Gender discrimination before mandated quotas? Evidence from Norway: 1989 to 2002

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Abstract

Is the low percentage of women on boards due to discrimination? Discrimination has a time dimension; it is repeated period after period and is thus highly *persistent*. This persistence is tested with data from Norway before quota regulations were instituted in 2003. The data consist of an unbalanced panel sample of all non-financial listed companies from 1989 to 2002. Persistence implies a serial correlation close to one. The main finding is low persistence, implying no discrimination in the sample period. The lack of significant estimates for managerial power supports the persistence result. The main result is also robust to varying the definition of female representation.

Keywords Corporate governance, board composition, gender, discrimination, managerial power, panel data, dynamic estimation.

Introduction

In 2003 the Norwegian Parliament mandated a minimum 40% representation of each gender on the boards of directors of public limited liability companies (PLCs). The law was implemented from 2006 to 2008. Ansgar Gabrielsen, the minister who proposed the law, announced the possibility of a quota law in a surprise newspaper interview in February 2002. He said he knew how boards are elected, implying male discrimination against women. In this article, we examine whether discrimination against women at the time was a valid rationale for state intervention in owners' appointment of directors. We do so by studying the time patterns of director appointments. The Norwegian experience is important because it has inspired similar developments in other countries. Teigen (2012); Adams and Kirchmaier (2013), and Terjesen, Aguilara, and Lorenz (2015) report that other countries have followed Norway's example and enacted similar laws or plan to do so. Teigen (2012) explains the quota law as an outgrowth of the *Norwegian state feminist tradition*, that is, the law was due to political pressure channelled through political parties. Terjesen et al. (2015) likewise stress political institutions when explaining the uptake of legislation to end gender inequality in the boardroom. The Norwegian experience provides a clean testing ground for detecting possible discriminatory practices. The first country to enact such policy is informative because it has no precedent on which to build.

The data span the period 1989 to 2002, that is, immediately preceding the 2003 legislation, and consist of company-level data on all non-financial listed companies in Norway. This provides a panel data set with a large number of companies and few time periods (large N, small T). I use time dimension properties of the panel data to study if discrimination can explain the low number of female directors on Norwegian boards before the new law in 2003. Discrimination has a time dimension. Altonji and Blank (1999, p. 3168) state that discrimination takes place in the labour market when 'persons who provide labour market services and who are equally productive in a physical or material sense are treated unequally in a way that is related to observable characteristics such as race, gender, or ethnicity'. When people are unfairly treated unequally, they experience this repeatedly, year after year. Discrimination is persistent. The persistence of discrimination should therefore be apparent

in the autocorrelation of female directors. In this paper, I use the *system generalised method of moments (GMM)* methodology (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998) to systematically determine the level of persistence. This is an instrumental variables methodology employing variables in levels and in first differences. System GMM is suitable for large N (many companies), small T (few periods) panel data series with a dependent variable likely to change slowly.

Farrell and Hersch (2005) find persistence in the number of female directors. Typically, a new female director replaces a former female director. The fraction of female directors is upheld and is thus persistent. In this paper, I model persistence explicitly, a novel approach in the literature. For instance, Dobbin and Jung (2011) relate the fraction of female directors to background variables but do not consider temporal, dynamic aspects. The review of Terjesen et al. (2009) shows that research on women on the board has mostly been concerned with outcomes of governance and company performance and the roles women play in the boardroom. Therefore, studies on determinants of gender diversity are lacking. This paper contributes to the literature on the role of discrimination and, more generally, to the empirical research on board composition (Baker and Gompers 2003, Boone, Field, Karpoff, and Raheja 2007, Coles, Daniel, and Naveen 2008, Linck, Netter, and Yang 2008).

There is no reason to assume that owners discriminate a priori against female directors. On the contrary, they should welcome a larger pool of candidates. The heavily gender segregated labour market in Norway at the time, with women predominantly finding employment in the government sector and working part-time (Strøm, 2009), restricted the pool of candidates for board positions. Furthermore, owners may favour new female directors because they are likely to be more independent than their male peers and thus more likely to actively monitor the chief executive officer (CEO) (Adams and Ferreira, 2009). On the other hand, a power elite of insiders – specifically the CEO, the chair, and directors – presumably has vested interests in not hiring female directors. If managers are strong relative to owners (Berle and Means, 1932), they should be able to exclude women from directorships. Thus, based on the *managerial power hypothesis* (Bebchuk et al., 2002), I can either corroborate, refute, or moderate the results from persistence.

The fraction of female directors was low before the legislation of 2003. An implication of the rarity of women on boards in this period is that endogeneity is not a serious issue, a feature that often plagues studies in corporate governance (Hermalin and Weisbach, 2003). Specifically, the low percentage signifies that reverse causation cannot be a problem. There were simply too few women and their experience too new to induce high gender diversity on a typical board.

The government's proposal for the quota law states that 'increased board diversity, not only related to gender, but also age and background, can contribute to better strategic choices, more innovation, faster restructures, and through this to increased profitability' (Ot. prop. no. 97, 2003, p. 10, my translation). However, research on the effects of mandatory gender quotas in Norway has uncovered costs of regulation that challenge the realism of assumed benefits. Bøhren and Staubo (2014) document that a sizable fraction of PLCs switched incorporation to the unexposed limited liability (LTD) organisational form during the sample period. In fact, while the number of PLCs reached a maximum of 631 in 2001, in 2010 it was 339, 46% less, at a time when the number of PLCs had increased in two neighbouring countries, Denmark and Sweden. Due to this transition, some companies may have acquired a sub-optimal organisational form and those remaining incurred costs of compliance such as searching for and screening suitable candidates for the board. In a follow-up paper, Bøhren and Staubo (2015) show that board independence in Norwegian PLC companies increases at the expense of the board's advisory function (Adams and Ferreira, 2007) and, implicitly, deviates from the owners' perceived optimal board composition. Awareness of the costs of the regulation makes an analysis of discrimination before the legislation important. It is fair to ask whether the gains in gender equality in a dwindling number of companies are worth the costs.

Seierstad and Opsahl (2011) find that female directors have greater network *betweenness centrality* (Wasserman and Faust, 1994) compared to men but are seldom the board chair. Furthermore, Ahern and Dittmar (2012) find a negative reaction in the stock market to the 2002 Gabrielsen interview, especially among companies with few female directors. Likewise, Matsa and Miller (2013) find a lower return on assets in a comparison of company performance before and after 2006. On the other hand, Nygaard (2011) and Dale-Olsen et al.

(2013) find a positive or a neutral effect upon profitability. One reason for the conflicting results is that there is no clear break in the timeline between the period before regulation and the period after. Gabrielsen's interview gave a first warning, the legislation was drawn in 2003, with a clause that it would be implemented if companies did not comply voluntarily by the end of 2005, and then it was implemented from 2006 to 2008. The research is further complicated by the drop in the number of PLC companies from their peak in 2001. The ensuing sample survivorship bias is not trivial. These sample problems are not present in this paper, however, since I choose to investigate the extent of discrimination before the quota law.

The paper proceeds as follows. The next section presents the theoretical foundation and introduces the main variables. The subsequent section describes the data, followed by a section on the estimating methodology. The next sections present the regression findings, the results of robustness checks, and, finally, the conclusions.

Theory and hypotheses

Discrimination could be the reason for the low female participation on company boards in Norway before the quota regulation. If this is the case, we expect to observe a persistent pattern of not electing women to board positions. This persistence is *state dependent* in the sense that discrimination in one period necessarily follows discrimination in previous periods. Such temporal dependence will be strong and close to 1.0 if discrimination takes place. In the extreme, no woman is elected to a board period after period, resulting in high persistence. On the other hand, if the fraction of women on the board changes from one period to the next, persistence is low. Thus, the degree of serial dependence in gender representation will reveal the degree of discrimination against female directors. In other areas of economics, persistence is a central explanation; see, for instance, Cahuc and Zylberberg (2004, ch. 8) on the persistence of unemployment.

Persistence shows up in the lagged term of our gender diversity measure, the ratio of female directors to all directors. The estimating relation for persistence with time-varying company

characteristics and year indicators Y_t is then

$$GD_{i,t} = \alpha + \beta GD_{i,t-1} + \gamma_1 \text{Firm size}_{i,t} + \gamma_2 \text{Firm risk}_{i,t} + \sum_{t=1990}^{t=2002} \theta_t Y_t + c_i + \varepsilon_{i,t} \quad (1)$$

for $t = 1989 \ldots 2002$, where $GD_{i,t}$ is gender diversity in company i in year t; c_i represents time-invariant company characteristics, such as its industry affiliation; and $\varepsilon_{i,t}$ is pure variation, that is, independently and identically distributed idiosyncratic errors. If the persistence parameter β is 1.0, the level of female representation remains the same; if it is higher than 1.0, more women will be on the board in the next period; and if the persistence parameter is less than 1.0, fewer women will be on the board in the next period. The decay in persistence is larger the further removed from 1.0 the persistence parameter is. Thus, if women are discriminated against, I expect a persistence of 1.0. A value well below 1.0 points towards no discrimination.

Equation (1) includes the *control variables* company size and company risk. The company's operating conditions could better explain why gender diversity is low, as Baker and Gompers (2003); Boone et al. (2007); Linck et al. (2008), and Coles et al. (2008) find for other governance mechanisms. Previous studies find that company size and risk can explain a company's gender diversity. Adams and Ferreira (2009) find that when a board is gender diverse, the company is larger, spans more industry segments, and has a lower Tobin's Q but a higher return on assets, greater volatility, and a larger board than companies with no female directors. They also note that industry structure plays a part, so that, for instance, infrastructure industries have few female directors. Hillman et al. (2007) suggest that gender diversity is greater in larger companies, since these are more likely to be exposed to legitimacy pressure for gender diversity. The authors find that organisational size, industry type, company diversification strategy, and network effects (linkages to other boards with female directors) significantly impact the likelihood of female representation on boards of directors. This is a plausible explanation for greater gender diversity in Norway, since pressures were brought to bear on the largest companies in the 1990s (see the section on stylised facts). From this perspective, the larger the company, the greater its gender diversity. However, another theory could be equally likely. Large companies generally attract the best qualified

in the competition for leadership talent. When few women have long and varied leadership experience, the expectation is that large companies tend to elect few female directors. Thus, the direction of the effect of company size is undecided.

Last, I include year indicators in the regressions to control for the possibility that changes in gender diversity tend to cluster in particular years .

Persistence

The idea that discrimination is persistent is implied in labour economic theories of discrimination. The *taste-based* theory (Becker, 1971) and the *statistical* theory of discrimination (Phelps, 1972; Arrow, 1973) are the founding contributions in this area of economics.

According to taste-based labour discrimination, the employer does not like having workers of a certain race or gender. Applying this to the selection of directors means that if owners do not like women on the board, none will be elected. This induces persistence in the female representation on the boards of companies.

Statistical discrimination means that an individual is judged not on his or her own merits but, instead, on membership to a group. This is discrimination by stereotype. Assume that the stereotype is gender; that the owners perceive men to have, on average, greater ability as board members than women; and that the dispersion of abilities for each gender is very large. If the owners are unable to judge the true ability of individuals, they will choose a man, since owners perceive men to have better qualifications, on average, than women. Lundberg and Startz (1998) develop a dynamic self-fulfilling prophesy (Merton, 1948) version of the theory: Women excluded from board membership may internalise the view that they are inferior, believing that no effort will suffice to qualify for a board position. Consequently, women will, on average, invest less in education and work experience to qualify for such positions. The upshot is that the owners' prejudices are confirmed, so that they continue to think that women are simply insufficiently qualified. The owners will continue to elect male members period after period. The dynamic statistical theory of discrimination thus predicts that discrimination will be persistent.

Both the taste-based and statistical theories of discrimination underline the role played by the employer. Scholars have been increasingly conducting experiments based on psychological insights to investigate whether differences in *psychological attitudes* between men and women (the typical subjects of study) explain observed patterns in female and male occupational choices. Bertrand (2011) provides an overview of the literature on gender differences. We rely upon this overview for the sake of economy. The researchers use experimental methods to search for gender differences, on average. It turns out that women are more risk averse than men; they perform worse in competitions than men, especially when competing against men; they are worse negotiators; and they value equity and inclusion more than men do. However, the differences within each gender are great. A possible consequence of these differences is that the average woman is likely to self-select into positions that do not make her a candidate for leadership positions in the business world. If so, the lack of leadership candidates may show up as a persistent pattern of male dominance in board positions. However, Adams and Funk (2012) find that female directors are slightly less risk averse than male peers in a sample of Swedish directors. They explain this contrasting finding by the possibility that female directors constitute a select group of women.

Thus, the taste-based, statistical, and psychological theories of discrimination predict that discrimination is persistent. This implies that the autocorrelation of female representation is close to 1.0. Thus, an autocorrelation test of female representation of the kind in (1) is a simple test of discrimination or women's self-selection. It is surprising that this measure has not been used before.

Powerful insiders

The taste-based and statistical theories of discrimination also imply that particular persons are responsible for certain types of discrimination. In this paper, I investigate whether powerful insiders played such a role towards women in the period preceding the quota legislation. In this paper, I define these powerful insiders as large owners, the CEO, the chair, and board members. A vast literature, beginning with Berle and Means (1932) and extending to Bebchuk et al. (2002) and beyond, documents the importance of incumbents in the selection

of candidates to the board and the final election of directors. Bebchuk et al. (2002) call this view the managerial power hypothesis. Table 1 defines the various variables in this study. Insiders' tenure, their other directorships, and ownership of a company's shares constitute the attributes of the power of the CEO, the chair, and the board members, as explained below.

Table 1

Why would powerful insiders be interested in barring women from board positions? The Hermalin–Weisbach (1998) model of an endogenously determined board is an appropriate point of departure for an explanation. The model is based on signalling theory (Spence, 1973), where the signal is the company performance a CEO achieves. The model assumes that the CEO bargains for board composition as well as pay and that the CEO values freedom of action and, therefore, prefers little interference from independent directors. An independent director is one who has no family or business relations with the CEO (Shivdasani, 1993). A CEO is better able to bargain for less board independence when company performance has been good. If good performance continues, the CEO will be better able to fill director positions with loyal members. The board becomes less and less independent with a CEO's tenure as the election of a new independent director becomes increasingly unlikely. Consequently, a CEO becomes more powerful with tenure. Hermalin and Weisbach (1998) also note that changes in corporate governance should exhibit long-term persistence. Thus, once a board is no longer independent, it will continue being dependent for an extended period. The persistence outcome in their theory supports the autocorrelation test in (1).

If a CEO stereotypically considers a woman to be independent, the CEO will not nominate a female candidate for a directorship. The independence of female directors is noted by Adams and Ferreira (2009), who report that gender-diverse boards appear to be tougher monitors, the members attending and scheduling more meetings and basing director pay more often on performance. This is exactly the kind of director such a CEO would avoid. In addition, the CEO's loyal directors would resist a female director on these grounds. The CEO and his team of loyal directors would be, instead, more likely to propose new directors from their

work experience and educational networks. Since female directors are few and far between, few women are members in such leader networks. Therefore, male CEOs tend to recruit new male directors in an example of so-called property of homophily. A female director is less likely to be elected because she is independent, the low fraction of female directors tends to persist, and this share is negatively related to CEO and director tenure. Evidently, this is statistical discrimination. Women are stereotypical of independent directors who monitor CEOs more diligently.

Other attributes of CEO power include the directorship on the company's board and outside directorships. The CEO is often a favourite candidate for board positions in other companies. For instance, Fich (2005) finds that CEOs of high-performing companies are more likely to gain new board appointments. Thus, I expect board gender diversity to be lower when the CEO is also a member of the board as well as a member of the board of other companies. Norwegian company law does not allow a CEO to be the company's chair.

The chair's and the board's tenure and the number of their outside directorships are proxies for chair and board member power, respectively. Fama and Jensen (1983) see multiple board memberships as a sign of a director's quality. Bøhren and Strøm (2010) find that the number of directorships is strongly linked to company performance. Such sought after directors can achieve powerful positions, wielding power that can be keep independent rivals at bay. Thus, the hypotheses are that the longer the chair's and the board's tenure and the more directorships they hold, the less gender diverse the board. Board power increases with classified or staggered boards (Falaye, 2007), that is, the practice of exempting part of the board, often one-third, from election in a given year. Classified boards were not legal in Norway in the sample period.

Finally, I differentiate between two ownership measures. The first is the insider ownership of company shares. Naturally, insiders who also own shares in a company are better able to entrench their position. Morck et al. (1988) find that director ownership increases company value at lower levels, while Hermalin and Weisbach (1991) find that the CEO's ownership stake has the same effect. I expect an insider's ownership stake will boost the insider's power in the director selection process. Thus, the greater the incumbents' ownership, the lower the

board's gender diversity. The second measure is ownership concentration. Building upon findings by Adams and Ferreira (2009), we expect owners to prefer a larger pool of independent candidates for director positions. Hence, the higher the ownership concentration, the larger the fraction of female directors.

Sample and stylised facts

The sample comprises all non-financial companies listed on the Oslo Stock Exchange at year-end at least twice from 1989 to 2002.[1] This produces an unbalanced panel data set (Wooldridge, 2010). To reduce censoring bias in the tenure measures, director data collection starts with 1986. The ownership structure data cover every equity holding of every investor in every sample company. The public securities register provided the ownership data, accounting and share price data are from the Oslo Stock Exchange's data provider, and I collected board data manually from *Kierulf's Håndbok* and a public electronic register (*Brønnøysundregisteret*).

Figure 1 shows that the call for greater female representation on Norwegian boards was justifiable in the 1990s. Although the rise was relatively rapid in the sample period, in 2002 female directors constituted only about 7.5% of shareholder-elected directors of non-financial listed companies. Evidently, female directors were new and few in the period. A *glass ceiling* (Kanter, 1977) barring women's advancement to companies' highest positions seems to be in place.

Figure 1

Since 1 January 2006, large Norwegian companies, including all listed companies, have been obliged by law to have a minimum of 40% of each gender represented on their board.[2] Since forward-looking companies were likely to search for qualified women for their boards

[1] See: `www.ose.no` and `www.fibv.com`.

[2] The *Norwegian Public Limited Liability Companies Act*, Article 6-11a. We have seen how the law came into being in stages. The final stage was reached on 1 January 2008, when the grace period for all PLCs had expired. The quota law applies to PLCs and not the more numerous LTDs , which have lower transparency requirements. All listed companies need to be PLCs. The threat of company dissolution upon non-compliance with the law ensured that all PLCs had the required percentage of female directors in place by 2008.

following the 2003 decision, I sample the data in the period before the first enactment in 2003.

Stylised facts

Table 2 sets out stylised facts about the variables used in the analysis. It shows that gender diversity among shareholder-elected directors (gender diversity 1) is 3.3% of all observations in the sample, while for the full board it is 4.8%. The difference is not surprising, since employees are more likely to vote for women as their representatives on the company's board than shareholders are. Out of the 287 companies in the sample, 98, that is, 34.1% of all companies, had a female director at some point in the sample period. In the company–year observations, zero is obviously the most common number, with 85.8% of all observations; 11.7% of observations show one female director, 1.9% two, 0.4% three, and 0.18% (or four observations) four female directors. Thus, there is no doubt that the level of female directorship is low in the pre-quota period, when female directors were few and far between.

Table 2

The years before the quota law enactment should have given women ample opportunities to become directors. First, this is evident from the low aggregate numbers for the CEO's and directors' measures of power. Specifically, the CEO and director tenures are both quite short. On average, the CEO has had 2.23 years in office, the chair has served 1.89 years, and ordinary board members slightly more. The law stipulates that a director is elected for two years at a time and the GM must actively confirm further tenure. Furthermore, director tenure may be terminated at any time at or before the elected term expiration by majority vote at the GM (company law). The GM may be called at any time in addition to the obligatory annual meeting. This implies that insiders have few tactical means to delay female director elections. Second, macroeconomic developments have opened new opportunities for women. The period 1989 to 2002 includes a banking crisis in the beginning of the 1990s, access to the European Economic Area, and low petroleum prices leading to not only company restructuring, but also a high rate of newly listed companies. Thus, the election of new directors to replace old directors and to fill seats in new companies should

improve the likelihood of women being elected. The aggregate numbers in Figure 1 also reflect this. Third, company law curtails a CEO's power. The CEO is also the director in only 25% of companies. Moreover, low tenure implies that CEOs and directors have comparatively weak ties to a social elite. This is also mirrored in the rather low numbers of directorships in other companies that the CEO and directors hold. According to Ferris et al. (2003), the number of directorships per director in the United States was 1.25, on average, in a 1995 sample of 3,190 companies. In my sample, the comparable number is 1.12 for all 12 years, that is, about 12% less than in the United States. Thus, opportunities for women to attain a director position should be high in the sample period.

Some of the variables in the analysis are possibly closely linked and create multicollinearity problems in regressions, which a correlation analysis can reveal. Table 3 reports simple pairwise correlations between the variables.

Table 3

On the whole, the correlations are low. Kennedy (2008) identifies a correlation coefficient of 0.80 or higher to be in the problem area. None of the correlations here reach this level, since the highest is 0.56 between chair and board tenure. The correlations between the tenure variables are rather high and positive. The high and positive correlations can indicate the existence of an *old boys* network of male managers and directors. In a multivariable regression, such high correlations can cause problems, even if individual correlations are satisfactory. These are good reasons for constructing a *tenure power* variable by means of principal components analysis (PCA) (Johnson and Wichern, 1988). The interpretation of the new tenure variable is that the higher the value, the higher the tenure of the CEO, chair, and director group. Similarly, the CEO power variables tenure, director, and directorships can be reduced to a *CEO power* variable by PCA analysis. The CEO variables are not as closely linked as the tenure variables; however, they are also positively related. If the managerial power hypothesis of Bebchuk et al. (2002) is correct, one should expect a high positive correlation between these variables. The CEO power variable is positively linked to each of its constituent parts (not reported here).

Our variable of interest, *gender diversity*, has very low and insignificant correlations with the insider power variables, but quite high and significant correlations with company size and company risk. These latter two variables can, therefore, be good control variables.

Methodology

The panel data in our analyses are of the large N, small T type, since the data comprise 274 companies and a maximum of 14 observation per company, for a total of 1,645 observations. The estimation equation (1) is written as a basic unobserved effects model (Wooldridge, 2010) where c_i is time-invariant company heterogeneity and ε_{it} is idiosyncratic error that changes in time t as well as between company i.

I use the Arellano–Bond/Blundell–Bond *system GMM* estimator (Arellano and Bover, 1995; Blundell and Bond, 1998). The method combines estimation of (1) with the *difference GMM* (Arellano and Bond, 1991) in (2) below. The method proves to be well suited for slowly changing dependent variables and a persistence parameter β close to 1.0 (Blundell and Bond, 1998; Flannery and Watson Hankins, 2013). The difference GMM is called this because variables in (1) are first differenced to remove fixed effects; for instance, $\Delta GD1_{it} = GD1_{i,t} - GD1_{i,t-1}$ replaces $GD1_{it}$ as the dependent variable. The estimating equation then becomes

$$\Delta GD1_{it} = \alpha + \beta \Delta GD1_{i,t-1} + \Delta\varepsilon_{it} \tag{2}$$

First differencing removes fixed effects, but $GD1_{i,t} - GD1_{i,t-1}$ is still correlated with the error term $\Delta\varepsilon_{it} = \varepsilon_{it} - \varepsilon_{i,t-1}$. First differences in independently and identically distributed idiosyncratic errors are serially correlated (Arellano and Bond, 1991).[3] This means that only deeper lags of the dependent variable can be used as instruments; that is, the orthogonal moment conditions $E\left(GD1_{i,t-2}\Delta\varepsilon_{it}\right) = 0$ for $(t = 2, \ldots, T)$ give rise to valid instruments and, therefore, it is necessary to test for autocorrelation in the error term for deeper lags than

[3]If the error term ε_{it} is serially uncorrelated, $\Delta\varepsilon_{it}$ is correlated with $\Delta\varepsilon_{i,t-1}$, because $Cov\left(\Delta\varepsilon_{it}, \Delta\varepsilon_{i,t-1}\right) = Cov\left(\varepsilon_{it} - \varepsilon_{i,t-1}, \varepsilon_{i,t-1} - \varepsilon_{i,t-2}\right) = -Cov\left(\varepsilon_{i,t-1}, \varepsilon_{i,t-1}\right) \neq 0$. But $\Delta\varepsilon_{it}$ is not correlated with $\Delta\varepsilon_{i,t-k}$ for $k \geq 2$.

one. The number of instruments in the difference GMM rises quadratically with the number of periods T in the sample from the $(T-2)(T-1)/2$ moment conditions. I implement the estimation of the system GMM using the two-step GMM estimator corrected for finite sample variance (Windmeijer, 2005).

Roodman (2009) warns of instrument proliferation in the system GMM. The large number of generated instruments may overfit endogenous variables. The problem is particularly severe when $\beta \to 1.0$. This could be the case in the present investigation, since I use few variables in the estimation relation, resulting in a fairly large proportion of instruments to endogenous variables. A cap on the number of periods from which instruments are generated mitigates this problem. I proceed by first imposing no restrictions on the number of instrument periods and then running regressions with only one lag.

The regressions containing managerial power variables also use a composite variable of, for example, *CEO power* extracted from the three underlying variables *CEO tenure*, *CEO director* (of the company's board), and *CEO directorships* (of other companies' boards) by means of PCA.

Robustness tests

Adams and Ferreira (2009) and Carter et al. (2010) show that their financial performance results are sensitive to the definition of female director. I perform two robustness tests using alternative definitions of female director. I first define *gender diversity 2* as the fraction of all female directors on the board, including employee-elected directors. Figure 1 reveals that *gender diversity 2* is greater than *gender diversity 1*. The second measure is the absolute *number of female directors*. This measure is potentially important because changes in board size can induce changes in the fraction of female directors, even if the number of women is fixed. This second measure is also important for discovering *tokenism* (Kanter, 1977), which is when companies put women on the board for *window dressing* purposes; that is, the company pretends to have equal gender policies by electing female directors period after each period. If the company follows such an election policy, it will induce the kind of persistence in the number of women on the board that Farrell and Hersch (2005) discover.

Furthermore, I also test if ownership concentration can induce gender diversity. In the earlier section on powerful insiders, I argue that shareholders want independent directors, even though insiders do not. If shareholders value an independent board, one should expect them to vote for women at the general assembly. Shareholders' voices are more likely to be heard the higher the ownership concentration. This implies that the higher the ownership concentration, the greater the female director fraction is expected to be. The ownership concentration variable is used for all three definitions of gender diversity.

Results

Persistence

First, I present the persistence parameter with few additional control variables. Under discrimination, the hypothesis is that the persistence parameter for gender diversity is close to 1.0. Table 4 shows the results from dynamic system GMM regressions when the lagged gender diversity is introduced as an explanatory variable together with the control variables company size and company risk.

Table 4

In the first column of Table 4, I perform regressions with all available instruments, while in the second column the instrument list has been capped to one period. All the results are significant and autocorrelation tests show that we cannot accept the hypothesis that lag 2 is autocorrelated with the dependent variable in any of the equations. The persistence parameter is in the range of 0.259 to 0.360. The table further shows that the estimates with either the full or the restricted instrument set are close. This means that I can safely proceed with the restricted instrument set to avoid the Roodman (2009) instrument proliferation problem.

Table 4 shows that the persistence coefficient is low. Assume that the persistence parameter is at a middle value of 0.30. This value implies that the persistence effect quickly decays. After four years, the effect is only 0.008, or less than 1%. This means that temporal

dependence is weak and gender diversity changes from period to period. Weak temporal dependence is the opposite of what one would expect if taste-based or statistical discrimination prevailed. Thus, shareholders elect female directors in a normal way, seemingly based on competence. The owners do not systematically discriminate against female directors in the formative period before the quota law enactment in 2003. Thus, the gender inequality in board membership is not due to overt discrimination.

An objection to the above result might be that the temporal dependence is even lower for other governance mechanisms. To investigate this issue, I run tests for six other governance mechanisms with the same control variables as in Table 4.

Table 5

The test statistics in Table 5 are similar to those in Table 4. Table 5 tells us that low temporal dependence is not limited to gender diversity but is a common feature among governance mechanisms. In fact, only the two ownership variables *insider ownership* and *ownership concentration* have coefficients close to 1.0, when full temporal dependence is achieved. Thus, as with gender diversity, owners change board characteristics year by year. This is perhaps not surprising, given the low tenure on Norwegian boards.

Insiders' power

This section addresses the role that the CEO's and directors' power plays in resistance against female directors. I assume that the power measures are related to tenure, directorships, and insider ownership characteristics. Table 3 shows rather high correlations between several of these proxies. Therefore, I run regressions with one variable at a time and then the aggregate *CEO power*. I do the same for the CEO, board, and chair tenure variables, and the aggregate *tenure power* variable. Table 6 gives the results for the CEO and Table 7 shows the results for the board, the chair, and ownership variables.

Table 6

The overall statistics are satisfactory, with a Wald statistic showing that all variables taken together cannot be rejected as unassociated with gender diversity. The $AR(2)$ test rejects

confirmation of autocorrelation in the residuals.

The persistence parameter remains in the range of 0.25 to 0.40. Thus, power variables do not upset earlier findings in Table 4 about low temporal dependence. As for the power variables themselves, only *CEO outside directorship* is significant and negative. The sign is negative for *CEO tenure* and *CEO director*, but the results are not significant. When the two PCA-generated variables *CEO power* and *tenure power* enter regressions, only *CEO power* is significant. This reflects the significance in the *CEO directorships* variable. The overall evidence shows that insider power is only weakly associated with lower gender diversity.

Table 7 reports the remaining insider power variables, including board, chair, and insider ownership. In addition, I also run a regression with ownership concentration.

Table 7

The overall statistics are comparable to the earlier regressions and the persistence parameter is again significant at the 1% level and in the range from 0.25 to 0.40. The striking result is that no insider power variable is significant and only board tenure has the expected sign. Both insider ownership and ownership concentration have a positive sign. Thus, owners want more independent directors but the result is insignificant and, therefore, cannot confirm predictions in the Hermalin–Weisbach (1998) model.

On balance, the evidence in Tables 6 and 7 confirms the result in Table 5 of low gender diversity persistence. The new information from the tables is that only one insider power proxy variable, *CEO directorships* , is negatively related to gender diversity. This means that both the low persistence of gender diversity and the lack of significant results for the insider power variables indicate that insiders did not oppose female directors. To the degree that female directors are more independent than men (Adams and Ferreira, 2009), the evidence does not support Hermalin and Weisbach's (1998) conjecture that owners want an independent board.

Robustness checks

I run two robustness checks. First, I use the number of shareholder-elected female directors on the board as the dependent variable instead of the fraction of female directors. Adams and Ferreira (2009) and Carter et al. (2010) find that female director results are often sensitive to the definition used. Second, I check for another definition of gender diversity, that is, when the regressions also include employee-elected directors. Table 8 presents regressions when the dependent variable is the number of female directors.

Table 8

The overall statistics are satisfactory and in line with this article's previous findings. The results across regressions are remarkably similar. We note that the persistence parameter is about 0.40, somewhat higher than for gender diversity but equally significant. Thus, the previous conclusion about the persistence of gender diversity is upheld here for the alternative measure of the number of female directors. Furthermore, among the insider power variables, only *chair tenure* is significant. This time the sign is positive, that is, the opposite of what regressions for gender diversity state. The number of CEO outside directorships is no longer significant. Compared to the gender diversity and female director variables, the insider ownership variables are quite unstable and do not yield consistent estimates across regressions. Thus, taken together, the evidence from regressions cannot support the discrimination hypothesis for female board representation.

What if the measure of gender diversity included all directors, whether elected by shareholders or by employees? If gender diversity is a desirable quality in itself, the presence of employee-elected female directors could discourage shareholders from electing a female director. Anecdotal evidence shows that shareholders argued that the quota regulations from 2006 should apply to the whole board, not just shareholder-elected directors.

Table 9

The results in Table 9 largely reflect the findings in earlier tables. The lagged gender diversity measure is highly significant, although this time somewhat higher than before, in the range 0.50 to 0.60, as opposed to 0.25 to 0.40 when the gender diversity measure includes only

shareholder-elected directors. This is expected, since employees tended to elect more women than shareholders do during the sample period. The insider power variables are again mostly not significant. This time, board tenure and insider ownership are significant, but with opposite signs. In conclusion, the evidence on gender diversity using the full board in Table 9 confirms this paper's previous findings.

Conclusion and discussion

I investigate if the low gender diversity in Norwegian boards in all listed non-financial companies from 1989 to 2002 is due to resistance against female directors among the CEO, chair, and ordinary directors. The sample period is well before the law in 2006 required the boards of large companies to consist of at least 40% of each gender. I utilise the time property of discrimination, in that if discrimination takes place, it extends for several periods and is persistent. This induces high autocorrelation in the time series for the female director variable. I present two main conclusions. First, the persistence of female directors is low, indicating that companies do not systematically discriminate against female directors, but elect female directors in a normal way based on personal competence. In fact, with a persistence parameter of about 0.30, only 0.8% of the effect remains after four years. Second, when we consider a female director an independent director, the results are as predicted by the theory of Hermalin and Weisbach (1998); that is, owners want more independent directors to increase monitoring, while the CEO and incumbent directors do not. But the statistical significance of these relationships is weak. Thus, the managerial power hypothesis (Bebchuk et al., 2002) cannot explain why women are barred from board positions in the period.

Still, the number of women in Norwegian corporate boardrooms is small during the sample period. To understand why this is so, one needs to seek explanations outside the choices made in the GM. I suggest two research direction. The first underlines women's own choice. From the Lundberg–Startz (1998) model, it can be argued that women internalise beliefs of inferiority for boardroom positions and consequently do not seek education or a career path leading to possible directorship. Such internalisation is manifested in the deeply rooted conceptions of what defines a man's work and a woman's work (Akerlof and Kranton, 2000).

Thus, future investigations on male and female educational and occupational choices in earlier decades can possibly shed light on the low fraction of female directors in the 1990s. In the 1990s, female directors were few and far between in Norway, not because of discrimination but maybe because of a lack of candidates. The second research direction underlines the Norwegian state feminist tradition (Hernes, 1987; Teigen, 2012). The quota law is imposed upon companies from the political establishment. Squires (2007, p. 29) sees political parties' gender quota regulation within their party and within state political bodies as an effort to appeal to the female electorate and so enhancing the parties' electoral fortunes. The explanation is in line with Terjesen et al. (2015) who stress the political institutional explanation for a more equal gender boardroom representation. The further elaboration of these research directions could produce better explanations for the observed gender inequality in the boardroom and the efforts to find a more equal balance.

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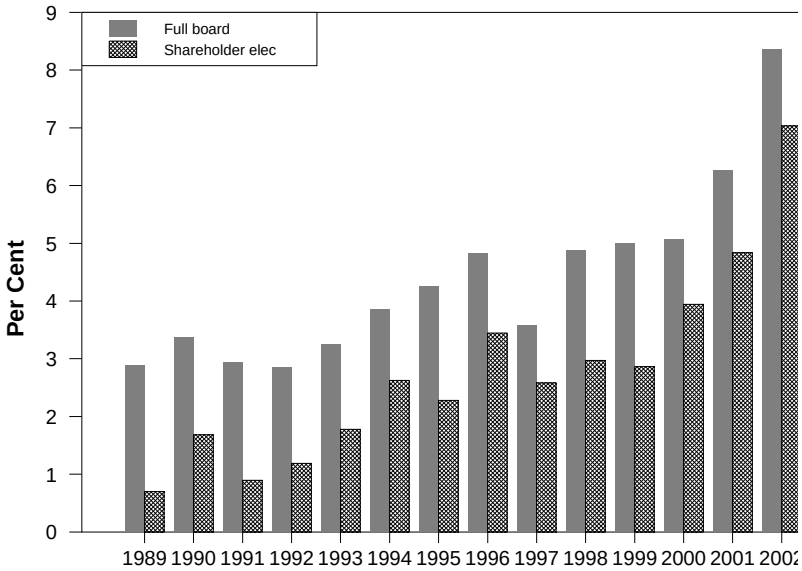

Figure 1: The average percentage of women on the full board and among shareholder-elected directors only in non-financial listed companies, 1989–2002

Table 1 Definition of variables used in the study .

Name	Definition
Gender diversity 1	The number of shareholder-elected female directors divided by shareholder-elected board members
Gender diversity 2	The number of female directors divided by the number of directors
Female directors	The number of shareholder-elected female directors
CEO tenure	The CEO's number of years in the position
CEO director	A binary variable equal to 1 if the CEO is a member of the board and zero otherwise
CEO directorships	The number of directorships the CEO holds in other listed companies
Chair tenure	The chair's number of years in the position
Board tenure	The shareholder-elected director's mean tenure, excluding the chair
Board directorships	The board's average number of directorships in other listed companies
Insiders' ownership	The fraction of the total number of shares held by insiders
Ownership concentration	A Herfindahl index of ownership holdings, $HI = \sum_{j=1}^{N} s_j^2$, where s_j is owner j's share and N is the number of all shareholders
Firm size	The (logarithm) of the company's assets
Firm risk	The company's beta that year

Table 2 Descriptive statistics of the variables . The data consist of total company–year observations.

	Avg.	Std.	Min	Max	Obs
Gender diversity 1	0.033	0.090	0.000	0.667	2209
Gender diversity 2	0.048	0.097	0.000	0.556	2209
Female directors	0.174	0.478	0	4	2209
CEO tenure	2.228	2.482	0.000	16.000	2206
CEO director	0.296	0.456	0.000	1.000	2209
CEO directorships	0.348	0.747	0.000	6.000	2209
Chair tenure	1.890	2.331	0.000	16.000	2206
Board tenure	1.933	1.793	0.000	14.667	2206
Board directorships	1.676	1.342	0.000	7.000	2209
Insiders' holdings	0.063	0.184	0.000	0.964	1861
Ownership concentration	0.167	0.218	0.002	1.000	1795
Firm size (mil. NOK)	4240	14500	0	232000	1683
Firm risk	0.770	0.658	-0.994	8.127	1726

Table 3 Pairwise Pearson correlations of the main variables

		1	2	3	4	5	6	7	8	9	10
1	*Gender div.* 1										
2	*CEO tenure*	-0.02									
3	*CEO director*	-0.04	0.04								
4	*CEO dir.ships*	0.04	0.13	0.14							
5	*Chair tenure*	0.02	0.46	0.01	0.10						
6	*Board tenure*	0.01	0.51	0.01	0.07	0.56					
7	*Board dir.ships*	*-0.05*	0.06	-0.04	0.32	0.13	0.13				
8	*Insiders' holdings*	-0.01	-0.01	0.00	0.03	*0.06*	*0.06*	0.04			
9	*Own.ship concentr.*	0.11	-0.06	*0.06*	-0.01	-0.13	-0.14	-0.15	-0.08		
10	*lnAssets*	0.25	0.16	0.13	0.07	0.07	0.10	0.12	*-0.05*	0.06	
11	*Beta*	-0.08	-0.07	0.10	0.07	-0.01	-0.02	0.22	-0.09	-0.17	0.12

The underlined coefficients indicate that the correlation is significant at the 1.00% level; italicized coefficients denote a significance level of 5.00%.

Table 4 The persistence in the election of female directors System GMM regressions with shareholder-elected female directors as the dependent variable , using either all available instruments or the instruments available when the maximum lag length is set to one.

	All inst.	Instr. lag 1
Gender diversity lagged	0.360**	0.259***
Firm size	-0.008	-0.002
Firm risk	-0.013*	-0.005
Constant	0.175	0.054
Year indicators?	Yes	Yes
Wald $\chi^2(2)$ test	0.000	0.000
AR(2) p-value	0.175	0.191
Instruments	101	38
Observations	1420	1420
Firms	242	242

Table 5 Persistence in board and ownership characteristics.

	Dependent variable					
	CEO director	*CEO dir.ships*	*Board dir.ships*	*Board size 1*	*Insider own.ship*	*Own.ship conc.*
Dependent lagged	0.500***	0.550***	0.544***	0.450***	0.912***	0.872***
Firm size	0.052	0.029	0.091	0.126	-0.009	-0.009
Firm risk	0.045**	-0.027	0.105	0.140*	-0.010*	-0.005
Constant	-1.071	-0.430	-1.330	0.250	0.198	0.177
Year indicators?	Yes	Yes	Yes	Yes	Yes	Yes
Wald $\chi^2(2)$ test	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.263	0.271	0.507	0.703	0.209	0.316
Instruments	39	39	39	39	39	39
Observations	1420	1420	1420	1420	1420	1420
Firms	242	242	242	242	242	242

Table 6 Relationship between insiders' power and gender diversity.

	(1)	(2)	(3)	(4)	(5)	(6)
Gender diversity lagged	0.394***	0.266***	0.277***	0.387***	0.394***	0.387***
CEO tenure	-0.006			-0.001		
CEO director		-0.009		-0.009		
CEO directorships			-0.007**	-0.006**		
CEO power					-0.006***	
Tenure power						-0.002
Firm size	-0.001	-0.002	-0.002	-0.001	-0.001	-0.001
Firm risk	-0.001	-0.006	-0.006	-0.001	-0.001	-0.001
Constant	0.020	0.044	0.052	0.027	0.021	0.020
Year indicators?	Yes	Yes	Yes	Yes	Yes	Yes
Wald $\chi^2(2)$ test	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.170	0.188	0.197	0.176	0.173	0.164
Instruments	39	39	39	41	39	39
Observations	1418	1420	1420	1418	1418	1418
Firms	242	242	242	242	242	242

CEO power and tenure power are generated from PCA. CEO power summarises the three variables CEO tenure, CEO director, and CEO directorships. Tenure power is generated from the three tenure variables CEO tenure, chair tenure, and board tenure.

Table 7 Insiders' power: Board, chair, and ownership variables.

	(1)	(2)	(3)	(4)	(5)
Gender diversity lagged	0.390***	0.259***	0.399***	0.258***	0.234***
Board tenure	-0.003				
Board directorships		0.000			
Chair tenure			0.000		
Insider ownership				0.022	
Ownership concentration					0.037
lnAssets	-0.002	-0.002	-0.001	-0.002	-0.003
Beta	0.000	-0.005	-0.001	-0.006	-0.005
Constant	0.035	0.053	0.026	0.055	0.057
Year indicators?	Yes	Yes	Yes	Yes	Yes
Wald $\chi^2(2)$ test	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.168	0.191	0.160	0.192	0.173
Instruments	39	39	39	39	39
Observations	1418	1420	1418	1420	1418
Firms	242	242	242	242	242

Table 8 Robustness check using the number of female directors as the dependent variable.

	(1)	(2)	(3)	(4)	(5)	(6)
Female directors lagged	0.427***	0.411***	0.435***	0.404***	0.414***	0.408***
CEO tenure	-0.009					
CEO directorships		-0.025				
Chair tenure			0.013**			
Board tenure				-0.005		
Insider ownership					0.123	
Ownership concentration						0.132
lnAssets	0.002	0.003	-0.002	-0.009	0.003	-0.001
Beta	-0.005	-0.009	0.002	0.001	-0.007	-0.004
Constant	-0.030	-0.035	0.027	0.202	-0.048	0.018
Year indicators?	Yes	Yes	Yes	Yes	Yes	Yes
Wald $\chi^2(2)$ test	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.190	0.192	0.186	0.193	0.192	0.186
Instruments	39	39	39	41	39	39
Observations	1418	1420	1418	1418	1420	1418
Firms	242	242	242	242	242	242

Table 9 Robustness check using all female directors in the gender diversity measure.

	(1)	(2)	(3)	(4)	(5)	(6)
Gender diversity lagged	0.515***	0.604***	0.608***	0.616***	0.510***	0.504***
CEO tenure		-0.002				
CEO directorships		0.000				
Chair tenure			0.000			
Board tenure				-0.003*		
Insider ownership					0.043*	
Ownership concentration						0.004
lnAssets	-0.002	-0.002	-0.003	-0.003	-0.002	-0.002
Beta	0.001	0.000	0.001	0.000	0.001	0.001
Constant	0.046	0.059	0.062	0.069	0.036	0.046
Year indicators?	Yes	Yes	Yes	Yes	Yes	Yes
Wald $\chi^2(2)$ test	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) p-value	0.668	0.523	0.547	0.563	0.738	0.700
Instruments	39	41	40	40	40	40
Observations	1420	1418	1418	1418	1420	1418
Firms	242	242	242	242	242	242

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