the GBL.

[9] Most variables are quite symmetric. For instance, female directors has a minimum of 0, mean of 0.24, median of 0.25, and a maximum of 0.67. The corresponding values for the largest owner are 0.05, 0.42, 0.32, and 1.00.

These characteristics suggest that independent directors who monitor management on the owners' behalf are less critical in non-listed firms. Risk as measured by asset return volatility is also considerably higher. Both characteristics make advice important relative to monitoring, which also follows from the fact that non-listed firms are smaller and younger.

Table 3 shows the prevalence of outside, grey, and inside directors for the sample as a whole in panel A. The fraction of outside directors increases every year, growing from 46 percent in 2003 to 67 percent in 2008. In contrast, the fraction of inside directors declines monotonically from 44 to 27 percent. Finally, the fraction of grey directors drops from 10 to 6 percent. Hence, the large growth in the use of outside directors primarily happens at the expense of inside directors rather than grey ones.

This pattern suggests that the fraction of outside directors may capture a fundamental shift in director skills towards more monitoring at the expense of less advice. Therefore, the fraction of outside directors will be our base-case board independence measure in the following.

Table 3

Panel B shows that the fraction of outside directors grows from 52 to 72 percent in listed firms and from 41 to 59 percent in the non-listed. Hence, the growth is unrelated to listing status, documenting that the increased independence is not due to the governance code for listed firms, which was introduced two years before the GBL became mandatory in 2008.

Panel C documents the relationship between director type and gender. Females are on average outside directors in 84 percent of the cases, while the average for males is 50 percent. Hence, the average female is more than 60 percent (34 percentage points) more likely than the average male to be an outside director. Similarly, 13 percent of the females are inside directors, while 43 percent of the males are. These relationships remain practically constant

over time. Although not reported in the table, the pattern is also the same regardless of listing status.

This difference in independence between males and females is very close to the estimate of Farrell and Hersch (2005) and Adams and Ferreira (2009b) from the United States. They report that 84 percent of the females are independent, as opposed to 40 percent of the males. Our figures are 84 percent and 50 percent, respectively. This evidence strengthens the impression that owners of Norwegian firms could not have mitigated excessive independence after the GBL by recruiting more dependent (inside) female directors than they did earlier. It seems there is no such untapped pool of talent better qualified for advice than for monitoring.

Unlike our research, the existing literature studies only firms where there is no gender quota, where about 10 percent of the directors are females, and where the governance code recommends that half the directors be independent. This setting means that the unobserved pool of female director candidates may very well be balanced regarding dependence vs. independence. Firms may nevertheless recruit more heavily from the subpool of independent females in order to comply with the independence code while also catering to the general public's positive attitude towards better gender balance. Table 3 documents, however, that even firms facing no independence requirement from governance codes increase board independence by about 40 percent (20 percentage points) when one third of their male directors must be replaced by females. Therefore, it seems the complete, unobserved pool of female director candidates is indeed heavily biased towards independence. This bias means that mandatory quotas will be a more serious problem for optimal board design the more gender balance regulators enforce.

Stockholders could have dampened the GBL's impact on independence by just adding female directors to the existing, male-dominated board. According to Table 4, however, this is not a

widespread strategy, because board size does not increase noticeably during the sample period. The average board has 5.60 members in 2003 and 5.86 members five years later (panel A).[10] In fact, board size even decreases somewhat in non-listed firms (panel B), where the board also tends to be smaller than in the listed firms (4.97 vs. 6.13 members on average, respectively).

Table 4

The second way to avoid excessive independence is by appointing females who already hold board seats elsewhere. Table 5 shows the holding of multiple directorships by men and women in 2003, 2006, and 2008, respectively.

Table 5

Panel A documents, as expected, a trend towards a higher total number of multiple seats held by females and a lower total number held by males. In particular, multiple seats are held by as many females as males at the end of the sample period (68 vs. 66, respectively), while males dominate very strongly five years earlier (320 vs. 18, respectively). This pattern follows almost by implication when females in short supply replace 30 percent of the males during a brief period. A similar impression is given by panel B, where the number of seats per director increases for females and decreases for males. For instance, the mean number of seats increases from 1.16 to 1.22 for females, while decreasing from 1.25 to 1.10 for males.

When we consider only directors with multiple seats in panel C, however, there is no clear tendency that the fraction of females with multiple seats increases over time. Rather, the striking feature is that males have multiple seats considerably less often. For instance, the fraction of males with multiple seats drops from 22 percent to 8 percent.

[10] Not increasing board size in order to reduce independence may be rational. Several studies find an inverse relationship between board size and performance (Yermack 1996; Eisenberg et al. 1998; Bøhren and Strøm 2010).

Overall, Table 5 shows a certain tendency for some females to hold multiple directorships more often. Nevertheless, the only clear trend is that males do so much less often than earlier. Although unreported tests show that females with multiple seats are generally more dependent than are females with just one seat, recruiting female directors with multiple seats is not a widespread strategy to reduce board independence. One possible reason is that stockholders share the view that busy directors may easily become overstretched (Fich and Shivdasani 2006). Alternatively, the pool of females who can potentially hold multiple directorships is so small that this recruiting source does not matter much.[11]

Summarizing this section, larger board size and more female directors with multiple seats are not widely used strategies to dampen the growth in board independence caused by the GBL. Instead, stockholders comply with the new law by recruiting from the talent pool of female directors with limited leadership experience and few board seats. These female directors replace males, thereby leaving board size unchanged while increasing board independence.

4. Base-case results

We relate board independence to regulatory and non-regulatory characteristics in Section 4.1, while Section 4.2 relates performance after the GBL to gender balance and independence.

4.1 Determinants of board independence

Our data set contains multiple observations of the same firm over time. This property allows us to use panel data techniques, which reduce potential endogeneity problems caused by

[11] The effect of female directors on board independence may also be dampened by appointing experienced females from abroad. Nygaard (2011) shows, however, that the proportion of foreign directors in 2003 was 12 percent for females and 13 percent for males. Five years later, 13 percent of the females and 16 percent of the males were foreigners. Thus, there is no clear shift from national to international recruitment of female directors.

unobservable determinants of board independence (Hsiao 2003).[12] We use the fixed-effects approach to account for firm-specific unobservables.[13] Moreover, we use year fixed effects to control for the possibility that the GBL's impact on board independence in all firms changes towards 2008, when the law became mandatory. Table 6 shows the estimates of (1).[14]

Table 6

The estimates show that the presence of female directors is associated positively with board independence. Thus, as predicted, mandating a large change in gender balance does not just alter the gender balance, but also increases the board's independence. This result is consistent with Table 3, where the average monitoring skills are much higher for females than for males. Conversely, females have a comparative disadvantage as advisors. The stockholders' problem is, however, that they must make the tradeoff between monitoring and advice after the GBL within a severely restricted opportunity set for female director candidates.

Listed firms have boards with greater independence than non-listed firms do. This result is as predicted, given the regulatory fact that the governance code applies only to the listed firms. Moreover, the negative coefficient for the joint effect of female directors and listing status suggests that listed firms do not fill the gender quota and the independence quota in one go. That is, listed firms do not recruit independent females more often than non-listed firms do. Rather, it is even more common for a female director to be independent in non-listed firms,

[12] Endogeneity due to reverse causation seems to be a minor concern in (1). First, the large increase in female directors is due to an exogenous shock through a new law. Second, the relationship between independence and listing status is partially driven by an exogenous governance code for listed firms. Third, although firms exposed to the GBL can avoid the law by exiting to an unexposed organizational form, exit is not an option for a listed firm unless it also chooses to delist. Bøhren and Staubo (2014) show that, although half the firms exposed to the GBL in 2003 had left this organizational form by 2008, roughly three quarters of them were non-listed.

[13] We use fixed firm effects even though the base-case model contains a dummy variable for the firm's listing status. Because some firms change listing status during the sample period, this dummy variable is not a constant over time for all firms. We prefer the fixed-effects approach because it allows the unobservable firm effect to be correlated with the error term. The robustness tests also use the random-effects approach, which assumes the unobservable firm effect is a random variable that is uncorrelated with the error term.

[14] No bivariate correlation coefficient between the independent variables in (1) exceeds 0.8, which is considered the critical limit for suspecting multicollinearity problems (Studenmund 2000).

despite the fact that such firms are subject only to the GBL and not to the independence code as well. This result suggests that independence and gender are closely related in the talent pool, and possibly also that dependent female director candidates prefer listed firms because of higher visibility.

Turning next to the non-regulatory determinants, the table shows that while the concentration of outside ownership is not significant, inside ownership relates inversely to board independence. This finding supports our prediction that the demand for directors who primarily monitor is weaker when these directors or the CEO are owners as well.

As expected, past firm performance and board independence are negatively correlated, suggesting that monitoring increases when the firm has been doing poorly. Independence decreases as leverage grows, which is consistent with substitutability between a monitoring board and monitoring creditors. However, board independence is unrelated to asset risk, suggesting that monitoring costs as reflected in the volatility of asset returns are unimportant for the tradeoff between monitoring and advice. Finally, and as predicted, complexity as measured by the firm's size and age correlates positively with independence. Hence, smaller and younger firms choose less independent boards.

The statistically significant relationships for the two regulatory variables are also strong economically. The expected fraction of independent directors increases by 14 percentage points if a non-listed firm becomes listed, while increasing by 31 percentage points if a non-listed firm replaces an all-male board by an all-female board. Due to the interaction effect of female directors and listing status, the expected increase in independence is 12 percentage points rather than 31 if an all-male board is replaced by an all-female board in a firm that is listed rather than non-listed.

This evidence supports earlier findings that the demand for independent directors with monitoring skills varies from firm to firm (Linck et al. 2008; Duchin et al. 2010). Our results extend this literature by showing that a large regulatory shock to gender diversity produces a side effect on board independence that shifts the skills from advice towards monitoring. The resulting distortion of board composition is strongest in firms that need monitoring the least and advice the most. Such firms may have low agency costs related to the manager-stockholder relationship because they have few and strong stockholders (non-listed firm and high ownership concentration) who can easily stay well informed (small and young firm). Hence, they have little need for monitoring by non-owner directors. These firms may have high need for advice, however, because their low age and small size suggest they lack the internal resources to make good strategic decisions and to establish external networks of high quality without the help from experts on their boards.

4.2 Female directors, board independence, and firm performance

The GBL is costly if compliance with the gender quota forces the board away from its optimal independence level. Table 7 tests the hypothesis that the larger the board upheaval, the more the firm will suffer economically.

Panel A makes a rough test by relating the fraction of female directors the year the law was passed (pre GBL) to the firm's average ROA afterwards (post GBL). We place a firm into one of four subsamples, depending on the fraction of female directors pre GBL. Because the average fraction of female directors pre GBL is 11 percent, and because the quota is 40 percent, we construct four subsamples consisting of the bins 0-10, 10-20, 20-30, and 30-40, respectively (column 1).

The larger the pre-GBL fraction of female directors, the less the firm must change its board in order to comply. Hence, if the GBL is more costly the larger the board upheaval, the exposed

firm will perform better the less its fraction of female directors pre GBL deviates from 40%. We expect no such relationship for unexposed firms, which can freely choose the value-maximizing fraction of female directors both before and after the GBL. The firms in this control group have similar size as the exposed firms. Both groups contain 439 firms.

The estimates in panel A support these predictions. The exposed firms (column 2) tend to have higher performance post GBL the higher the fraction of female directors pre GBL. For instance, firms in the 30-40 percent female directors subsample are doing significantly better than those in the 0-10 percent subsample. There is no such pattern in the unexposed firms (column 3).

Table 7

Panel B reports the estimates of model (2), where we regress the firm's post-GBL performance year by year on the residuals from model (1), which relates board independence to a series of firm characteristics. As expected, firms exposed to the GBL have weaker performance the more the board's actual independence deviates from is predicted independence based on characteristics that matter for the quality of monitoring and advice. There is no such relationship for the unexposed firms.

Summarizing, this section first tested the multivariate model in (1) using panel data techniques to account for unobservable firm and time effects on board independence. Most relationships are statistically significant, and both regulatory variables (gender balance and listing status) are also strong economically. Every significant relationship is consistent with our predictions of how the choice of independent vs. dependent boards is driven by regulatory and non-regulatory characteristics. We find that independence is lower when the firm has few female directors, strong owners, high historic profits, and when the firm is small, young, and

non-listed. Such firms trade off monitoring and advice in ways that reflect a relatively low value of being monitored. This evidence is strengthened when we estimate how the firm's performance relates to either gender balance or independence when the GBL was introduced. The more regulation shifts these two board characteristics, the less profitable the firm. Overall, these results suggest the GBL is costly for stockholders.

5. Robustness

We first re-estimate the base-case model in (1) using alternative econometric techniques. Subsequently, we analyze what happens when we use alternative measures of board independence. Finally, we test the sensitivity to using different empirical proxies than those used in (1) for some of the non-regulatory determinants of board independence.

5.1 Econometric techniques

The base-case regression in Table 6 uses fixed-effects estimation to control for the influence of unobservable firm characteristics that remain constant over time. Table 8 repeats these estimates as the point of reference under technique I. Technique II is random-effects regressions with maximum likelihood (ML) methodology, and III controls for fixed firm effects by using sample period averages for each variable in every firm.

Table 8

The estimates reported in II and III are mostly consistent with those of the base case in I. First, the significant relationships between board independence and female directors, listing status, inside ownership, and firm size are robust to the econometric technique used. Second, none of the remaining variables are significant with opposite sign under alternative techniques. These results show that our major findings in the base-case model are not driven by the chosen

estimation method. Therefore, we continue controlling for fixed firm effects and fixed time effects in the following.

5.2 Board independence

The independence measure in the base case comes from hand-collected data that we use to classify directors as outside, grey, or inside according to the definitions from Section 2. Both data collection and classification may be biased because they rely on our judgment. Moreover, independence is an elusive concept because it is hard to define precisely by a specific empirical proxy. Therefore, we test three alternative measures of independence.

Model A in Table 9 defines independent directors as the fraction of outside directors minus the fraction of inside directors (Bhagat and Black 2002). Model B classifies both outside and grey directors as independent (Linck et al. 2008; Ahern and Dittmar 2012), while model C classifies the board as independent if the CEO is not a member and as dependent otherwise. The argument is that the board is only independent when the monitored party has no formal say in the monitoring body (Carter and Lorsch 2004). Unlike the base case and models A and B, model C uses neither hand-collected data nor our judgment to measure independence.[15] We estimate C as a logit model with random effects. Finally, the sample and the determinants of independence in models A, B, and C correspond to what we used in the base case.

Table 9

The table shows that all three models produce estimates close to those from the base case. Female directors, listing status, past performance, leverage, and firm size are significant at the 5-percent level or lower in every model. Four determinants are insignificant (the interaction

[15] The CEO is not on the board in 92 percent of the listed firms and in 80 percent of the non-listed. Hence, a potential weakness of this model is that the vast majority of observations come from independent boards.

term, inside ownership, outside ownership, and risk). Reassuringly, the key base-case relationships are rather insensitive to alternative ways of measuring board independence.

5.3 Non-regulatory determinants of board independence

The set of potential determinants of board independence is large when moving from theoretical constructs to empirical proxies. Given the purpose of this paper, however, our major focus is on determinants that reflect regulatory effects. These determinants are female directors as an indirect determinant through the GBL and listing status as a direct determinant through the governance code. The remaining variables in (1) are non-regulatory determinants. To analyze whether the choice of non-regulatory determinants matters for our findings, we specify a model where the non-regulatory determinants are as close as possible to those used in recent studies of board composition in the United States (Linck et al. 2008; Adams and Ferreira 2009a):

$$
\begin{aligned}
(3)\quad \textit{Board independence}_{it} = {} & \alpha + \beta^{A} X^{\text{Reg}} + \beta^{B} X^{\text{Non-reg}} \\
= {} & \alpha + \beta_1 \textit{Female directors}_{it} + \beta_2 \textit{Listed}_{it} + \beta_3 \textit{Female directors}_{it} * \textit{Listed}_{it} \\
& + \beta_4 \textit{Board size}_{it} + \beta_5 \textit{CEO ownership}_{it} + \beta_6 \textit{CEO ownership squared}_{it} \\
& + \beta_7 \textit{CEO tenure}_{it} + \beta_8 \textit{CEO tenure squared}_{it} + \beta_9 \textit{Firm age}_{it} \\
& + \beta_{10} \textit{Firm age squared}_{it} + u_{it}
\end{aligned}
$$

The regulatory determinants in the second row of (3) are identical to those used in (1). Rows 3–5 hold the non-regulatory determinants, which differ from those used in (1).

Board independence tends to decline with increasing CEO ownership and CEO tenure (Weisbach 1988; Shivdasani and Yermack 1999; Boone et al. 2007; Coles et al. 2008; Linck et al. 2008). However, Adams and Ferreira (2009a) predict theoretically and find empirically that this relationship is not monotonic. Specifically, they find that board independence first decreases and then increases with growing CEO ownership and tenure. This evidence of a v-shaped relationship suggests that changes in board independence come with benefits and costs

that vary with the pre-change level (Adams and Ferreira 2007). We include CEO ownership, CEO tenure, and their squared values in (3). We expect the coefficient for both proxies to be negative for the linear term and positive for the quadratic term.

Complex firms may need boards with greater independence, but firm complexity may not increase linearly with firm age (Boone et al. 2007). We account for this possible non-linearity by including firm age squared, which we expect to have a negative coefficient. Finally, larger boards tend to be more independent (Boone et al. 2007), and larger firms are usually more complex and have larger boards (Yermack 1996; Eisenberg et al. 1998; Linck et al. 2008). Accordingly, we use board size instead of firm size to proxy for firm complexity in (3), expecting independence to grow with growing board size.

Table 10 shows the estimates. The two new measures of CEO characteristics and the new measure of firm complexity (board size) are all significant at the 5-percent level with the predicted signs. In addition, the role of female directors corresponds to its role in the base case, while listing status is no longer significant. Although the results as a whole are generally weaker than in the base case, the relationship between gender balance regulation and board independence is insensitive to how we account for the non-regulatory determinants.

Table 10

6. Conclusions

This paper is the first to analyze the empirical relationship between mandatory gender quotas and director independence in corporate boards. We show that requiring firms to change the board's gender mix radically and quickly produces a strong upwards shift in board independence. The reason is that independence is a much more common characteristic among female directors than among males. This finding suggests that the pool of female director

candidates differs from the pool of male director candidates regarding the two fundamental director skills, which are monitoring and advice.

We also find that board independence varies systematically from firm to firm before the gender quota became mandatory. This result supports the notion of a firm-specific need for monitoring skills vs. advisory skills in the boardroom. As predicted, we find that firms using monitoring directors the least and advising directors the most are small, young, non-listed, and profitable firms with strong owners and low gender diversity on the board. Such firms are likely to experience the largest loss of board skills under a high, mandatory gender quota.

Consistent with these results, we find that the firm performs worse the more the board's gender mix deviates from what it was before the gender balance law. Performance is also weaker the more the board's independence deviates from the level predicted by firm characteristics that motivate the use of independent directors.

These findings illustrate the general problem that regulation may have strong and unintended side effects (Hermalin and Weisbach 2006; Lerner 2009). Half the exposed firms exited to an exempted organizational form before the Norwegian gender quota became mandatory (Bøhren and Staubo 2014). Hence, the law ended up regulating only half the firms it was targeted for. Our paper documents that board independence increased and performance declined in the firms that complied with the law by filling the gender quota. Hence, although the law explicitly regulates gender balance only, it implicitly regulates independence as well.

Overall, this evidence suggests that gender balance on corporate boards may be difficult to achieve by large mandatory quotas unless the regulator accepts large, unintended side effects. These side effects reflect the general insight that regulating board composition in order to achieve only the intended effect is easier said than done.

References

Adams, Renée B., and Daniel Ferreira. 2007. "A Theory of Friendly Boards." *Journal of Finance* 62 (1):217–250.

Adams, Renée B., and Daniel Ferreira. 2009a. "Strong Managers, Weak Boards?" *CESifo Economic Studies* 55 (3–4):482–514.

Adams, Renée B., and Daniel Ferreira. 2009b. "Women in the Boardroom and Their Impact on Governance and Performance." *Journal of Financial Economics* 94 (2):291–309.

Adams, Renée B., and Patricia Funk. 2009. "Beyond the Glass Ceiling; Does Gender Matter?" *ECGI Finance Working Paper* No. 273/2010.

Adams, Renée B., Benjamin E. Hermalin, and Michael S. Weisbach. 2010. "The Role of Boards of Directors in Corporate Governance: A Conceptual Framework and Survey." *Journal of Economic Literature* 48 (1):58–107.

Adams, Renée B., and Tom Kirchmaier. 2013. "From Female Labor Force Participation to Board Gender Diversity." *ECGI-Finance Working Paper* No. 347/2013.

Ahern, Kenneth R., and Amy Dittmar. 2012. "The Changing of the Boards: The Impact on Firm Valuation of Mandated Female Board Representation." *Quaterly Journal of Economics* 127 (1):137–197.

Baysinger, Barry D., and Henry N. Butler. 1985. "Corporate Governance and the Board of Directors: Performance Effects of Changes in Board Composition." *Journal of Law, Economics, and Organization* 1 (1):101–124.

Beecher-Monas, Erica. 2007. "Marrying Diversity and Independence in the Boardroom: Just How Far Have You Come, Baby?" SSRN eLibrary.

Betz, Michael, Lenahan O'Connell, and Jon M. Shepard. 1989. "Gender Differences in Proclivity for Unethical Behavior." *Journal of Business Ethics* 8 (5):321–324.

Bhagat, Sanjai, and Bernard S. Black. 1998. "Independent Directors." *The New Palgrave Dictionary of Economics and the Law* 2:283–287.

Bhagat, Sanjai, and Bernard S. Black. 2002. "The Non-Correlation Between Board Indpendence and Long-Term Firm Performance." *Journal of Corporation Law* 27 (2):231–273.

Boone, Audra L., Laura C. Field, Jonathan M. Karpoff, and Charu G. Raheja. 2007. "The Determinants of Corporate Board Size and Composition: An Empirical Analysis." *Journal of Financial Economics* 85 (1):66–101.

Bøhren, Øyvind, and R. Øystein Strøm. 2010. "Governance and Politics: Regulating Independence and Diversity in the Board Room." *Journal of Business Finance and Accounting* 37 (9–10):1281–1308.

Bøhren, Øyvind, and Siv Staubo. 2014. "Does Mandatory Gender Balance Work? Changing Organizational Form to Avoid Board Upheaval." *Journal of Corporate Finance* 28:152–168.

Carter, Colin B., and Jay W. Lorsch. 2004. "Back to the Drawing Board: Designing Corporate Boards for a Complex World." Boston, MA: Harvard Business School Press.

Clikeman, Paul M., Marshall A. Geiger, and Brendan T. O'Connell. 2001. "Student Perceptions of Earnings Management: The Effects of National Origin and Gender." *Teaching Business Ethics* 5 (4):389–410.

Cohen, Jeffrey R., Laurie W. Pant, and David J. Sharp. 2001. "An Examination of Differences in Ethical Decision-Making Between Canadian Business Students and Accounting Professionals." *Journal of Business Ethics* 30 (4):319–336.

Cohen, Lauren, Andrea Frazzini, and Christopher Malloy. 2012. "Hiring Cheerleaders: Board Appointments of "Independent" Directors." *Management Science* 58 (6):1039–1058.

Coles, Jeffrey L., Naveen D. Daniel, and Lalitha Naveen. 2008. "Boards: Does One Size Fit All?" *Journal of Financial Economics* 87:329–356.
Dravis, Bruce F., 2007, "The Role of Independent Directors after Sarbanes-Oxley," Chicago, IL: American Bar Association.
Duchin, Ran, John G. Matsusaka, and Oguzhan Ozbas. 2010. "When are Outside Directors Effective?" *Journal of Financial Economics* 96:215–237.
Eisenberg, Theodore, Stefan Sundgren, and Martin T. Wells. 1998. "Larger Board Size and Decreasing Firm Value in Small Firms." *Journal of Financial Economics* 48 (1):35–54.
Fama, Eugene F., and Michael C. Jensen. 1983. "Separation of Ownership and Control." *Journal of Law & Economics* 26 (2):301–326.
Farrell, Kathleen A., and Philip L. Hersch. 2005. "Additions to Corporate Boards: The Effect of Gender." *Journal of Corporate Finance* 11 (1/2):85–106.
Fich, Eliezer M. and Anil Shivdasani. 2006. 'Are Busy Boards Effective Monitors?' *Journal of Finance* 61 (2):689–724.
Fields, M. Andrew, and Phyllis Y. Keys. 2003. "The Emergence of Corporate Governance from Wall St. to Main St.: Outside Directors, Board Diversity, Earnings Management, and Managerial Incentives to Bear Risk." *Financial Review* 38 (1):1–24.
Gul, Ferdinand A., Bin Scrinidhi, and Judy Tsui. 2007. "Do Female Directors Enhance Corporate Board Monitoring? Some Evidence from Earnings Quality." *Hong Kong Polytechnic University*.
Hermalin, Benjamin E., and Michael S. Weisbach. 1991. "The Effects of Board Composition and Direct Incentives on Firm Performance." *Financial Management* 20 (4):101–112.
Hermalin, Benjamin E., and Michael S. Weisbach. 1998. "Endogenously Chosen Boards of Directors and their Monitoring of the CEO." *American Economic Review* 88 (1): 96–118.
Hermalin, Benjamin E., and Michael S. Weisbach. 2006. "A Framework for Assessing Corporate Governance Reform." *NBER Working Paper* No. 12050.
Hsiao, Cheng. 2003. "*Analysis of Panel Data*." Cambridge, UK: Cambridge University Press.
Hwang, Byong-Hyoun, and Seoyoung Kim. 2009. "It Pays to Have Friends." *Journal of Financial Economics* 93 (1):138–158.
Jensberg, Heidi, Roland Mandal, and Erling Solheim. 2012. "Det kjønnsdelte arbeidsmarkedet, 1990-2010. " Trondheim: Rapport NTNU/SINTEF
Jensen, Michael C. 1986. "Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers." *American Economic Review* 76 (2):323–329.
Jensen, Michael C., and William H. Meckling. 1976. "Theory of the Firm: managerial Behavior, Agency Costs and Ownership Structure." *Journal of Financial Economics* 3 (4): 305–360.
Klenke, Karin. 2003. "Gender Influences in Decision-Making Processes in Top Mangement Teams." *Management Decision* 41 (10):1024–1034.
Langli, John C. 2011. "Kjønnskvoterte Styrer." *Praktisk Økonomi & Finans* (4):67–92.
Lerner, Josh. 2009. "Boulevard of Broken Dreams. Why Public Efforts to Boost Entrepreneurship and Venture Capital Have Failed – And What to Do About It." Princeton, NJ: Princeton University Press.
Linck, James S., Jeffry M. Netter, and Tina Yang. 2008. "The Determinants of Board Structure." *Journal of Financial Economics* 87 (2):308–328.
MacAvoy, Paul W., and Ira M. Millstein. 1999. "The Active Board of Directors and its Effect on Performance of the Large Publicly Traded Corporation." *Journal of Applied Corporate Finance* 11 (4):8–20.

Mason, E. Sharon, and Peter E. Mudrack. 1996. "Gender and Ethical Orientation: A Test of Gender and Occupational Socialization Theories." *Journal of Business Ethics* 15 (6):599–604.
Maug, Ernst. 1997. "Boards of Directors and Capital Structure: Alternative Forms of Capital Restructuring." *Journal of Corporate Finance* 3 (2):113–139.
McKinsey & Company. 2007. "Women Matter: Gender Diversity, A Corporate Performance Driver." McKinsey & Company, Inc.
Nygaard, Knut. 2011. "Forced Board Changes: Evidence from Norway." SSRN eLibrary.
Powell, Melanie, and David Ansic. 1997. "Gender Differences in Risk Behaviour in Financial Decision-Making: An Experimental Analysis." *Journal of Economic Psychology* 18 (6):605–628.
Raheja, Charu G. 2005. "Determinants of Board Size and Composition: A Theory of Corporate Boards." *Journal of Financial & Quantitative Analysis* 40 (2):283–306.
Riley, William B., and K. Viktor Chow. 1992. "Asset Allocation and Individual Risk Aversion." *Financial Analysts Journal* 48 (6):32–37.
Shivdasani, Anil, and David Yermack. 1999. "CEO Involvement in the Selection of New Board Members: An Empirical Analysis." *Journal of Finance* 54 (5):1829–1853.
Shleifer, Andrei, and Robert W. Vishny. 1997. "A Survey of Corporate Governance." *Journal of Finance* 52 (2):737–783.
Studenmund, A. H. 2000. *Using Econometrics: A Practical Guide*. Vol. 4. Boston, MA: Addison Wesley Longman, Inc.
Sundén, Annika E., and Brian J. Surette. 1998. "Gender Differences in the Allocation of Assets in Retirement Savings Plans." *American Economic Review* 88 (2):207–211.
Terjesen, Siri, Ruth Sealy, and Val Singh. 2009. "Women Directors on Corporate Boards: A Review and Research Agenda." *Corporate Governace: An International Review* 17 (3):320–337.
The Guardian. 2012. "Britain's Boardrooms Need More Women, Cameron says." Guardian News and Media Limited (guardian.co.uk).
Trinidad, Cristina, and Anthony H. Normore. 2005. "Leadership and Gender: A Dangerous Liaison?" *Leadership and Organization Development Journal* 26 (7):574–590.
Weisbach, Michael S. 1988. "Outside Directors and CEO Turnover." *Journal of Financial Economics* 20:431–460.
Yermack, David. 1996. "Higher Market Valuation of Companies with a Small Board of Directors." *Journal of Financial Economics* 40 (2):185–211.

Table 1: The empirical proxies

Theoretical variable	Empirical proxy
Board characteristics	
Board independence	The number of outside board members divided by the number of stockholder-elected board members
Outside director	0/1 dummy variable which is 1 if and only if the board member is neither a full-time employee in the firm, a former employee, an employee of a closely related firm, related to a member of management, nor has business relationships with the firm
Board size	The number of stockholder-elected board members
Female director number	The number of stockholder-elected directors who are women
Female directors	The proportion of stockholder-elected board members who are women
Female age	The average number of years since the female directors were born
Male age	The average number of years since the male directors were born
Ownership characteristics	
Inside ownership	The ultimate fraction of equity owned by the firm's officers and directors
Outside ownership	The sum of squared ultimate equity fractions in the firm (Herfindahl index)
Largest owner	The ultimate equity fraction held by the firm's largest stockholder
General firm characteristics	
Listed	0/1 dummy variable which is 1 if the firm is public and 0 otherwise
CEO age	The number of years since the CEO was born
CEO tenure	The number of years since the CEO took office
Performance	Real book return on assets (ROA) during the year
Past performance	The average real book return on assets (ROA) per year during the last three years
Risk	The standard deviation of performance during the last three years
Leverage	Total debt divided by total assets
Firm age	The number of years since the firm was founded
Firm size	Sales in constant 2009 millions of NOK. Log-transformed in regressions

This table defines the variables used in the empirical analysis.

Table 2: Board, ownership, and general firm characteristics

Variable	All	Listed	Non-listed	Difference	t-value	(p-value)
Board characteristics						
Board independence	0.59	0.64	0.50	0.14	5.63	(0.00)
	[0.30]	[0.27]	[0.36]			
Outside director	3.63	3.78	3.36	0.42	9.21	(0.00)
	[2.21]	[2.23]	[2.19]			
Board size	5.69	5.91	4.95	0.96	7.49	(0.00)
	[1.67]	[1.51]	[1.78]			
Female director number	1.51	1.68	1.21	0.47	5.85	(0.00)
	[1.05]	[0.99]	[1.09]			
Female directors	0.24	0.28	0.23	0.05	3.80	(0.00)
	[0.17]	[0.16]	[0.19]			
Female age	45.72	46.22	44.59	1.63	2.87	(0.00)
	[6.20]	[6.06]	[6.38]			
Male age	51.37	52.00	50.25	1.75	3.87	(0.00)
	[5.86]	[5.60]	[6.13]			
Ownership characteristics						
Inside ownership	0.12	0.08	0.16	-0.08	-7.99	(0.00)
	[0.21]	[0.15]	[0.28]			
Outside ownership	0.19	0.13	0.32	-0.19	-8.70	(0.00)
	[0.24]	[0.14]	[0.33]			
Largest owner	0.42	0.29	0.63	-0.34	-11.40	(0.00)
	[0.31]	[0.19]	[0.35]			
General firm characteristics						
CEO age	47.09	47.35	46.62	0.73	1.35	(0.18)
	[7.03]	[6.92]	[7.20]			
CEO tenure	5.13	5.26	4.06	1.20	4.18	(0.00)
	[3.87]	[4.24]	[3.58]			
Past performance	0.06	0.06	0.07	-0.01	-0.07	(0.95)
	[0.16]	[0.14]	[0.19]			
Risk	0.18	0.11	0.29	-0.18	-3.74	(0.00)
	[0.47]	[0.21]	[0.75]			
Leverage	0.43	0.41	0.46	-0.05	-1.93	(0.06)
	[0.30]	[0.23]	[0.39]			
Firm age	25.13	31.97	12.88	19.09	9.02	(0.00)
	[33.44]	[36.95]	[21.07]			
Firm size	2,513	2,915	2,262	658	3.07	(0.00)
	[22,256]	[24,930]	[21,670]			
Average N	696	418	278	140		

This table shows the mean and standard deviation (in brackets) of board, ownership, and general firm characteristics for all firms, listed firms, and non-listed firms. The differences between mean values across the two subsamples, their t-values and p-values (in parentheses) are reported in the three right-most columns. Table 1 defines the variables. Past performance, Risk, and Leverage are censored at the 1% and 99% tails. The sample consists of all firms exposed to the Norwegian gender balance law during the period 2003–2008.

Table 3: The prevalence of outside, grey, and inside directors

A. All

Director type	2003	2004	2005	2006	2007	2008	Mean	2008 less 2003 Diff.	z	p(z)	Average N
Outside	0.46	0.52	0.54	0.58	0.64	0.67	0.57	0.21	11.98	(0.00)	427
Grey	0.10	0.09	0.09	0.08	0.07	0.06	0.08	-0.04	-3.13	(0.00)	60
Inside	0.44	0.40	0.37	0.34	0.29	0.27	0.35	-0.17	-5.16	(0.00)	263
N	706	702	757	825	863	645	750				750

B. By listing status

	Outside		Grey		Inside	
Year	Listed	Non-listed	Listed	Non-listed	Listed	Non-listed
2003	0.52	0.41	0.03	0.10	0.45	0.49
2004	0.56	0.47	0.03	0.09	0.41	0.44
2005	0.64	0.50	0.02	0.09	0.34	0.41
2006	0.64	0.52	0.01	0.09	0.33	0.39
2007	0.71	0.57	0.01	0.08	0.28	0.35
2008	0.72	0.59	0.00	0.07	0.28	0.34
Average	0.63	0.51	0.02	0.09	0.35	0.40
Difference	0.12		-0.07		-0.05	
z-value	15.36		-27.11		-8.12	
p(z)	(0.00)		(0.00)		(0.00)	
2008 less 2003	0.20	0.18	-0.03	-0.03	-0.17	-0.15
z-value	5.97	4.13	-3.63	-1.23	-5.09	-3.49
p(z)	(0.00)	(0.00)	(0.00)	(0.22)	(0.00)	(0.00)

C. By gender

	Outside		Grey		Inside	
Year	Female	Male	Female	Male	Female	Male
2003	0.84	0.49	0.02	0.07	0.14	0.44
2004	0.83	0.50	0.03	0.08	0.14	0.42
2005	0.85	0.50	0.02	0.06	0.13	0.44
2006	0.83	0.48	0.03	0.09	0.14	0.43
2007	0.83	0.50	0.04	0.08	0.13	0.42
2008	0.83	0.51	0.04	0.04	0.13	0.43
Average	0.84	0.50	0.03	0.07	0.13	0.43
Difference	0.34		-0.04		-0.30	
z-value	30.70		-25.50		-38.40	
p(z)	(0.00)		(0.00)		(0.00)	
2008 less 2003	-0.01	0.02	0.02	-0.03	-0.01	-0.01
z-value	-0.16	0.51	0.63	-0.84	0.00	-0.18
p(z)	(0.87)	(0.61)	(0.55)	(0.40)	(0.99)	(0.85)

This table reports the average fraction of outside, grey, and inside directors by listing status and gender. Inside directors are the firm's full-time employees, former employees, or employees of closely related firms. Grey (affiliated) directors are related to a member of management, or are likely to have business relationships with the firm. Outside directors are neither inside nor grey. Listed firms are quoted on the Oslo Stock Exchange. The sample is all firms exposed to the Norwegian gender balance law.

Table 4: Board size

A. Mean and median board size in all firms

	All		Females		Males	
Year	Mean	Median	Mean	Median	Mean	Median
2003	5.60	5	0.56	0	5.04	5
2004	5.65	5	0.89	1	4.76	4
2005	5.77	6	0.88	1	4.89	5
2006	5.67	5	1.12	1	4.55	4
2007	5.56	5	1.60	2	3.96	3
2008	5.86	5	2.25	2	3.61	3
Average	5.69	5	1.22	1	4.47	4
2008 less 2003	0.26	0.00	1.69	2.00	-1.43	-2.00
t-value	23.63	0.00	19.59	18.86	-18.06	-15.89
(p-value)	(0.00)	(1.00)	(0.00)	(0.00)	(0.00)	(0.00)

B. Mean board size by listing status

	Listed firms			Non-listed firms		
Year	All	Females	Males	All	Females	Males
2003	5.91	0.61	5.30	5.12	0.51	4.61
2004	6.11	0.90	5.21	5.11	0.63	4.48
2005	6.19	1.21	4.98	5.05	0.66	4.39
2006	6.22	1.53	4.69	4.93	1.04	3.89
2007	6.12	1.95	4.17	4.70	1.50	3.20
2008	6.23	2.52	3.71	4.88	1.95	2.93
Average	6.13	1.45	4.68	4.97	1.05	3.92
2008 less 2003	0.32	1.91	-1.59	-0.24	1.44	-1.68
t-value	5.83	31.83	-27.33	-4.90	29.39	-34.29
(p-value)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Listed less non-listed			1.17			
t-value			11.99			
(p-value)			(0.00)			

This table shows board size as measured by the number of shareholder-elected directors. The sample is all firms exposed to the Norwegian gender balance law. Listed firms are quoted on the Oslo Stock Exchange.

Table 5: Multiple directorships

A. Totals

	Females				Males			
Directorships	2003	2006	2008	Average	2003	2006	2008	Average
1	124	341	417	294	1,134	1,164	788	1,029
2	15	33	47	32	290	93	53	145
3	1	16	13	10	24	20	10	18
4	2	5	3	3.3	4	6	1	3.7
5		2	2	1.3	2	6	2	3.3
6			2	0.7				
7						1		0.3
8			1	0.3		1		0.3
N	142	397	485	341	1,454	1,291	854	1,199

B. Seats per director

	Females				Males			
Directorships	2003	2006	2008	Average	2003	2006	2008	Average
Mean	1.16	1.22	1.22	1.20	1.25	1.15	1.10	1.17
Median	1	1	1	1	1	1	1	1
Maximum	4	5	8	5.70	5	8	5	6
2008 less 2003				0.06				-0.15
t-value				15.50				-20.50
(p-value)				(0.00)				(0.00)
N	165	485	592	414	1,812	1,479	938	1,410

C. Directors with multiple seats

	Females				Males			
Directorships	2003	2006	2008	Average	2003	2006	2008	Average
Number	18	23	68	36	320	127	66	171
Fraction	0.13	0.06	0.14	0.11	0.22	0.10	0.08	0.14
2008 less 2003		0.01				-0.14		
z-value		0.41				-8.75		
(p-value)		(0.68)				(0.00)		
N	142	397	485	341	1,454	1,291	854	1,199

This table shows the tendency of females and males to hold more than one directorship in 2003, 2006, and 2008. Panel A shows the total number of directors with 1 to 8 seats. Panel B shows the number of seats per director, while panel C shows the number and the fraction of directors who hold more than one seat. The sample is all firms exposed to the Norwegian gender balance law during the period 2003–2008.

Table 6: Estimates of the base-case model

Determinant	Prediction	Coefficient	(p-value)
Female directors	(+)	0.308 ***	(0.003)
Listed	(+)	0.137 ***	(0.003)
Female directors * Listed	(+/-)	-0.185 *	(0.077)
Inside ownership	(-)	-0.002 *	(0.056)
Outside ownership	(+/-)	-0.076	(0.357)
Past performance	(-)	-0.002 ***	(0.007)
Leverage	(-)	-0.137 **	(0.015)
Risk	(-)	0.001	(0.196)
Firm age	(+)	0.028 ***	(0.000)
Firm size	(+)	0.026 **	(0.020)
Firm fixed effects		Yes	
Year fixed effects		Yes	
p-value (F)		0.000	
R^2		0.300	
N		429	

This table shows the base-case estimates of model (1) in the main text, which specifies board independence as a function of the determinants in column 1. The predicted signs of the coefficients are shown in column 2, column 3 reports the coefficient estimates, and the corresponding p-values (in parentheses) are in column 4. Female directors is the proportion of stockholder-elected board members who are women. Listed is a dummy variable which is 1 if the firm is public and 0 otherwise. Inside ownership is the ultimate fraction of equity owned by the firm's officers and directors. Outside ownership is the sum of squared ultimate equity fractions in the firm (Herfindahl index). Past performance at time *t* is the average real book return on assets per year during the last three years. Leverage is total debt divided by total assets. Risk at time *t* is the standard deviation of performance during the last three years. Firm age is the number of years since the firm was founded. Firm size is the log of sales in constant 2009 millions of NOK. Past performance, Risk, and Leverage are censored at the 1% and 99% tails. Statistical significance at the 1%, 5%, and 10% levels is labeled ***, **, and *, respectively. The sample is all firms exposed to the Norwegian gender balance law during the period 2003–2008.

Table 7: Board composition and firm performance after the gender balance law

A. Performance post GBL by fraction of female directors pre GBL

Fraction of female directors pre GBL	Performance post GBL	
	Firms exposed to the GBL	Firms not exposed to the GBL
0-10	6.90%	10.70%
10-20	7.90%	10.50%
20-30	8.80%	10.40%
30-40	8.30%	10.50%
30-40 less 0-10	1.40%	-0.20%
p-value	(0.023)	(0.758)

B. Post-GBL performance and residual board independence

	Firms exposed to the GBL		Firms not exposed to the GBL	
Determinant	Coefficient	(p-value)	Coefficient	(p-value)
Residual independence	-7.572	(0.029)	-0.027	(0.798)
Constant	10.374	(0.000)	10.818	(0.000)
N	439		439	

This table relates the firm's performance to its board composition from when the gender balance law (GBL) was passed until it became mandatory. Panel A classifies the firm into one of four alternative categories based on the firm's fraction of female directors when the GBL was passed. We measure performance as the average real return on assets (ROA) from when the GBL was passed until it became mandatory. Panel B regresses the firm's ROA year by year on the residual for the board's predicted board independence in equation (1) of the main text. We ignore past performance in (1) when estimating this residual. The sample of exposed firms consists of firms subject to the GBL when it was announced and that remain exposed until the end of the sample period. The sample of unexposed firms contains only firms that are not subject to the GBL. The average size of unexposed firms corresponds to that of the exposed firms, and no firm size is below the smallest or above the largest firm size for the exposed firms. Board independence for unexposed firms in panel B is measured as whether or not the CEO is on the firm's board. Pre GBL is 2003, while post GBL is 2004–2008. The sample period is 2003–2008.

Table 8: Alternative econometric techniques

	Technique		
Determinant	I	II	III
Female directors	0.308 ***	0.410 ***	0.410 ***
Listed	0.137 ***	0.094 **	0.098 **
Female directors * Listed	-0.185 *	-0.115	-0.119
Inside ownership	-0.002 *	-0.002 *	-0.002 *
Outside ownership	-0.076	-0.125 *	-0.12 *
Past performance	-0.002 ***	-0.001 **	-0.001 **
Leverage	-0.137 **	0.066	-0.068
Risk	-0.001	0.001	0.001
Firm age	0.028 ***	0.000	0.000
Firm size	0.026 **	0.018 **	0.017 **
Constant		0.403 ***	0.433 ***
Random firm effects	No	Yes	No
Fixed firm effects	Yes	No	No
Fixed time effects	Yes	Yes	No
p-value (Wald chi^2)		0.000	0.000
p-value (F)	0.000		
R^2	0.300	0.220	0.170
N	429	429	429

This table shows the results of using different econometric techniques to estimate model (1) of the main text. The base-case estimates from Table 6 are reported under technique I, while II uses ML to estimate a random-effects specification. Technique III uses OLS to estimate a specification with sample averages per variable per firm. We estimate the determinants of board independence, which we measure as the the fraction of outside directors. Female directors is the proportion of stockholder-elected board members who are women. Listed is a dummy variable which is 1 if the firm is public and 0 otherwise. Inside ownership is the ultimate fraction of equity owned by the firm's officers and directors. Outside ownership is the sum of squared ultimate equity fractions in the firm (Herfindahl index). Past performance at time *t* is the average real book return on assets per year during the last three years. Leverage is total debt divided by total assets. Risk at time *t* is the standard deviation of performance during the last three years. Firm age is the number of years since the firm was founded. Firm size is the log of sales in constant 2009 millions of NOK. Past performance, Risk, and Leverage are censored at the 1% and 99% tails. Statistical significance at the 1%, 5%, and 10% levels is labeled ***, **, and *, respectively. The sample is all firms exposed to the Norwegian gender balance law during the period 2003–2008.

Table 9: Alternative proxies for board independence

		Definition of board independence		
Determinant	Prediction	A: Fraction outside less fraction inside directors	B: Fraction outside and grey directors	C: The CEO is not a director
Female directors	(+)	0.571 ***	0.351 ***	0.576 ***
Listed	(+)	0.154 **	0.125 **	0.192 ***
Female directors * Listed	(-)	-0.176	-0.092	-0.294
Inside ownership	(-)	-0.001	-0.000	-0.001
Outside ownership	(+/-)	0.042	0.043	0.002
Past performance	(-)	-0.004 **	-0.004 **	-0.002 ***
Leverage	(-)	-0.096 **	-0.102 **	-0.106 **
Risk	(-)	-0.088	-0.092	-0.097
Firm age	(+)	0.011 *	0.016 **	0.017 **
Firm size	(+)	0.032 **	0.027 **	0.026 **
Constant				0.505 ***
Random firm effects		No	No	Yes
Fixed firm effects		Yes	Yes	No
Fixed time effects		Yes	Yes	Yes
p-value (Wald chi^2)/(F)		(0.000)	(0.000)	(0.000)
R^2		0.280	0.240	0.130
N		429	429	332

This table shows the estimates using alternative measures of board independence. Model A uses the fraction of outside directors minus the fraction of inside directors, while model B uses the fraction of outside and grey directors. Model C uses a dummy variable which equals 0 if the CEO is a board member and 1 otherwise. The predicted signs of the coefficients are shown in column 2. Female directors is the proportion of stockholder-elected board members who are women. Listed is a dummy variable which is 1 if the firm is public and 0 otherwise. Inside ownership is the ultimate fraction of equity owned by the firm's officers and directors. Outside ownership is the sum of squared ultimate equity fractions in the firm (Herfindahl index). Past performance at time *t* is the average real book return on assets per year during the last three years. Leverage is total debt divided by total assets. Risk at time *t* is the standard deviation of performance during the last three years. Firm age is the number of years since the firm was founded. Firm size is the log of sales in constant 2009 millions of NOK. Past performance, Risk, and Leverage are censored at the 1% and 99% tails. Statistical significance at the 1%, 5%, and 10% levels is labeled ***, **, and *, respectively. The sample is all firms exposed to the Norwegian gender balance law during the period 2003–2008.

Table 10: Alternative non-regulatory determinants of board independence

Determinant	Prediction	Coefficient	(p-value)
Female directors	(+)	0.038 **	(0.033)
Listed	(+)	0.055	(0.483)
Female directors * Listed	(+/-)	0.157	(0.487)
CEO ownership	(-)	-0.009 ***	(0.009)
CEO ownership squared	(+)	0.000 **	(0.018)
CEO tenure	(-)	-0.056 **	(0.011)
CEO tenure squared	(+)	2.030 **	(0.042)
Firm age	(+)	0.000	(0.999)
Firm age squared	(-)	0.000	(0.758)
Board size	(+)	0.154 **	(0.016)
Fixed firm effects		Yes	
Fixed time effects		Yes	
p-value (Wald chi^2)		(0.000)	
R^2		0.190	
N		407	

This table shows the estimates using alternative proxies for non-regulatory determinants of board independence compared to those used for the base case in model (1) of the main text. Female directors is the proportion of stockholder-elected board members who are women. Listed is a dummy variable which is 1 if the firm is public and 0 otherwise. CEO ownership is the ultimate fraction of equity held by the firm's CEO. CEO tenure is the number of years since the CEO was hired. Firm age is the number of years since the firm was founded. Firm size is the log of sales in constant 2009 millions of NOK. The predicted signs of the coefficients are shown in column 2, the coefficient estimates are in column 3, and column 4 reports the corresponding p-values (in parentheses). Statistical significance at the 1%, 5%, and 10% levels is labeled ***, **, and *, respectively. The sample is all firms exposed to the Norwegian gender balance law during the period 2003–2008.