Bertrand, Marianne; Black, Sandra E.; Jensen, Sissel; Lleras-Muney, Adriana

Working Paper

Breaking the Glass Ceiling? The Effect of Board Quotas on Female Labor Market Outcomes in Norway

IZA Discussion Papers, No. 8266

Provided in Cooperation with:
IZA – Institute of Labor Economics

DISCUSSION PAPER SERIES

IZA

IZA DP No. 8266

Breaking the Glass Ceiling? The Effect of Board Quotas on Female Labor Market Outcomes in Norway

Marianne Bertrand
Sandra E. Black
Sissel Jensen
Adriana Lleras-Muney

June 2014

Forschungsinstitut
zur Zukunft der Arbeit
Institute for the Study
of Labor

Breaking the Glass Ceiling? The Effect of Board Quotas on Female Labor Market Outcomes in Norway

Marianne Bertrand
Chicago Booth School of Business, CEPR, IZA and NBER

Sandra E. Black
University of Texas at Austin, IZA and NBER

Sissel Jensen
Norwegian School of Economics

Adriana Lleras-Muney
UCLA and NBER

Discussion Paper No. 8266
June 2014

IZA

P.O. Box 7240
53072 Bonn
Germany

Phone: +49-228-3894-0
Fax: +49-228-3894-180
E-mail: iza@iza.org

IZA Discussion Paper No. 8266
June 2014

ABSTRACT

Breaking the Glass Ceiling? The Effect of Board Quotas on Female Labor Market Outcomes in Norway

In late 2003, Norway passed a law mandating 40 percent representation of each gender on the board of publicly limited liability companies. The primary objective of this reform was to increase the representation of women in top positions in the corporate sector and decrease gender disparity in earnings within that sector. We document that the newly (post-reform) appointed female board members were observably more qualified than their female predecessors, and that the gender gap in earnings within boards fell substantially. While the reform may have improved the representation of female employees at the very top of the earnings distribution (top 5 highest earners) within firms that were mandated to increase female participation on their board, there is no evidence that these gains at the very top trickled-down. Moreover the reform had no obvious impact on highly qualified women whose qualifications mirror those of board members but who were not appointed to boards. We observe no statistically significant change in the gender wage gaps or in female representation in top positions, although standard errors are large enough that we cannot rule economically meaningful gains. Finally, there is little evidence that the reform affected the decisions of women more generally; it was not accompanied by any change in female enrollment in business education programs, or a convergence in earnings trajectories between recent male and female graduates of such programs. While young women preparing for a career in business report being aware of the reform and expect their earnings and promotion chances to benefit from it, the reform did not affect their fertility and marital plans. Overall, in the short run the reform had very little discernable impact on women in business beyond its direct effect on the newly appointed female board members.

JEL Classification: J1, J3

Keywords: gender discrimination, board of directors

Corresponding author:

Sandra E. Black
Department of Economics
1 University Station #C3100
University of Texas at Austin
Austin, TX 78712
USA
E-mail: sblack@austin.utexas.edu

Introduction

Despite significant labor market progress over the last decades, women remain heavily underrepresented in high-earnings, high-status occupations. This is particularly true in the financial and corporate sectors of the economy. In a recent census of Fortune 500 companies in the U.S., Catalyst found that in 2013 women held only 16.9% of corporate board seats and 14.6% of Executive Officer positions in those companies, about the same as a half a decade earlier.

In Europe, women represent only 11.9% of membership on boards of directors, despite being 45% of the labor force, and these numbers are even smaller in the other parts of the world (Pande and Ford, 2011).

This phenomenon—that at the top of the labor market women are under-represented and wages gaps are larger than average—is often referred to as the glass ceiling. It is pervasive, observed even in countries that are otherwise thought of as having achieved the most progress in terms of gender equality. Norway is one of these countries. While the gender gap in wages in Norway was less than 14% on average among full time workers in 2002, it was 20% among college graduates.[1] In 2000, only 5% of board members were women, and their annual earnings were 20 percent lower than those of male board members.

To address this disparity, in December 2003 Norway passed a law requiring 40% representation of each gender on the board of directors of publicly limited companies. Because most firms did not comply, in January 2006 the law became compulsory and firms that did not comply by January 2008 would be dissolved. While a number of firms switched corporate status to avoid complying with the law, those that remained did comply and the median percentage of female board members among publicly limited companies reached 40% by 2007, from a median of 0% in 2003 (see Figure 1 and Appendix Table A1).

Following Norway's lead, Spain, Iceland, Italy, Finland, France, and the Netherlands have all passed similar reforms. The idea of mandating gender quotas on corporate boards has been gaining further political traction in Europe over the last years. In 2014 the new German coalition government passed legislation requiring that corporate boards be comprised of at least 30% women by 2016 (or else the seat would be left vacant). On November 20 2013, the European parliament voted in favor of a proposed draft law that would require 40% female board members

[1] Background figures in the Norwegian Technical Calculation Committee for Wage Settlement committee's report submitted to the Ministry of Labor and Social Inclusion before the income settlement in 2012, Norwegian Ministry of Labor and Social Affairs (2012), tables 1.17 and 1.18 (NOU 2012: 11).

in about 5,000 listed companies in the European Union by 2020; state-owned companies would be required to comply by 2018. Yet there is no evidence on whether these quotas work. Prior work has examined the secondary impact of the Norwegian reform on the stock market valuation, accounting performance and corporate policies of targeted companies (see among others Johansen and Sandnes 2008, Nygaard 2011, Ahern and Dittmar 2012, and Matsa and Miller 2013). In this paper we investigate whether the reform has been successful so far in its primary objective of reducing gender disparities in the corporate sector.

In theory, quotas can be an effective tool to improve gender equality. This is particularly true if path dependence is a key factor for the under-representation of women in the highest corporate echelons. Because qualified women might be harmed by an absence of networks to help them climb the corporate ranks, quotas can provide the initial step up that women need to break this cycle. If discrimination is the key factor for the under-representation of women, quotas might help overcome any business prejudice (and improve efficiency) by forcing more exposure to talented women in positions of power (Beaman et al 2009, Rao 2013). However, if high-quality women cannot be found, the quotas may backfire and reinforce negative stereotypes, resulting in a "patronizing equilibrium" with fewer women investing further in their careers as they see that it does not "take much" to become a board member (Coate and Loury 1993).

We start by investigating effect of the Norwegian reform on the qualifications of board members. Opponents of the reform claimed there were not enough qualified women in Norway to fill the reserved board seats. Businesses were particularly vocal in expressing this concern in their lobbying against the reform (Criscione 2002).[2] As a result, businesses may have decided to "game" the reform by strategically appointing sub-par women to their boards, expecting such women would be only minimal participants in board decisions. If unqualified women are appointed then the possible benefits of the reform to others might be also muted, as they would not improve role models, have better business networks, or be vocal proponents of pro-female changes within the reforming companies.

We show that these concerns were not relevant in practice. The average observable qualifications of the women appointed to the boards of publicly limited companies significantly

[2] Storvik and Teigen (2010) and Heidenreich (2010). According to Heidenreich (2010), there is little evidence that the reform increased search costs for firms. She finds that that the recruitment process became more professionalized after the reform, and that women were recruited through the same professional networks and circles as male board members.

improved after the reform. While there is a substantial gap in observable qualifications between male and female board members both before and after the reform, this gap is substantially smaller after the reform. In addition, the gender gap in residual earnings within boards fell after the reform.

We then explore how the reform impacted the labor market outcomes of women working in the companies that were mandated to increase female representation on their board. Does an increase female share in the boardroom translate in the recruitment or promotion of more women within these firms? If boards play a direct role in the selection of C-suite executives, female board members might be vocal proponents of female candidates for these positions, or might be able to leverage their own female-heavier business networks, to recommend female candidates for these positions. A higher share of women in the C-suite might then trickle down to a higher share of women in lower-down executive positions. Finally if boards can help shape human resource policies, female board members might be more likely to support changes in corporate policies that improve work-family balance, such as more part-time work or more amenities for women with children.

Following Ahern and Dittmar (2012), we exploit variation across publicly limited companies in the pre-reform (2003) fraction of women on their board to identify the effect of the reform on firms. Companies that started with a larger share of women on their board had to make fewer changes to comply with the mandate, while companies that started with a smaller share had to make more changes. We find evidence suggestive of a growing representation of female employees at the very top of the earnings distribution (top 5 highest earners) within the companies that had to increase female representation on their board more to comply with the mandate. However, the representation of women does not improve anywhere else in the firms' income distribution (top 95th percentile, top 90th percentile, top 75th percentile). We also see no improvements on gender wage gaps among top earners and find no evidence of changing work environments in affected firms.

We then look at the impact of the mandate on a broader set of highly qualified women in the Norwegian labor market, women whose qualifications mirror those of board members but were not (yet) appointed to a board. There are several theoretical reasons as to why the mandate may indirectly improve labor market outcomes for these women. First, if board membership is an attractive prize, these women have additional motivation to remain on the business "fast-track" after the reform as the odds of winning this prize went up. Second, since the search for female board members helped in bringing these qualified women to the attention of businesses (e.g. many of these women may have been featured in the database), this may have reduced search frictions in the filling of other executive positions by women throughout the economy.

We identify these effects by comparing the gender gap in labor outcomes of 3 cohorts of men and women with similarly high business qualifications, with 2 cohorts pre-dating the reform and one cohort post-dating the reform. We find no evidence of significant differential improvements for women in the post-reform cohort, either in terms of average earnings or likelihood of filling in a top position in a Norwegian business. However, standard errors are large enough in some specifications that we cannnot rule out economically meaningful effects.

Finally we consider broader possible effects of the reform on younger women interested in a business career and who are considering a business education, enrolled in a business education program, or recently graduated from such a program. While these young women are unlikely to be directly impacted by the reform (they are too young to be considered for a board position or a top executive position), it is possible that the reform inspired them to consider a business career, and that they see greater benefits in investing in such a career as a result. However we find no evidence of such an effect. There was no differential increase in female enrollment in business programs after the reform. A qualitative survey we performed in the Fall 2013 at the Norwegian School of Economics suggest that female (and male) students are well aware of the reform and many of them expect to professionally benefit from it in terms of future earnings and likelihood of holding a top executive position. Yet very few female students report that the reform got them to reconsider their fertility plans (such as delaying fertility), which prior research suggests might be one of the biggest hurdle in keeping women with a business degree on the fast track (Bertrand, Goldin and Katz, 2011). Finally, comparing 3 cohorts of recent graduates from business programs (2 pre-reform and one post-reform), we see no apparent reduction in the large gender gap in earnings that emerge in the first few years post graduation.

1. Context

1.A. The Corporate Board Gender Quota Reform

Gender quotas legislating minimum representation of women on boards of directors were first introduced in Norway in 1981 and, at that time, only applied to government appointed boards, councils, and committees. This remained the status quo for almost twenty years. In 2001, the Norwegian government began official discussions to implement a more expansive board quota. Teigen (2012) suggests that the privatization of state-owned firms in the 1980s and 1990s had led to concerns about fairness because these newly privatized firms would no longer be covered under the existing legislation. The first change in the law was proposed in 2002, and in December 2003, the Norwegian Company Act was revised. The previous quota for publicly appointed boards, council, and committees would now also apply to public limited liability companies (known as ASA firms in Norway). This new law stated that all publicly limited liability companies were required to have at least 40% representation of each gender.[3] By 2005 however, the fraction of women on boards of directors of ASA firms was still only 17% (see Appendix Table A1), so sanctions were introduced. Affected firms had until January 1, 2008 to comply or would be subject to forced dissolution. By 2008, the average share of women on boards of ASA firms was 40% (Figure 1).

When faced with the quota, firms could either choose to comply with the law or change their status from public to private. Appendix Table A1 shows that a large number of public limited liability companies changed their status to private after 2003. Of the 563 companies that were ASA in 2003, only 346 remained ASA by 2005 and only 179 by 2008. Focusing on companies listed on the stock exchange prior to the reform (a strict subset of all ASA firms), Ahern and Dittmar (2012) show that the likelihood of delisting anytime between 2003 and 2009 was larger among those with a smaller pre-quota share of women on their board, suggesting that many firms might have delisted to avoid complying with the mandate. Thus the final number of new positions reserved for women was ultimately smaller than expected when the law was passed.

Given the large number of companies changing status, it is not surprising that business was overall quite opposed to the law, with their main argument being that there was a lack of qualified women to fill the reserved board positions. To address this concern, the government

[3] The mandated gender representation depends on the total number of directors on the board. If the board of directors has two or three members, both genders must be represented. If the board has four or five members, there must be at least two members of each gender, and if the board has six to eight, each must have at least three. If the board has nine members, there should be at least four member of each gender. Beyond that, there must be at least 40% of each gender. Median board size in ASA firms has been 5 throughout the 2000s (see Appendix Table A1). In Norwegian firms above a certain size (200 employees), employees have the right to elect one third of the board members and the quota was to apply separately to employee-elected board members and shareholder-elected board members.

created a database of women interested in being appointed to boards "to make women's competence more visible" (Ahern and Dittmar, 2012; Storvik and Teigen, 2010)

1.B. Related Literature

Existing evidence on the effects of the Norwegian board quota has focused on the relationship between board composition and firm performance. To date, the evidence on the stock market response to the quote remains inconclusive. Johansen and Sandnes (2008) argue that stock prices of affected firms declined with the 2002 announcement, and Ahern and Dittmar (2012) document that firm value (as proxied by Tobin's q) declined with the 2002 announcement. However, Nygaard (2011) finds that stock prices actually increased with the 2005 announcement.

Ahern and Dittmar (2012) also examine the effect of the quota on corporate policies and accounting performance. Using data from firms' annual reports, they show that the average age and experience of the new women directors was significantly lower than that of the existing male directors and argue that this change led to a (statistically insignificant) decline in accounting returns of the firm. In addition, affected firms grew in size and made more acquisitions as a result of the change. In a similar vein, using publicly available data, Matsa and Miller (2013) examine the effect of the quota on accounting performance. Using firms in Sweden as a control group, they show that the change in the board quota law led to a decline in operating profits, primarily due to fewer layoffs.

While there is no prior literature that examines the effects of a board quota on the labor market opportunities of the affected groups, a number of recent papers have looked at the effects of other types of affirmative action policies. Most closely related to our work is a wave of recent research looking at the introduction of political quotas in India. Chattopadhyay and Duflo (2004) show that increased representation of women in village councils in India affected policy choices in a way that is consistent with increased representation of female preferences. In terms of the effectiveness of the policy with regard to improving opportunities for women more generally, Beaman et al (2009) show that increased female representation in the village councils reduced the gender gap in aspirations for both parents and adolescents. In addition, it erased the gender gap in education among adolescents. Given that they find no evidence of changing opportunities for women, they argue that this is primarily due to more role models for young girls. To the best of our knowledge, this is the first paper examining the effects of a corporate board quota on women.

1.C. Gender Gap in Earnings in Norway

Norway is generally considered to be quite progressive in terms of gender equality. Norway is characterized by generous health insurance, family leave, and childcare provision. According to the World Economic Forum Global Gender Gap Report, Norway is ranked number three in terms of opportunities for women, where the ranking takes into account economic, health, political, and educational opportunities. Despite this, a significant gender gap in earnings remains.[4]

While the earnings of women in Norway have been growing in the past few decades, the earnings of men appear to be growing even faster. Figure 2A presents average annual earnings of women and men in the labor force starting in 1985. This disparity remains (and even grows) when we focus on individuals at the top of the income distribution; when we look at the 90th percentile of earnings by gender (Figure 2B), one sees that the gender gap has widened substantially since 1985. We see the same pattern when we limit the sample to individuals with MBAs (Figure 2C).

Note that in neither of these pictures do we observe evidence of a break in trend for women after the board mandate. In our analysis below, we will consider whether any such break in trend becomes visible when we focus on subsets of women who are more likely to be affected by the reform, either because they ended up on corporate boards, because they are employed by a company that increased female representation on its board, or because they have qualifications that closely mirror those of board members.

2. Data

Our primary data source is the Norwegian Registry Data, a linked administrative dataset that covers the population of Norwegians between the ages of 16 and 64 for the years 1986-2010 and is a collection of different administrative registers such as the education register, family register, and the tax and earnings register. These data are maintained by Statistics Norway and provide information about educational attainment (collected directly from the institution itself), labor market status, earnings, and a set of demographic variables (age, gender) as well as information about family members.

[4] http://reports.weforum.org/global-gender-gap-report-2013/

For each individual in the labor force, we are able to identify the firm at which the individual is working. Hence, we are able to observe the entire Norwegian workforce of a given firm. We can also merge this data to different firm level data sets maintained by the Norwegian Business Register ("Bronnoysund Registrene"). One such dataset is The Register of Company Accounts, which contains extensive information on the balance sheets of Norwegian firms, including firm size and firm profits. Furthermore, we obtain information from the Register of Business Enterprises on direct owner shares, the legal status of the business entity, whether the company is listed on the stock exchange, as well as aggregate board composition (size and gender). Finally, starting in 1998, we are also able to merge in administrative data on individual appointments to the board of directors to the Norwegian Registry data. We can thus identify the specific individuals in the Registry who are directors of an ASA firm in a given year.[5]

3. How did the Quota Affect Gender Differences on Corporate Boards?

Both the employers' federation (NHO) as well as many business leaders were against a mandatory quota. While the employers' federation main argument against the law was that it interfered with the shareholders right to appoint board members, businesses' main argument against the law was that there were not enough qualified women to serve on the boards.[6] Therefore, we start our investigation of the effect of the reform by comparing women appointed to boards before and after the reform.

Table 1 shows the average characteristics of women and men who served on the board of directors before (1998-2003) and after (2004-2010) the Norwegian board reform from detailed register data. Columns 1-4 report means for firms that were ASA in a given year. Because many ASA firms changed ownership status after 2003, we also show statistics for the group of firms that were ASA in 2003, whatever their ownership status is in other years (columns 5 to 8).

Female board members are on average about 3 to 4 years younger than male board members and that age gap did not change much post-reform. Similarly, there were no large changes in the relative share of married board members. However, we do observe a growing representation of women with kids on the boards post-reform: while 75 percent of female board members had kids

[5] As shown in Appendix Table A1, board data is missing for about 15% of ASA firms in 2002 but available for nearly all ASA firms by the end of the sample period (2010).

[6] These opinions were often quoted in newspaper articles around the time when the idea was first presented, for instance in the leading Norwegian business newspaper Dagens Næringsliv on February 22, 2002 (Egede-Nissen et al, 2002), and in the Guardian on August 1, 2002, (Osborn, 2002).

pre-reform (compared to 87 percent for men), that share went up to 83 percent post-reform (compared to 90 percent for men).

These summary statistics show absolute improvements in educational and professional backgrounds for women and decreases in gender gaps post-reform. While the educational achievement of male board members did not change much after the reform, female board members in the post-reform period had completed about an extra half year of education. Most strikingly, while there were large gender gaps in the share of board members that had completed business or MBA degrees pre-reform, those gaps had essentially disappeared post-reform. To the extent that such degrees are associated with more board specific skills, this suggests that women in the boardrooms post-reform have skills that are closer to those of the men with whom they work.

The relative change in female board members' schooling background is reflected in a relative improvement in their earnings prior to joining a board. For each board member, we compute log(earnings) and earnings rank (either in their cohort, or in their cohort*education degree group) the year prior to joining a board. These earnings figures suggest convergence between male and female board members. For example, while only 43 percent of women on ASA boards pre-reform had earnings above the 90th percentile in their cohort and degree group, that share went up to 51 percent post-reform; there was no change for men (61 percent pre-reform vs. 62 percent post-reform). There is also an 8 percentage point increase in the share of women coming from top positions in their firm after the reform—the change for men is only 3 percentage points. Also, interestingly, the fraction of women who have spouses on a board of directors fell post-reform, from 12% to only 7%. While this could in part reflect the mechanical drop in the number of male board members, it also suggests the possibility that firms went beyond their traditional networks when trying to fill their quota.

To examine these changes more thoroughly, Figure 3 displays the full distributions of female board member characteristics before and after the quota. We include four variables: log (earnings) among workers (Panel A), potential experience (age minus years of education minus five, Panel B), percentile rank of earnings within one's own cohort and education group (Panel C) and percentile rank of earnings within one's own cohort (Panel D), all computed prior to an appointment to an ASA board position.[7] For these figures, we focus on ASA boards only (e.g. similar to columns 1 to 4 in Table 1). Consistent with the evidence when looking at the simple means (Table 1), it is clear that the distributions of women's characteristics have shifted right for these important indicators of human capital (except potential experience). Figure 4 displays the distributions of the same variables for both male and female board members, pre and post-reform. Again, consistent with the analysis of means, we see convergence between men and women in the post-reform period.

We also calculated an overall index of board-related human capital. The index is a weighted sum of the many observable characteristics discussed above. To determine the weights, we use pre-reform data for men and calculate, using a linear probability model, which observable characteristics are most closely related to the probability of being on a board of directors in the next three years.[8] We estimate this linear probability model among men only in the pre-reform period (pre-2001). Then, using the estimated coefficients from the regression as weights, we predict the probability of being on a board for all men and women in a given year, before and then after the reform. If board member human capital has increased, the predicted probability will increase too. Panel C of Figure 4 presents the distributions of these predicted probabilities (or "board-specific human capital") prior to an appointment to an ASA board position, for men and women before and after the reform. Importantly, women appear to be "catching up" to men in terms of observable human capital.

Next we investigate the trends in qualifications at the time of appointment in more detail—the before and after comparisons by year over time. Figure 5 displays the evolution of gender gap in characteristics at the time of appointment from 1999 onwards. We present mean gaps, and gaps adjusted for age, experience and board fixed effects. Gender gaps in earnings pre-appointment (panel A) were falling pre reform, and they remained at their lowest level until 2010.

[7] Education groups are defined according to the 2-digit level of the Norwegian classification standard (NUS2000), which is close to the International Standard Classification for Education (ISCED97). The 2-digit level of NUS2000 has eight education levels and ten broad fields, which gives us 80 different education groups. We have reduced the number of education groups to 26 by combing all levels below lower secondary into one level instead of four, and not distinguishing between different broad fields for lower secondary education. For post-secundary education and above, we have defined eight broad fields instead of ten.

[8] The observable characteristics we include are education degree, age, age squared, earnings rank within cohort and 5 lags of this variable, and finally degree type interacted with all of the following variables: the probability that you are above the 90th percentile, the 95th percentile, and the 98th percentile in earnings within your cohort and five lags of each of these variables, an indicator of whether the individual is working and an indicator for out of the labor force and 5 lags of these variables.

We observe the same pattern for gender gap in likelihood the appointed member had earnings above the 90th percentile for their education and cohort (panel B). The gap in completed education (panel C) reverses and starts favoring women after 2004, and the gender gap in business degrees disappears and remains essentially zero post-reform. These patterns appear inconsistent with firm claims that they would be forced to appoint unqualified females to boards.

We now document post-reform convergence in residual earnings between men and women while serving as board members by estimating the following equation:

$$Y_{it} = \alpha_0 + \alpha_1 Female + \beta X_{it} + \lambda_t + \epsilon_{it}, \qquad (1)$$

where the outcome of interest is log wages for individual *i* in year *t*, λ_t is a set of year dummies and X_{it} is a vector of individual controls (age and age squared, experience and experience squared). We estimate equation *(1)* separately for the pre-reform years (1998-2003) and the post-reform years (2004-2010) using the population of individuals serving as board members in an ASA firm in a given year. To account for changes in the number and composition of ASA firms over time, we also estimate a version of equation *(1)* that includes board fixed effects, hence allowing us to focus on gender gaps in residual earnings among individuals that are serving on the same board.

The results are reported in Table 2. In our preferred specification that includes board fixed effects, we see that in the pre-reform period (column 3) women earned about 38% less than their male counterparts. This gap fell to between 28 and 32% after the reform (column 4), depending on whether we look at ASA firms or at firms that were ASA in 2003. Hence, post-reform, ASA boards became more equal not just based on the number of men and women sitting at the table, but also in the "caliber" of these individuals. Figure 6 explores the evolution of gender gaps in outcomes by year, rather than pooling pre and post years together. These results are similar: gender gaps in earnings were falling pre reform, and by 2010 their level is similar to the 2004 level (panel a). The reform does appear to be associated with a (somewhat mechanical) decrease in the gender gap in representation in top positions after 2006.

While the results in Table 2 are consistent with the improved selection of female board members documented in Table 1, they may also reflect differences over-time between the genders in the earnings premium associated with becoming a board member. To investigate this we estimate the "premium" associated with becoming a board member and how this premium has changed over time for males and females. Specifically, we select the sample of individuals who were ever board members over the sample period (1998 to 2010) and estimate the following equation:

$$Y_{it} = \alpha_0 + \alpha_1 B_{it} + \beta X_{it} + \gamma_i + \lambda_t + \epsilon_{it} \qquad (2)$$

where Y_{it} is the outcome for individual i at time t, B_{it} is an indicator variable that equals 1 if individual i was a board member of an ASA firm in year t, X_{it} is a vector of time-varying individual controls (age and age squared and experience and experience squared), γ_i is an individual fixed effect, and λ_t are year dummies. Standard errors are clustered at the individual level. Because our regression includes individual fixed effects, α_1 captures the effect of changes in board membership status on earnings, or the "board premium".

Table 3 presents the results when we estimate this equation for a variety of outcomes, separately for men and women, prior to the implementation of the gender quota reform (1998-2003) and after the reform (2004-2010). The table reports the board premium from individual regressions for each group, time period and outcome. We estimate the board premium both for all boards and for ASA firms only.

Not surprisingly, there are substantial financial returns to being elected to a board of directors. Becoming a board member is associated with an increase in annual earnings of 4% for women and about 1% for men prior to the reform. This premium is substantially higher for both men and women in ASA boards, between 9 and 5%. This board premium fell after 2004 for all firms, from 4 to 3% for women from 1 to 0.6% for men. Interestingly however, the ASA-board premium fell slightly for women after the reform (from 9.4 to 8%) while it increased for men (from 4.6 to 10%). This suggests that if anything, the convergence in earnings within boards we observe in Table 2 might have been even larger if only driven by the improved selection of female board members.

Table 3 also shows that becoming board member of an ASA firm is also associated with an increased likelihood of entering the C-suite of an organization (which we proxy with as being one of the 5 top earners within an organization in a given year). We do not see much difference in this specific premium between men and women, either before or after the reform.

4. How did the Quota Affect Gender Gaps within Publicly Limited Liability Firms?

Given the earlier evidence that publicly-limited firms were able to find high-human capital women to assume the reserved board positions, we now turn to the question of whether the presence of these new female board members led to better opportunities for women working within these firms. Indeed, by forcing a higher representation of women in the corporate boardrooms of publicly limited companies, the Norwegian Reform may have spurred other changes within firms that benefitted female employees. For example, as a result of the reform, publicly-limited companies may have hired more women to top management positions. This could have been the result of a new awareness of the existence of highly qualified women acquired during the search for female board members. Or perhaps women appointed to corporate boards play a direct role in improving outcomes for other women within the organization: they may recommend more female candidates for top executive positions, and may be more favorably inclined towards these candidates. In addition, female board members may be more vocal in urging companies to adopt human resource policies that favor other women; such policies may include tighter controls on pay, or more flexible work options for women, especially those with children. Such policies, if implemented, may increase the attractiveness of these companies for women and ultimately result in a greater female employment share.

On the other hand, some might argue that changes in the female representation in the board room will not translate in further gains for women within the organizations. One reason could be that corporate boards just do not matter much. In particular, boards may have little say in recruiting decisions or human resource policies. It is also possible that while boards matter, a 40% quota does not give women a majority opinion in board decisions, limiting their influence on personnel decisions. This could translate into no change for women within affected firms, or even a backlash by the remaining men on the boards. Finally, while females are presumed to recommend and favor candidates of their own gender for an appointment or a promotion, this might be not the case in practice. In an interesting paper, Bagues and Esteve-Volart (2010) study the decisions of recruiting committees for 4 main Corps of the Spanish Judiciary. Because the allocation of (male and female) candidates to committees is random, they can study how the gender composition of the committee affects hiring. They find that female candidates are significantly less likely to be hired when the share of female recruiters is relatively higher suggesting that female majority committees tend to overestimate the quality of male candidates.

We bring all of these considerations to the data by examining whether there is any evidence of improvement in women's outcomes in the publicly limited companies that were mandated to increase female representation on their board. The particular outcomes we focus on include the female employment share as well as the employment of women with MBAs. We also study women's representation at the top of these organizations: we consider women's representation in the highest paid and five highest paid jobs within these organizations, as well lower down in the income distribution within these organizations (top income vigintile, decile, and quartile). To account for possible changes in human resource policies that may have improved family-work balance, we consider the representation of women with kids, the likelihood of women working part-time, and the earnings of women with kids.

Our econometric identification strategy is similar to that in Stevenson (2010) and Ahern and Dittmar (2012). We use the pre-reform (which we define as 2003) variation in female board representation across publicly limited companies to capture exogenous variation in mandated changes in the proportion of female board members. The logic of this identification strategy is simple. The publicly limited companies that started with a higher share of women on their board prior to the reform had to make smaller changes to their boards to comply with the law, while those that started with a smaller share had to make larger changes. In particular, focusing on the 2003-2010 time period, we estimate the following baseline regression:

$$Y_{ijt} = \alpha_0 + \alpha_1 FemaleBoard_{jt} + \gamma_j + \lambda_t + \epsilon_{it}. \tag{3}$$

where Y_{ijt} is a characteristic or outcome for individual i working in firm j at time t (such as whether the individual is a woman, or a woman with an MBA; or whether the individual is the top earner within the organization), $FemaleBoard_{it}$ is the percentage of female board members in firm i at time t, γ_i are firm fixed effects, and λ_t are year fixed effects. We instrument for $FemaleBoard_{it}$ with $FemaleBoard_{i2003}$ interacted with year fixed effects.

The population of interest for the regression above is the set of workers in the Individual Register who are employed by publicly limited companies.[9] While isolating this population a priori seems like an easy task given the availability of firm identification numbers in the Individual Register, the task is complicated by the intricacies of corporate ownership structures in

[9] Note that because the Individual Register data only covers individuals physically working in Norway, our analysis below does not cover employees of Norwegian publicly limited companies based outside of Norway.

Norway. As documented in La Porta et al (1999), ownership pyramids are common in many developed economies outside the US, with a company at top of a pyramid (often a holding company) having control on other companies lower down in the pyramid. We therefore need to map each publicly limited company to the set of firms (and employees) in the Individual Register that are ultimately controlled by this publicly limited company.[10]

Once we have identified the set of individuals who are ultimately employed by a publicly-limited parent in a given year, we further restrict our attention to the subset of parents that were already publicly-limited in 2003, e.g. right before the reform was implemented. This is our main sample for the analysis below, covering the set of workers whose ultimate employer was treated by the reform.

As we mentioned earlier, a substantial number of companies that were publicly-limited in 2003 changed legal status after the Reform was passed. Using the Register of Company Accounts, we identify the set of firms that are ultimately owned by a publicly-limited liability company in 2003 and that the reform intended to treat. This alternative sample includes all individuals working at those firms between 2003 and 2010, whether or not their ultimate owner remained publicly-limited after 2003.

Appendix Table A2 provides a summary of the main features of both the main and alternative samples. Column 1 lists the number of parents we identify in each year, while column 2 lists that same number conditional on non-missing board data for the parent. As expected, the intent-to-treat sample (Panel B) contains a larger number of parents throughout the sample period. By 2010, only 92 parent companies remain in the treated sample, compared to 237 in the intent-to-

[10] In order to map each publicly limited company to the set of firms (and employees) in the Individual Register that are ultimately controlled by this publicly limited company, we proceed as follows. When firms submit their annual accounts to the Register of Company Accounts, they are required to disclose information about the largest corporate owner if this corporate owner holds more than, or equal to, 50% of the shares in the company. So for each worker in the Individual Register, we know whether his or her employer has a corporate parent that owns at least 50% of the shares. By tracing these ownership structures in the Register of Company Accounts, we can therefore identify the ultimate corporate owner of each firm in the Individual Register. Because a publicly limited company can itself ultimately be controlled by another publicly limited company, the sample of publicly limited firms whose board composition we exploit in this analysis is smaller than the full sample of publicly limited companies. Also, in some instances, the ultimate owner of a Norwegian firm is a foreign entity. In those instances, we assign control of that firm to the Norwegian company that is the highest up in the ownership chain; we include that firm, and its employees, in our sample if that ultimate Norwegian parent is publicly limited.

treat sample. Because several of the parent companies in Panel B ended up changing legal status, the average and mean percentage of women on the board (columns 3 and 4 respectively) in that sample, while also growing after 2003, never reaches the mandated 40%.[11]

Appendix Table A3 reports first-stage regressions. In each column, the dependent variable is the percentage of women on a board of directors in the parent company in a given year. The instruments are the percentage of women on the board in the parent company in 2003 interacted with year dummies. Also included in each regression are year dummies and firm fixed effects. Even numbered columns also include 20 industry category fixed effects interacted with a linear time trend. Standard errors are clustered at the parent company level. The first-stage results are qualitatively comparable across all columns, and the signs and magnitudes on the instrumental variables are as expected. Parent companies that started with a larger share of women on their boards increased the share of women on their board less throughout the quota treatment period. The point estimates indicated that the biggest adjustment to percentage female happened starting in 2007, e.g. right after the mandate became compulsory and the threat of dissolution was introduced. Not surprisingly, the point estimates on the instruments are always smaller in the intent-to-treat sample than in the treated sample.

Appendix Table A4 provides summary statistics for the employees of ASA firms between 2003 and 2010. On average ASA firms cover 2.2% of total employment during this period. Slightly less than 30 percent of them are women. Male and female employees are on average 42 to 43 years old, about 70% of them have children, and about 4% have completed an MBA degree. A much higher fraction of female than male employees are working part-time (14% vs. 4%). As

[11] Column 5 reports the number of separate business entities (parents and affiliates) in each year. In 2003, there are 3386 different companies in both samples. That number drops dramatically over time in both samples, reaching about 1200 by 2010. The reasons for the drop in sample sizes are however different across samples. In the treated sample, any company whose parent in that year switches legal status gets dropped with its parent; however, any company that is acquired in a given year by an ASA parent gets added to the sample. In the intent-to-treat sample, the reason for the drop in sample size is that only a subset of the fixed set of parents and affiliates that were identified in 2003 can be found in subsequent years. Finally, column 6 of Appendix Table A2 reports the average corporate layer of each firm in the sample each year. We assign 0 to the parent company, 1 to the affiliate immediately below that parent (e.g. the parent company owns 50% or more of an affiliate in layer 1), 2 to the affiliate immediately below that (e.g. the affiliate in layer 1 owns 50% of more of an affiliate in layer 2), etc. The average corporate layer is between 1.5 and 1.9 throughout the sample period across both datasets. This suggests that Norwegian business groups are on average not particularly deep compared to what has been documented in other parts of the world (LaPorta et al, 1999).

expected, male and female employees are unequally represented in the organization's income distribution. For example, while 30% of male employees earn more than the 75% of those in their cohort and education group, that share is only 11% among female employees. While 1% of male employees are top 5 earners within their organization, that share is only .2% among female employees.

The main IV results showing the impact of the reform on ASA firms are in Tables 4, 5 and 6. We perform this analysis at the individual employee level, thereby putting more weight on parents with a larger number of affiliates and larger overall employment. In odd numbered columns, we control for firm and year fixed effects; in even columns, we include 20 industry categories interacted with a linear time trend. In all regressions, we cluster standard errors at the parent company level. Table 4 shows little evidence of any positive impact of a mandated increased in the percentage of female board members on female employment (columns 1 and 2), the employment of women with business degrees (columns 3 and 4), the employment of women with children (columns 5 and 6), or the employment of women working part-time (columns 7 and 8). This holds both in the treated sample (Panel A) and the intent-to-treat sample (Panel B).

Theoretically, we would expect corporate boards to exert the largest possible influence on the appointment of C-suite employees. While our data does not allow us to directly identify who is in the C-suite, we proxy for it by isolating individuals that are either the top earner (likely the CEO) or one of the top 5 earners within the organization in a given year. Results are reported in Table 5. We do not observe a statistically significant relationship between the percentage of women on the board and the likelihood that a female employee is the top earner in the ASA group. The evidence in columns 4 to 6 and 10 to 12 suggest that a higher share of female directors may increase the chance that a female employee (columns 4 to 6) or a female employee with children (columns 10 to 12) is one of the top five earners within the ASA group. The magnitudes of these effects are not trivial. Given that on average .002 percent of female employees are in the C-suite (e.g. one of the top 5 earners), the estimated coefficients in Table 5 suggests that increasing the share of female board members from 5 to 40% would more than double female representation in the C-suites of these companies. Clearly though, the number of women that would be directly positively affected by such changes at the very top of the executive ladder is limited.

Greater numbers could be affected if any changes at the very top trickled-down the organization. We investigate this possibility in Table 6. We define for each female employee the likelihood of having earnings that fall in the top quartile (columns 1 to 3), top decile (columns 4 to 6) or top vigintile (columns 7 to 9) of the entire (men and women) earnings' distribution within the group (parent plus affiliates). We fail to find evidence of any gains for female employees in these less rarefied executive layers. In fact, most of the point estimates are negative, but all are statistically insignificant when we include individual controls.

To summarize, we conclude that the mandate to increase female representation in the boardroom may have increased female employees' representation in the C-suite of the targeted companies. However, we observe very few other positive changes outside the very top. The changes we observe at the very top, although they affected only a very small number of women directly, are nonetheless important: they are inconsistent with the views that a) corporate boards may not influence human resource decisions, b) a 40% share does not give female directors the ability to influence such decisions and c) female directors may be tougher (softer) than male directors in their evaluation of female (male) candidates for C-suite jobs. The lack of positive spillovers beyond the very top must be put into perspective: only a short amount of time has passed since the reform, and it may be too early to tell whether or not a larger number of female employees will benefit from the gender quota in the board room.

5. How did the Quota Affect Gender Gaps at the Top of Labor Market?

The ultimate goal of the reform was to improve labor market opportunities for all professional women, not just for those sitting on boards. In the previous section, we examined outcomes for one group that could indirectly benefit from the gender board quota: women employed in firms that were required to comply with the quota. In this section, we consider another set of women who might have indirectly benefitted from the reform: highly qualified women working in business settings and whose credentials mirror those of board members, even if they themselves have not (yet) been appointed to board. The mandate may have indirectly resulted in improved labor market outcomes for these women in many ways. First, to the extent that board membership is an attractive prize (see Table 3), the reform generates additional motivation to remain on the business fast track as the odds of winning this prize increased. Second, since the search for female board members helped bring these qualified women to the attention of businesses (e.g. many of these women may have been featured in the database), this may have reduced search frictions in the filling of other executive positions by women throughout the economy, and thus broken the cycle of dependence on old business networks. Third, the newly appointed female board members, if not recommending these women exclusively for a position at their firm, may have been in a superior position to spread information about these women throughout the Norwegian corporate sector more broadly.

To determine the effect of the quota on gender gaps more generally, we follow a cohort approach and ask whether the gender gap in the last (post-reform) cohort is smaller than for previous cohorts.

There is no unique way to define the set of highly qualified women in the business sector who might have benefitted from the quota reform even without having been appointed to the boards of ASA firms. We consider two different definitions. First we use the predicted probability of board membership constructed in Section 3 to define the group of women who are most similar to women on boards, and thus most likely affected. This measure is estimated by predicting board membership based on observables for men in 1998-2003. Using the coefficients from this regression, we generate the predicted probability of board membership for all individuals and periods based on observables. We define the targeted group as those individuals with the highest predicted probability of becoming board members in the period immediately before the reform. Based on the distribution of this predicted probability, we define the affected groups as individuals with a probability of becoming a board member above the 99.5th percentile of the propensity score in 1989 (for the 1990-1996 cohort), 1996 (for the 1997-2003 cohort) and 2003 (for the 2004-2010 cohort).[12] Given the ultimately arbitrary nature of this sample definition, we also report results using a narrower and easily observed definition: we select individuals with a business degree, graduate or undergraduate, whose earnings were above the 98th percentile of the earnings distribution (of individuals with the same education and experience) in each of the three years preceding.

[12] Appendix Figure 2 shows the predicted probability of becoming a board member in the post-period as a function of this propensity score. Each point represents the difference in the probability of board membership between those with predicted probabilities above and below the cutoff after the reform. The plot begins at 95.1 percentile and, for this first point, the control group is the 95.0 percentile. To select the cutoff we note that if the "true" cutoff were at the 96th percentile for instance, then the graph would show a peak exactly at the 96th percentile (see Appendix Figure 3). The figure shows that at the lower levels (95.1-99.0), there is little difference between the probability of board membership after the reform for those above and below the cutoff, although it is slowly rising with the percentile (as one might expect). However, there is a clear increase in the difference after the 99th percentile, although there is no peak. This suggests that the affected group is smaller than the 99th percentile.

We divide our sample into three 7-year time periods (1990-1996, 1997-2003 and 2004-2010) and, in each period, consider the earnings of men and women who are between the ages of 35 and 55, because most board members fall within this age group (See Appendix Figure 1). Because of aging, individuals can appear in more than one seven-year period. Specifically, we estimate the following equation:

$$Y_{it} = \alpha_0 + \alpha_1 Female * Post_t + \alpha_2 Female_i * Pre_t + \alpha_3 Female_i + \beta X_{it} + \lambda_t + \epsilon_{it}. \qquad (4)$$

where Y_{it} is the outcome of interest (log of earnings or an indicator for earning above the 95th percentile income within a firm), $Post_t$ is an indicator equal to one if this is the post-reform cohort (2004-2010), Pre_t is an indicator for the earliest cohort (1990-1996). The omitted cohort is the cohort just prior to the reform (1997-2003). X_{it} refers to time varying individual characteristics (age and age squared, potential experience dummies), and fixed individual characteristics (an indicator for whether the individual was working at the time of selection into his or her cohort, as well as marital status and presence of children at the time the individual was selected into his or her cohort). We control for year dummies (λ_t) and cluster the standard errors at the person level.

The coefficient α_3 measures the gender gap in the 7 years prior to the reform, and we expect it to be negative; that is, women earned less than men. The gender gap after the reform is given by $\alpha_3 + \alpha_1$, thus α_1 measures the change the gender gap in the post-reform period. A positive coefficient indicates that the gender gap fell after the reform. The gender gap two periods (14 years) before the reform is given by $\alpha_3 + \alpha_2$. If gender gaps fell throughout the period at the same rate then $\alpha_1 = -\alpha_2$. Thus α_2's sign and magnitude indicate whether the change we observe after the reform constitutes a significant deviation from the trends prior to the reform. Because we employ a cohort approach, the key identifying assumption is that the composition of the cohort is not changing overtime in unobserved ways. To assess the validity of this assumption we also estimate regressions that control for the value of Y in the year the individual was selected into his or her cohort.

Table 7 presents results. The gender gaps in earnings in the period preceding the reform are substantial, with women in these top groups earning between 14 and 16% less than the men (Panel A). These gaps appear to have shrunk after the reform: all the coefficients on female*(2004-2010) are positive and non-trivial in magnitude, but they are all statistically insignificant. However, if we drop from the sample individuals who serve on boards (those directly affected) then all coefficients become negative and remain statistically insignificant. If we concentrate on the last three years of each cohort to allow for a lag in the appearance of an effect (e.g. only 2008-2010 for the last cohort, 2001-2003 for the middle cohort and 1994-1996 for the earliest cohort) the coefficients remain small or negative and always insignificant. Thus, although women newly appointed to boards do benefit from the mandate, there is no evidence of benefits among those women not directly affected. Nor is there any evidence that an effect is "emerging".

While our analysis is restricted to very small and highly selected groups of top male and female earners, it is still possible that men and women within those selected groups are not directly comparable to each other. More importantly, the baseline gender differences between males and females might differ across the 3 synthetic cohorts. Thus in Panel B, we re-estimate equation (5) controlling for each individual's log annual earnings in the year prior to the beginning of his or her cohort (e.g. 1989 for the 1990-1996 cohort; 1996 for the 1997-2003 cohort; and 2003 for the 2004-2010 cohort). These results are presented in Panel B. The average gender gap in earnings that emerge between men and women in the pre-reform cohort is smaller under this alternative specification (reaching at most 5 percent, column 4). There is also little evidence of any substantial change between the earliest cohort (1990-1996) and the middle cohort (1997-2003) under this alternative specification. Most strikingly, this additional control tends to reduce the point estimate on α_1 (which would occur if the males and females in the post-reform synthetic cohort were more comparable to each other than those in the two pre-reform synthetic cohorts). Overall in Panel B, the results suggest little evidence of any improvement in earnings for women in the post-reform cohort, especially when we restrict the analysis to individuals who did not mechanically benefit from the quota. However the standard errors are large.

Despite no clear sign of reduced gender gaps in earnings, it is possible that the reform improved the representation of women in top positions within firms, for which there is some evidence in Table 5. In Table 8 we estimate gender gaps in the probability of being one of the top 5 earners within a firm. As in Table 7, the evidence in Table 8 suggests no systematic improvement in female representation in the C-suites of corporations, if anything the estimates are negative. Interestingly, in both tables 7 and 8 it appears that women are actually doing worse in the period prior to the reform than the earliest period, suggesting that our finding of no effect may in fact represent a break from a negative trend, although our standard errors are too large to distinguish this. Overall, we find little evidence suggesting that the Norwegian board reform had any statistically significant impact on high-achieving women beyond the effect on board members themselves.

6. How did the Quota Affect Gender Gaps among Young People?

In a final step, we examine the effect of the reform for young individuals who are contemplating a career a business, are currently pursuing an education degree toward such a career, or have recently started such a career. While a clean estimation strategy of the impact of the reform for this broader set of individuals is not available, we combine time series evidence, qualitative surveys and cohort analyses to document associations between the reform and young women's (and men's) choices, expectations, and early career outcomes.

We start by assessing whether the reform coincided with changes in the share of young men and women interested in pursuing a business degree: if the reform made business careers more appealing for women, then we might observe an increase in the fraction of women obtaining the degrees that lead to those careers. In 2000, 11% of women and 17% of men completed their undergraduate studies with a business degree, while 14.5% of women and 22% of men completing graduate programs did so with a degree in business. To investigate how the reform affected the decisions of students to obtain business degrees, we estimate the following linear regression:

$$Y_{it} = \alpha_0 + \alpha_{1t} Female * (year = t) + \beta X_{it} + \lambda_t + \epsilon_{it}, \qquad (5)$$

where the dependent variable is a dummy equal to one if individual *i* graduated with a business degree in year *t* (or alternatively from business law or social studies) and the independent variable of interest is a dummy for female interacted with a year dummy. The regression also controls for age and age squared and year dummies. We estimate this regression for those obtaining a graduate degree and then for those obtaining an undergraduate degree.

We display the results of the estimation graphically in Figure 7, both for graduates (Panel A) and undergraduates (Panel B). Each point in the figure represents the estimated coefficient for female in that year, thus showing whether women were more or less likely than men to graduate with a business oriented major in that year. The gender gap is normalized to 0 in the baseline year (2000). Regardless of our definition of "business-oriented" majors, we find no increase in the share of female majors in 2004 or in 2006.[13] If anything, the share of women obtaining business degrees fell after 2004 (except for 2007).[14] Thus, we see little evidence suggesting that the reform coincided with an increase in young women's interest in business degrees.

Next we look at evidence of any actual changes in the gender gap in early career earnings among recent graduates of business programs. We follow an empirical approach similar to that in Section 5 (Tables 7 and 8). We construct 3 cohorts of recent (within 3 years of completing their degree) male and female graduates from either a business program or a business, law, or social studies program, and study the gender gaps that emerge over a 7 year period. We include two pre-reform cohorts (1990-1996 and 1997-2003) and post-reform cohort (2004-2010).

Table 9 presents the results of estimating equation (5) for this sample of recent graduates. The gender gap in earnings among recent graduates in the middle cohort (1997 to 2003) is very large, between 22 and 27%. This gap does not change in the post reform period: the coefficient on female*(2004-2010) is small and statistically insignificant for both groups of graduates. And again we do not find statistically significant or large effects of the reform on gender gaps when we allow for a delayed effect and concentrate on the last 3 years of each cohort.

Finally to understand how young people's perceptions might have been affected by the Reform, we also conducted an online survey of all current students (both male and female) at the Norwegian School of Economics, one of Norway's most prestigious business schools. Students received an invitation to answer the short survey; a total of 763 students responded, with a bit more than half women (54%).[15]

Table 10 shows the distribution of responses by gender. The vast majority of students reported being aware of the reform (70% of women and 75% of men). About 50% of women expect their earnings to increase as a result of the reform, while 40% expect them to be unaffected (with a remaining 10% expecting a decline). Interestingly almost 30% of men expect the reform to lower their earnings while only 10% expect their earnings to increase (with a remaining 60% expecting no change). Similarly, most women (70%) believe the reform will

[13] Overall the estimated coefficients are not statistically significant.
[14] In Norway, as in the United States, undergraduates primarily choose their major once enrolled in college.
[15] Those completing the survey would be eligible to win one of 20 500 NOK gift cards.

make it more likely they will eventually be in top executive business positions, while 50% of men expect their chances to be in such positions to have decreased as a result of the reform. Fewer than 10% of women report that the quota increased their motivation to obtain a business degree, and only 4% of men reported a decrease—consistent with our regression analysis showing no significant changes in the fraction of women choosing business-oriented degrees.

Despite the large share of female respondents who report expecting that the reform will improve their labor market outcomes, we find little evidence that these young women anticipate modifying their family plans as a result. When asked about their marital and fertility plans (whether and when to have children), almost all women reported that the reform left those plans unaffected. This is particularly notable given that prior research suggests that child birth might be one of the biggest hurdles to keeping women with a business degree on the fast track in their early years out of school at least in the U.S. (Bertrand, Goldin and Katz 2011). The fact that the reform did not change these young women‘s fertility plans may limit the potential for actual earnings gains.

In regressions not reported here, we also re-estimated equation 5 in the samples of recent graduates using number of children and marital status as alternative dependent variables. Here again, we found no evidence of any changes in the outcomes in the post-reform cohort. This is consistent with the findings that emerged from the self-reported marital and fertility plans in our qualitative survey of current business students. There is no sign that the reform was associated with changes either expected or actual changes in family decisions among the set of younger women that will be eligible to become board members in the near future.

7. Conclusion

This paper provides what we believe is the first effort to assess whether gender quotas in business can be an effective tool to reduce gender disparities in the corporate sector. The Norwegian approach, focused on mandating gender diversity on corporate boards, is important to study since it is being adopted by more and more countries throughout Europe. Our study of the "mechanical" effect of the quota offers optimistic news for supporters of this affirmative action policy. Despite businesses' fear that there were not enough qualified women to fill the board positions, the new reserved seats were filled with women who are observationally better qualified to serve on boards than women appointed before, suggesting that previously untapped networks of top business women were activated by the policy. As a consequence, the gender gap in earnings within boards fell at the same time as the boards became more diverse. As argued earlier, we view such a finding nearly as a necessary condition for the hope of any positive spillovers of the quota policy beyond its mechanical effect.

When looking for evidence of any such spillovers in the subset of the economy where we would expect them the most, the evidence is more mixed. We find no effect on the set of highly qualified women across Norway. We do find increased likelihood of finding female employees in the C-suite of firms that were targeted by the mandate. Any signs of female gains however seem to be limited to this very rarified set of employees. However, we do observe the gains where we would indeed expect the most direct influence being exerted by the boards, and hence where we would expect the first positive changes to occur.

We also considered the possibility that the law was important in changing expectations, behaviors, and outcomes among the younger cohorts entering the corporate sector. Most interesting was qualitative evidence based on self-reported data. Career expectations of young women in business went up, with many viewing the reform as improving their future earnings or increasing the likelihood of making it to the very top corporate echelons. It is possible that the positive mindset the reforms induced among young women in business will ultimately encourage them to stay on the fast track for longer. At the same time, we did not see much actual change in the gender gap in labor market outcomes among this younger group around the time the reform came into effect, nor do we see any actual or reported change in marital status and fertility. At least in the short run, these improved expectations have not resulted in any significantly different choices or outcomes among the young.

While it is likely too early to draw definitive conclusions, the evidence we report in this paper suggests that governments should be wary of placing too much faith in this specific affirmative action policy as a broad solution to the persistent under-representation of women in the top layers of the business sector. Yet, supporters of this policy will also see some positive takeaways in our results. First, businesses' main argument against the policy (lack of qualified women) appears weak in light of the fact that the newly appointed female board members were—on paper at least—more qualified than those appointed before; most likely, the reform spurred a more widespread search effort and helped break some of the "old boys" networks that may have dominated the board appointment process prior to the reform. Second, the changes in the C-suite of the targeted firms we observe are the most immediate changes that could have been achieved, as board members can play a more direct role in such appointments. While we do not observe any trickling-down to other top managerial positions, it is possible not enough time has passed for such spillovers to occur. Third, it is telling that young women preparing themselves for a career in business widely support the policy and perceive it as opening more doors and opportunities for their future career. Hence, it is possible then that the reform might have broader longer-term effects we cannot yet observe. An evaluation in the spirit of this one should be repeated in a decade or so. However, because similar policies are currently discussed in many countries, we view this short-term evidence as relevant information into the law-making and policy-making processes.

Bibliography

Ahern, Kenneth, and Amy Dittmar, 2012. "The Changing of the Boards: The Impact on Firm Valuation of Mandated Female Board Representation". *Quarterly Journal of Economics,* 127(1): 137-97.

Bagues, Manuel F., and Berta Esteve-Volart, 2010. "Can gender parity break the glass ceiling? Evidence from a repeated randomized experiment." *The Review of Economic Studies,* 77(4), 1301-1328.

Beaman, Lori, Raghabendra Chattopadhyay, Esther Duflo, Rohini Pande, and Petia Topalova, 2009. "Powerful women: Does exposure reduce bias?" *The Quarterly Journal of Economics,* 124: 1497–1540.

Bertrand, Marianne, Claudia Goldin, and Lawrence F. Katz, 2010. "Dynamics of the Gender Gap for Young Professionals in the Financial and Corporate Sectors." *American Economic Journal: Applied Economics,* 2(3): 228–55.

Chattopadhyay, R., and E. Duflo, 2004, "Women as Policy Makers: Evidence from a Randomized Policy Experiment in India." *Econometrica,* 72: 1409–1443.

Coate, S., and G. Loury, 1993. "Antidiscrimination Enforcement and the Problem of Patronization." *American Economic Review Papers and Proceedings*, 83(2): 92-98.

Criscione, Valeria, 2002. "Oslo's boardroom battle", The Financial Times, March 13, p. 15, edition 34.

Egede-Nissen, Heidi, Arne Grande, Åsne Haugli, Ingvild Rugland, Torstein Tranøy, and Morten Ånestad, 2002. "Kvoteforslag høster storm", Dagens Næringsliv, February 26, page 10.

Heidenreich, Vibeke, 2010. "Rekruttering til ASA-styrer etter innføringen av kvoteringsregelen", *Magma*, 7/2010.

Johansen, Marius Apland, and Marius Javier Sandnes, 2008. "Gender equality in the boardroom: the Norwegian case of Rosa Parks? An event study", Master thesis, The Norwegian School of Economics.

Matsa, David A., and Amalia R. Miller, 2013. "A Female Style in Corporate Leadership? Evidence from Quotas." *American Economic Journal: Applied Economics*, 5(3): 136-69.

Norwegian Ministry of Labor and Social Affairs, 2012. "Grunnlaget for inntektsoppgjørene 2012", Norwegian Official Report 2012:11, Oslo.

Nygaard, Knut, 2011. "Forced board changes: Evidence from Norway." Norwegian School of Economics and Business Administration Discussion Paper Sam 5/2011.

Osborn, Andrew, 2002. "Norway sets 40% female quota for boardrooms. Companies insist too few qualified women are available to fill posts". The Guardian, August 1, http://www.theguardian.com/society/2002/aug/01/publicsectorcareers.genderissues

Pande, R., and D. Ford, 2011. "Gender Quotas and Female Leadership: A Review". Washington DC: Worldbank.

La Porta, Rafael, Florencio Lopez-De-Silanes, and Andrei Shleifer, 1999. "Corporate Ownership Around the World." *Journal of Finance*, 54(2): 471-517, 04.

Rao, Gautam, 2013. "Familiarity Does Not Breed Contempt: Diversity, Discrimination and Generosity in Delhi Schools," unpublished mimeo. https://sites.google.com/site/graoeconomics/

Stevenson, Betsey, 2010. "Beyond the classroom: Using Title IX to measure the return to high school sports." *The Review of Economics and Statistics*, 92: 284–301.

Storvik, Aagot, and Mari Teigen, 2010. «Women on Board. The Norwegian Experiment». Friedrich-Ebert-Stiftung, International Policy Analysis, http://library.fes.de/pdf-files/id/ipa/07309.pdf

Teigen, Mari, 2012. "Gender quotas on corporate boards: On the diffusion of a distinct national policy reform." *Comparative Social Research*, 29: 115-146.

Figure 1: Percentage Female Directors in ASA Firms, 1998 to 2010

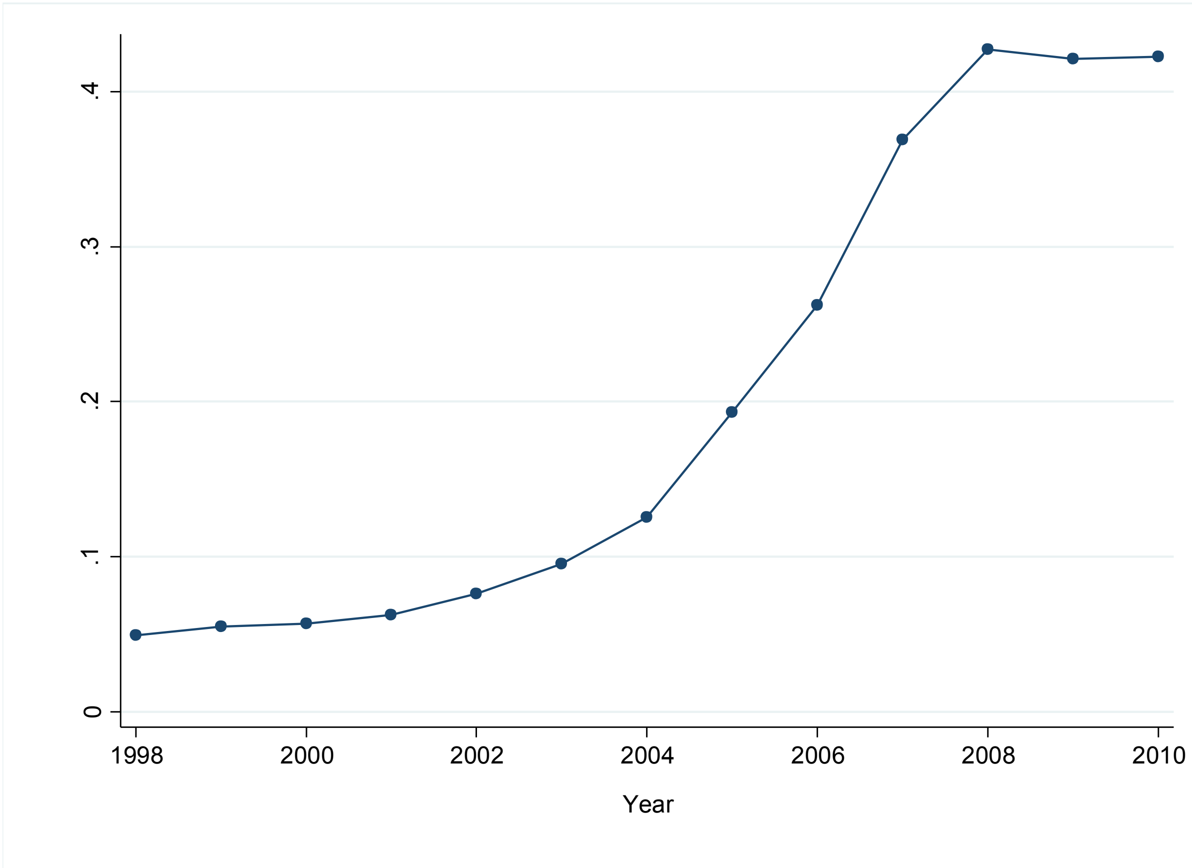
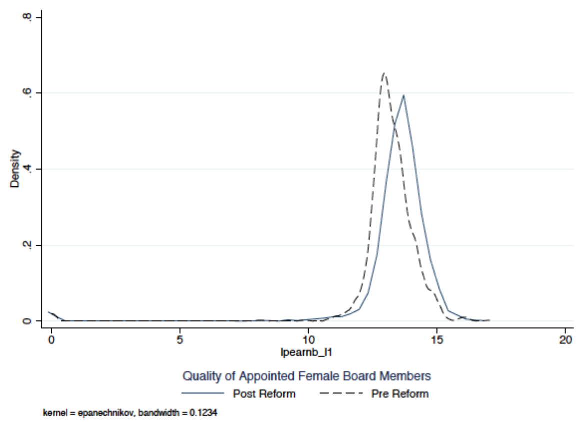


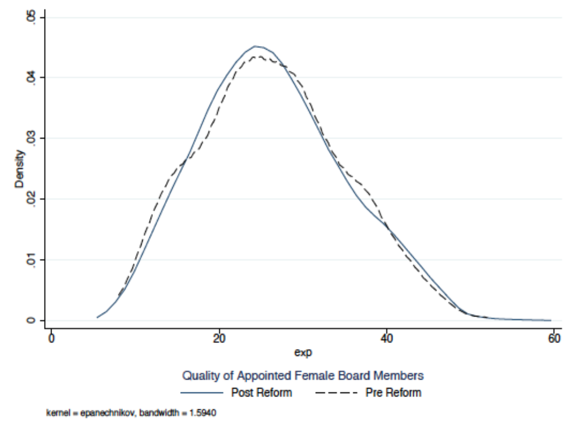
Figure 2: Earnings Gender Gap in Norway, 1985-2010

Figure 3: Economic Background of Female Board Members, Pre and Post-Reform

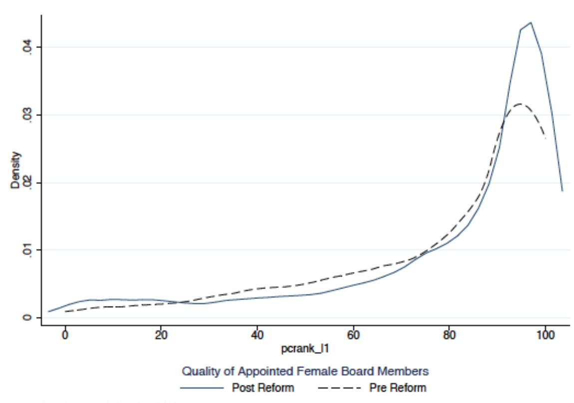
Panel A: Log of Annual Earnings before appointment



Panel B: Experience (in years) before appointment



Panel C: Percentile of earnings within education-cohort before appointment



Panel D: Percentile of earnings within cohort before appointment

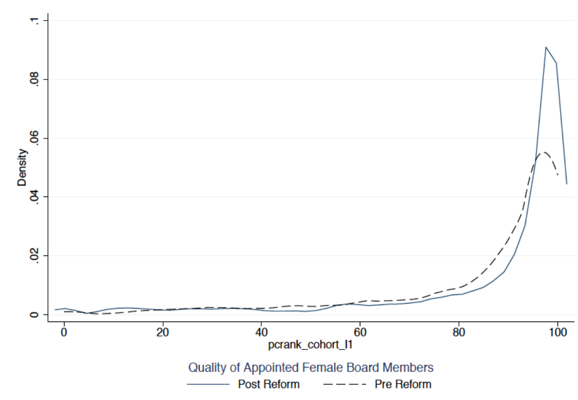
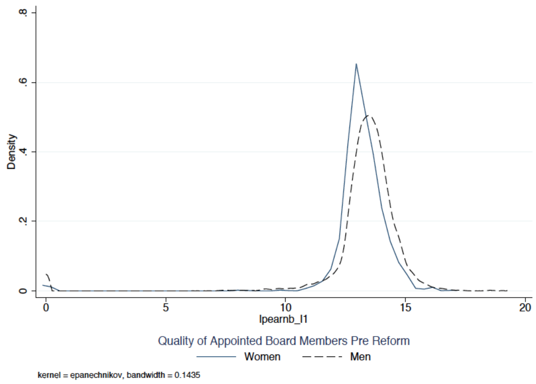
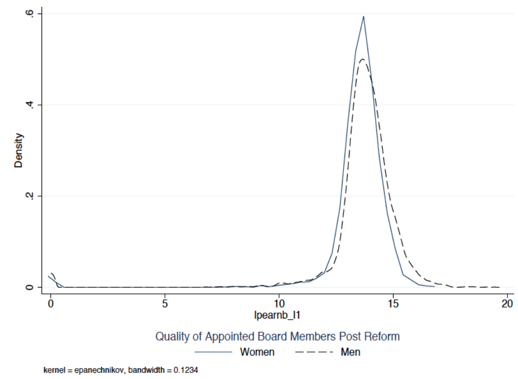


Figure 4: Economic Background of Male and Female Board Members

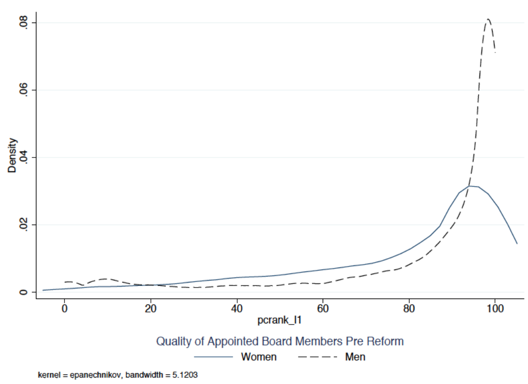
Before the Reform | **After the Reform**

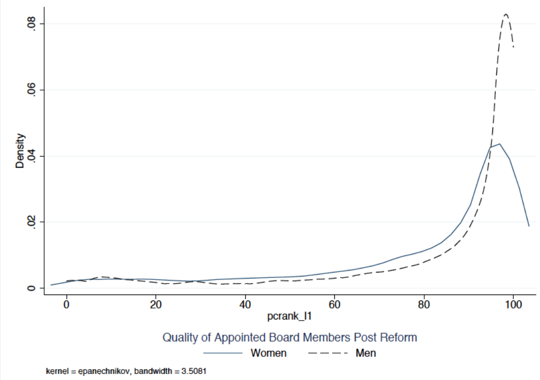
Panel A: Log of Annual Earnings before appointment



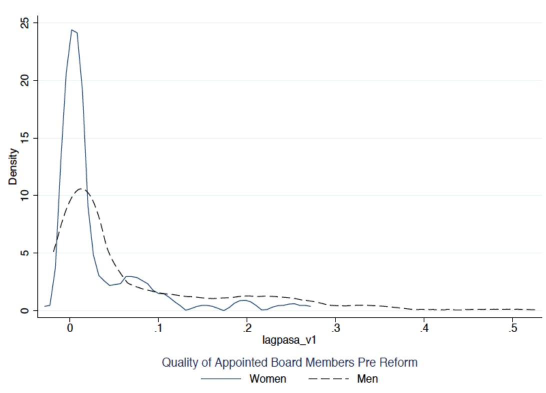


Panel B: Percentile of earnings within education-cohort before appointment





Panel C: Board-specific Human capital index



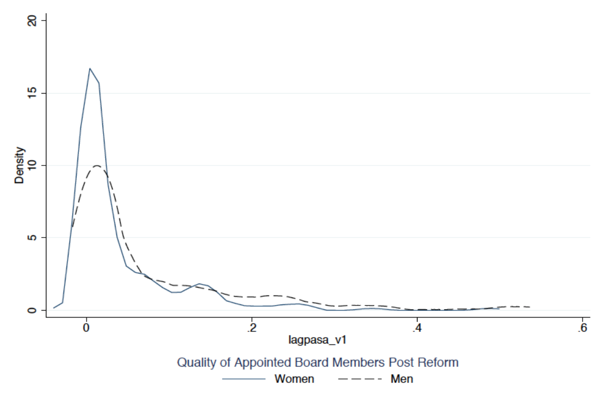
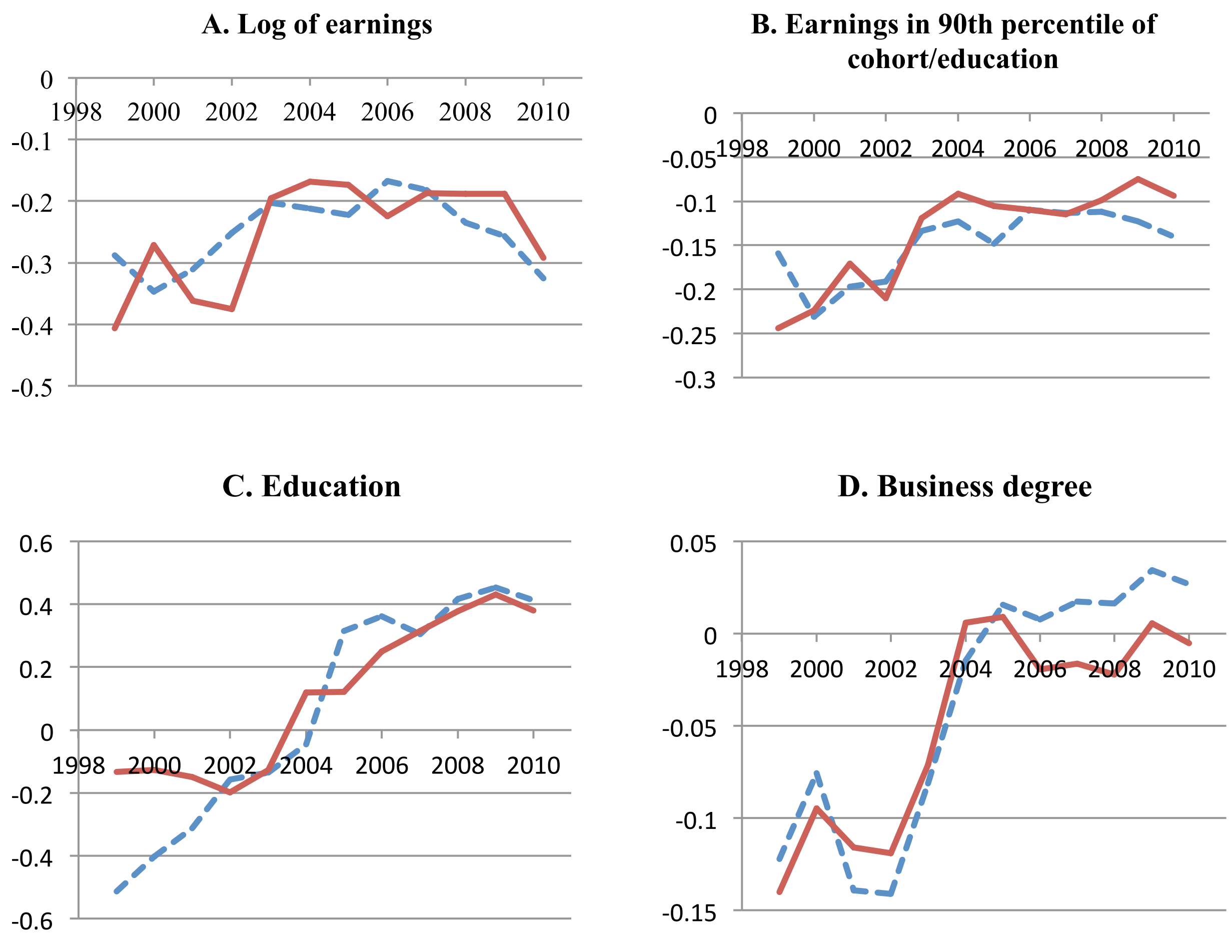


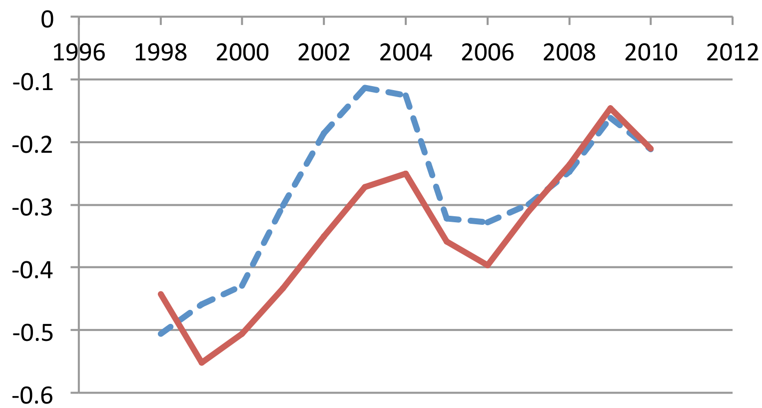
Figure 5: Evolution of gender gap in qualifications at the time of appointment among ASA board members



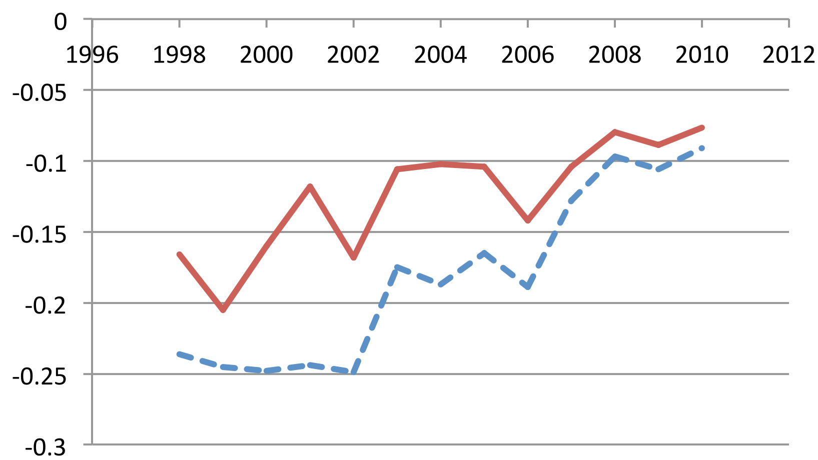
Dotted line reports mean differences between men and women. Solid line reports adjusted differences, from a regression that controls for experience, experience squared, age, age squared, and board fixed effects.

Figure 6: Evolution of gender gap in outcomes among ASA board members

a. (Log of) Earnings



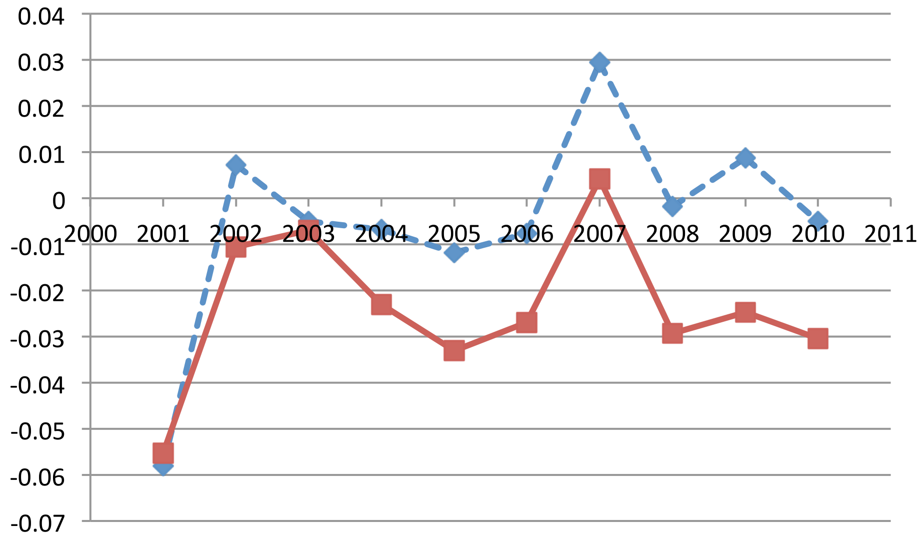
b. % that are top 5 earner in firm



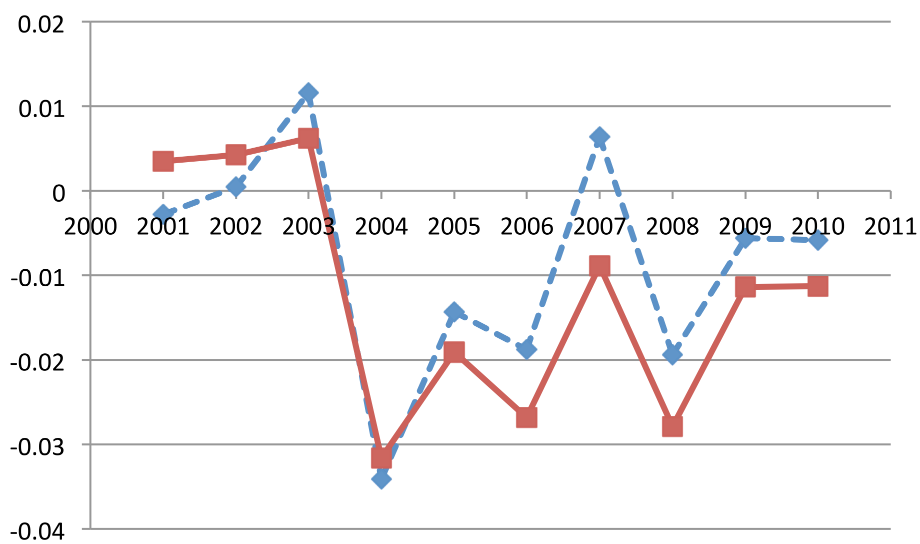
Dotted line reports mean differences between men and women from a regression that controls for experience, experience squared, age, age squared. Solid line reports coefficients with board fixed effects.

Figure 7: Gender Gap in Graduation from Business Programs, By Graduation Year

Panel A: Graduate Degree

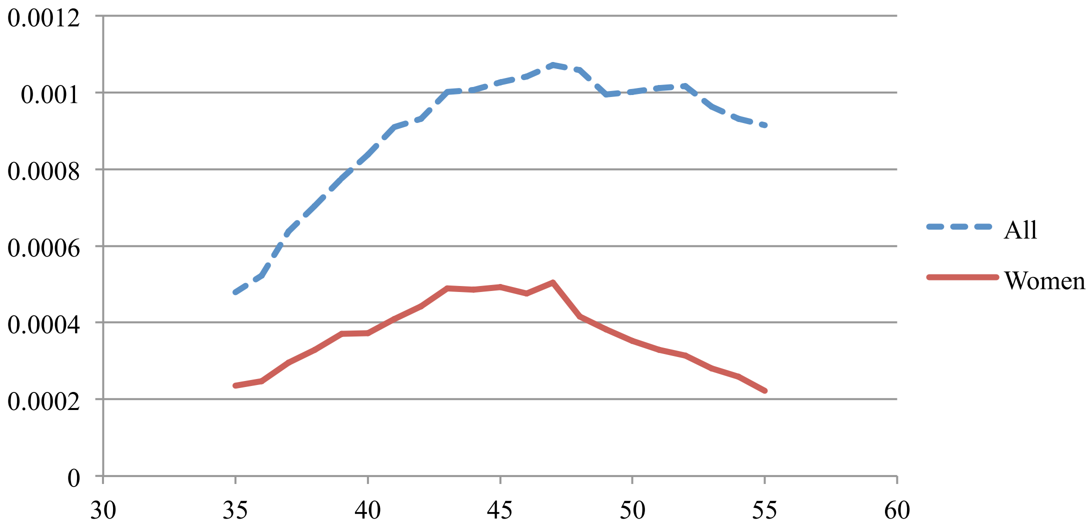


Panel B: Undergraduate Degree



Dashed line reports the results for business degree and the solid line includes social studies and law in addition to business degrees. The graphs report coefficient of female*D(Year=y) in a regression predicting whether individual obtained a business (or a social studies, law or business) degree in that year. Year 2000 is the reference year.

Appendix Figure 1:
Probability of Becoming an ASA Board Member, by Age



Appendix Figure 2: Change in Women's Probability of Becoming a Board Member

2004-2010 Cohort vs. 1998-2003 Cohort

(as a Function of Baseline Percentile of the Board Human Capital Index)

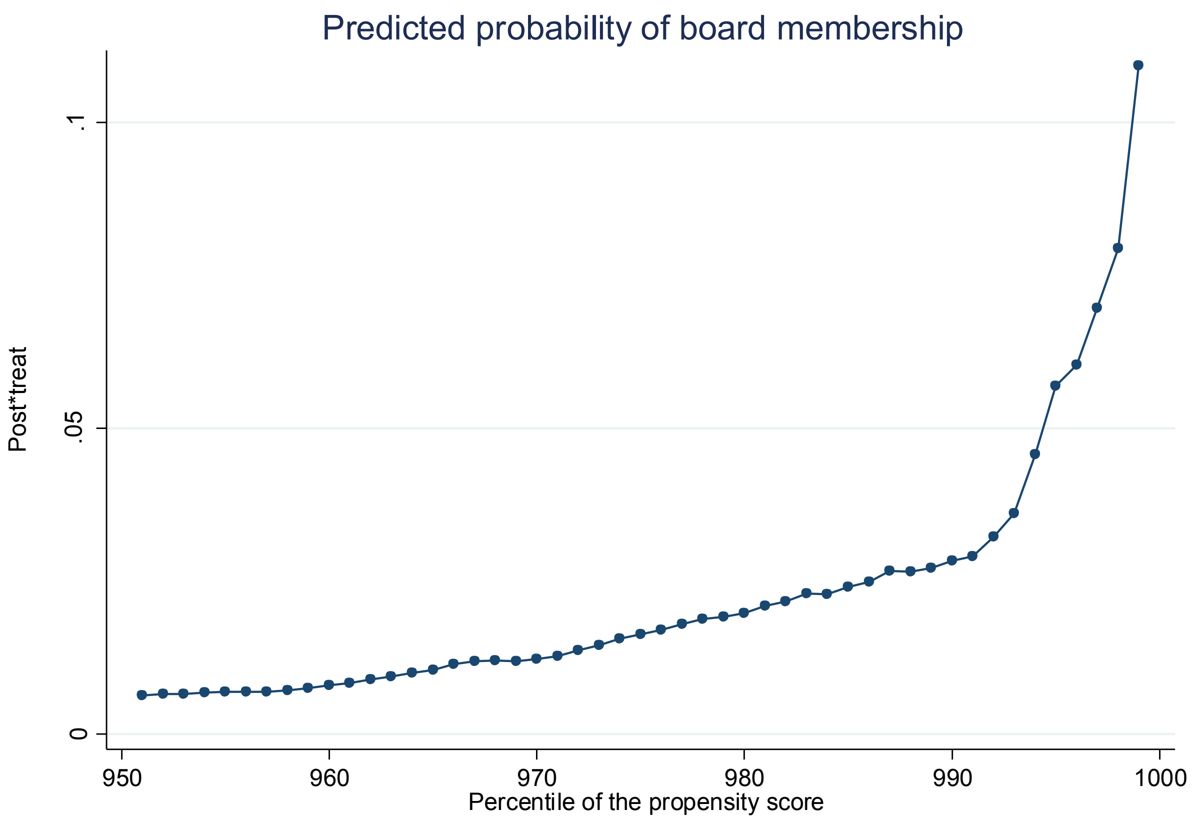


Figure reports the coefficient of post*treat in regression where ASA=1 is the outcome, post=1 if the year is 2004 or later, and treat=1 for individual i if i's predicted propensity of becoming a board member is above the nth percentile of the propensity score distribution. The propensity to become a board member is predicted by first estimating the probability of becoming a board member among males in the pre-period based on their covariates. We then use the estimated coefficients to predict the likelihood that a woman will become a board member based on her covariates.

Appendix Figure 3: Finding cutoff percentile

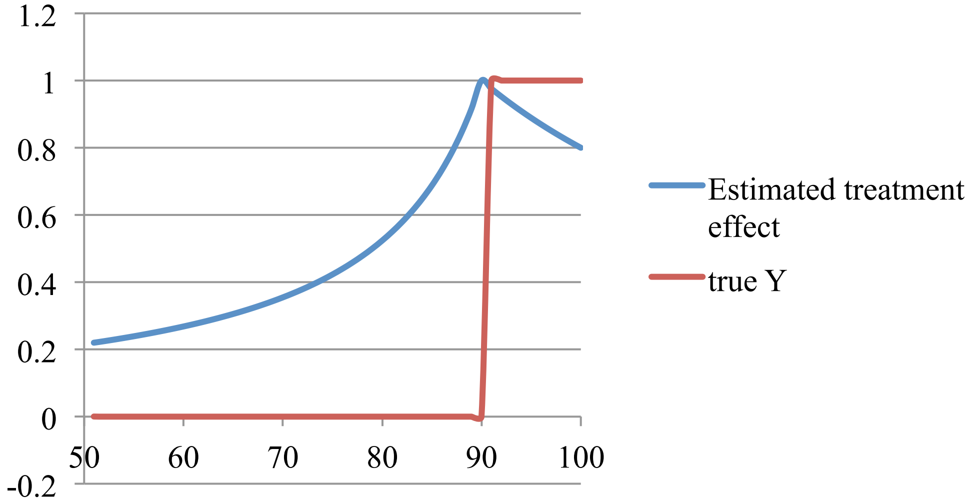


Table 1: Characteristics of Board Members in firms covered by Legislation

	ASA Boards				Intent-To-Treat Boards (ASA 2003)			
	Male		Female		Male		Female	
	1998-2003	2004-2010	1998-2003	2004-2010	1998-2003	2004-2010	1998-2003	2004-2010
Pre-appointment characteristics								
Highest grade completed	14.45	14.5	14.13	14.87	14.49	14.46	14.2	14.63
Business degree	0.32	0.35	0.21	0.37	0.32	0.37	0.2	0.39
MBA degree	0.18	0.2	0.08	0.19	0.17	0.2	0.08	0.18
Age	47.75	49.54	44.2	45.63	47.86	49.37	44.3	45.84
Log of earnings	13.43	13.68	13.18	13.5	13.47	13.67	13.22	13.5
Earnings rank in cohort and degree	83.03	82.92	77.21	78.94	83.51	83.34	79.06	80.01
Earnings rank in cohort/degree>90th percentile	0.61	0.62	0.43	0.51	0.62	0.62	0.46	0.52
Top 5 earner in firm	0.48	0.51	0.24	0.33	0.48	0.49	0.25	0.32
Spouse is ASA board member	0	0.01	0.08	0.09	0	0.01	0.08	0.08
Post-appointment characteristics								
Working more than 30 hours/week	0.75	0.72	0.8	0.72	0.75	0.75	0.8	0.72
Log of earnings	13.65	13.96	13.33	13.78	13.67	13.97	13.37	13.73
Earnings rank in cohort	89.66	90.7	86.37	88.82	90.26	90.95	87.24	88.17
Earnings ranking in cohort and degree	85.18	86.09	80.63	83.38	85.65	86.6	82.09	82.97
Earnings rank in cohort/degree>90th percentile	0.67	0.69	0.52	0.59	0.68	0.69	0.54	0.58
Married	0.81	0.8	0.65	0.68	0.81	0.79	0.65	0.67
Has kids	0.87	0.9	0.75	0.83	0.87	0.88	0.74	0.82
Number of kids	1.88	2.03	1.48	1.65	1.87	2	1.46	1.62
Spouse is ASA board member	0.01	0.02	0.12	0.07	0.01	0.02	0.12	0.06
N observations (board position*year)	10388	6888	799	3094	9493	7072	728	2425
N individuals	3180	2274	342	945	2788	2065	294	731

Table 2: Gender Gaps in Earnings among Board members 1998-2010

	No Board FE		Board FE	
Dependent variable: Log(earnings)	Pre-reform 1998-2003	Post-reform 2004-2010	Pre-reform 1998-2003	Post-reform 2004-2010
	1	2	3	4
Panel A: ASA firm				
Female	-0.297***	-0.252***	-0.384***	-0.276***
	[0.060]	[0.043]	[0.056]	[0.038]
Male mean	13.65	13.96		
Female mean	13.33	13.78		
N females	796	3075		
N	11,065	9,913	11,065	9,913
N boards	638	571	638	571
Panel B: ASA in 2003				
Female	-0.283***	-0.282***	-0.384***	-0.318***
	[0.064]	[0.045]	[0.060]	[0.040]
1998-2003 Male mean	13.67	13.97		
1998-2003 Female mean	13.37	13.73		
1998-2003 N women	726	2410		
N	10,115	9,433	10,115	9,433
N boards	473	373	473	373

Sample includes all individuals observed serving in ASA boards (panel A) or serving in boards of firms that were ASA in 2003 (panel B). Standard errors [in brackets] clustered at the individual level. Regression includes controls for age, age squared, experience, experience squared, and year dummies. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 3: Effect of being board member on labor market outcomes.
Sample includes all individuals ever observed serving on AS or ASA Boards

		ALL firms		ASA Firms	
Dependent variable	Group	Pre-reform (1998-2003)	Post reform (2004-2010)	Pre-reform (1998-2003)	Post reform (2004-2010)
Log of annual earnings	Women	0.0444***	0.0298***	0.0940***	0.0784***
		[0.004]	[0.003]	[0.025]	[0.017]
	Men	0.00911***	0.00572***	0.0468***	0.101***
		[0.002]	[0.002]	[0.013]	[0.016]
Top 5 earner in firm	Women	0.128***	0.128***	0.0322*	0.0260**
		[0.002]	[0.002]	[0.017]	[0.011]
	Men	0.145***	0.155***	0.0287***	0.0228***
		[0.001]	[0.001]	[0.007]	[0.008]
Observations for women		549,152	628,390	7,548	8,878
Observations for men		1,583,471	1,750,024	28,582	30,501

Each coefficient comes from a separate regression by gender and time period.Specification includes age, age squared, experience, experience squared, year dummies and individual fixed effects. Standard errors [in brackets] are clustered at the person level. *** p<0.01, ** p<0.05, * p<0.1

Table 4: Effect of Board Gender Quota on Female Representation in ASA Groups

Instrumental Variable Regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Treated ASA Business Groups								
Dependent Variable:	*Employee is a…*							
	woman		*woman with an MBA*		*woman with kid*		*woman working part-time*	
Percent Women on Board$_t$	-0.0291	-0.0316	-0.0111**	-0.0106**	-0.00948	-0.00980	0.00227	-0.000399
	[0.046]	[0.047]	[0.005]	[0.005]	[0.031]	[0.032]	[0.015]	[0.015]
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects*Year Trend	No	Yes	No	Yes	No	Yes	No	Yes
Observations	763,454	763,454	754,223	754,223	763,454	763,454	763,451	763,451
R-squared	0.095	0.095	0.008	0.008	0.065	0.065	0.055	0.055
Panel B: Intent-to-Treat ASA Business Groups								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dependent Variable:	*Employee is…*							
	woman		*woman with an MBA*		*woman with kid*		*woman working part-time*	
Percent Women on Board$_t$	-0.0320	-0.0324	-0.0117*	-0.0102	-0.00988	-0.0106	0.00405	0.0129
	[0.039]	[0.040]	[0.007]	[0.007]	[0.025]	[0.026]	[0.025]	[0.025]
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects*Year Trend	No	Yes	No	Yes	No	Yes	No	Yes
Observations	731,696	731,696	723,067	723,067	731,696	731,696	731,693	731,693
R-squared	0.112	0.112	0.010	0.010	0.067	0.067	0.095	0.095

Note: Sample includes all individuals working in a treated ASA group (Panel A) or intent-to-treat ASA group (Panel B). "Percent Women on Board" is the percentage of women on a board of a given parent firm in a given year; it is instrumented for by the percentage of women on a board in 2003 interacted with year dummies. Appendix Table reports first stage regressions. Industry fixed effects correspond to 20 industry categories. Standard errors are clustered at the ultimate parent firm level. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Effect of Board Gender Quota on Female Representation in Top Earnings Positions

Instrumental Variable Regressions

Panel A: Individuals Employed in Treated ASA Business Groups

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Subsample:	Females						Females with kids					
Dependent Variable:	*I(Top 1 earner in group and year)*			*I(Top 5 earner in group and year)*			*I(Top 1 earner in group and year)*			*I(Top 5 earner in group and year)*		
Percent Women on Board$_t$	0.000320	0.000328	0.000407	0.00910*	0.00936**	0.00957**	0.000479	0.000584	0.000692	0.00860*	0.00899*	0.00890*
	[0.001]	[0.001]	[0.001]	[0.005]	[0.005]	[0.005]	[0.002]	[0.002]	[0.002]	[0.005]	[0.005]	[0.005]
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects*Year Trend	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Individual controls	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Observations	230,946	230,946	228,450	230,946	230,946	228,450	161,747	161,747	161,114	161,747	161,747	161,114
R-squared	0.174	0.174	0.176	0.289	0.294	0.297	0.201	0.201	0.202	0.319	0.325	0.328

Panel B: Individuals Employed in Intent-to-Treat ASA Business Groups

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Subsample:	Females						Females with kids					
Dependent Variable:	*I(Top 1 earner in group and year)*			*I(Top 5 earner in group and year)*			*I(Top 1 earner in group and year)*			*I(Top 5 earner in group and year)*		
Percent Women on Board$_t$	0.00216	0.00282	0.00348*	0.0120*	0.0115	0.0130*	0.00325	0.00465	0.00488*	0.0224**	0.0221**	0.0226**
	[0.002]	[0.002]	[0.002]	[0.007]	[0.008]	[0.008]	[0.002]	[0.003]	[0.003]	[0.010]	[0.010]	[0.010]
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects*Year Trend	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Individual controls	No	No	Yes	No	No	Yes	No	No	Yes	No	No	Yes
Observations	215,133	215,133	212,283	215,133	215,133	212,283	147,344	147,344	146,516	147,344	147,344	146,516
R-squared	0.119	0.120	0.122	0.250	0.251	0.255	0.140	0.141	0.141	0.278	0.279	0.283

Note: Sample includes all women working in a treated ASA group (Panel A) or intent-to-treat ASA group (Panel B). "Percent Women on Board" is the percentage of women on a board of a given parent firm in a given year; it is instrumented for by the percentage of women on a board in 2003 interacted with year dummies. Appendix Table reports first stage regressions. Industry fixed effects correspond to 20 industry categories. Individual controls include: quadratic in age, education dummies, marital status dummy, kid dummy. Standard errors are clustered at the ultimate parent firm level. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Effect of Board Gender Quota on Female Outcomes in ASA Groups

Instrumental Variable Regressions

Panel A: Individuals Employed in Treated ASA Business Groups									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Subsample:	Females								
Dependent Variable:	*Employee's earnings in top …. of business group's earnings distribution (Y=1):*								
	Quartile			*Decile*			*Vigintile*		
Percent Women on Board$_t$	-0.0627***	-0.0592***	-0.0267	-0.0258***	-0.0267***	-0.0140	-0.00322	-0.00594	0.00149
	[0.021]	[0.021]	[0.027]	[0.010]	[0.010]	[0.014]	[0.007]	[0.007]	[0.009]
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects*Year Trend	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Individual controls	No	No	Yes	No	No	Yes	No	No	Yes
Observations	230,941	230,941	228,445	230,941	230,941	228,445	230,941	230,941	228,445
R-squared	0.013	0.013	0.140	0.007	0.007	0.068	0.006	0.006	0.037
Panel B: Individuals Employed in Intent-to-Treat ASA Business Groups									
	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Subsample:	Females								
Dependent Variable:	*Employee's earnings in top …. of business group's earnings distribution (Y=1):*								
	Quartile			*Decile*			*Vigintile*		
Percent Women on Board$_t$	-0.0811***	-0.0704**	-0.0379	-0.0330**	-0.0309**	-0.0174	-0.00873	-0.00658	0.00193
	[0.025]	[0.028]	[0.041]	[0.014]	[0.014]	[0.025]	[0.008]	[0.009]	[0.012]
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects*Year Trend	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes
Individual controls	No	No	Yes	No	No	Yes	No	No	Yes
Observations	215,123	215,123	212,273	215,123	215,123	212,273	215,123	215,123	212,273
R-squared	0.019	0.019	0.141	0.009	0.009	0.072	0.007	0.007	0.039

Note: Sample includes all women working in a treated ASA group (Panel A) or intent-to-treat ASA group (Panel B). "Percent Women on Board" is the percentage of women on a board of a given parent firm in a given year; it is instrumented for by the percentage of women on a board in 2003 interacted with year dummies. Appendix Table reports first stage regressions. Industry fixed effects correspond to 20 industry categories. Individual controls include: quadratic in age, education dummies, marital status dummy, kid dummy. Standard errors are clustered at the ultimate parent firm level. *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Gender Gaps in Earnings among Top Business Earners, Ages 35-55.
Dependent variable: Log(annual earnings)

Sample	All		Dropping Board Members		Dropping Board Members--Last three years only	
Affected group:	Pscore>99.5	P98 & bus	Pscore>99.5	P98 & bus	Pscore>99.5	P98 & bus
Panel A: Basic Specification						
Female*(2004-2010)	0.0124	0.0301	-0.0160	-0.0292	0.00315	-0.0371
	[0.035]	[0.050]	[0.036]	[0.055]	[0.046]	[0.069]
Female*(1992-1998)	0.00644	0.0391	0.0489	0.0704	0.0532	0.0234
	[0.052]	[0.082]	[0.052]	[0.090]	[0.072]	[0.142]
Female	-0.129***	-0.132***	-0.157***	-0.134***	-0.153***	-0.111**
	[0.032]	[0.041]	[0.031]	[0.044]	[0.041]	[0.055]
1998-2003 Male mean	*13.71*	*13.73*	*13.66*	*13.68*	*13.69*	*13.71*
1998-2003 Female mean	*13.51*	*13.57*	*13.43*	*13.52*	*13.47*	*13.58*
1998-2003 N women	*2002*	*802*	*1735*	*664*	*704*	*266*
N	*110,375*	*44,934*	*97,405*	*38,153*	*37,684*	*14,817*
% obs from women	*0.0729*	*0.0680*	*0.0680*	*0.0622*	*0.0709*	*0.0622*
Panel B: controlling for lagged Y						
Female*(2004-2010)	0.00357	-0.000912	-0.00334	-0.0233	0.00484	-0.0393
	[0.015]	[0.023]	[0.015]	[0.026]	[0.022]	[0.034]
Female*(1992-1998)	-0.00656	-0.0122	0.0132	0.00130	-0.00383	-0.0628
	[0.021]	[0.038]	[0.022]	[0.042]	[0.039]	[0.069]
Female	-0.0373***	-0.0297	-0.0528***	-0.0352*	-0.0417**	-0.00154
	[0.013]	[0.019]	[0.013]	[0.021]	[0.020]	[0.028]
1998-2003 Male mean	*13.71*	*13.73*	*13.66*	*13.68*	*13.69*	*13.71*
1998-2003 Female mean	*13.51*	*13.57*	*13.43*	*13.52*	*13.47*	*13.58*
1998-2003 N women	*2002*	*802*	*1735*	*664*	*704*	*266*
N	*110,028*	*44,817*	*97,089*	*38,046*	*37,509*	*14,754*
% obs from women	*0.0729*	*0.0680*	*0.0680*	*0.0622*	*0.0709*	*0.0622*

The regressions also control for year dummies, age, age squared, potential experience dummies, and fixed individual characteristics (an indicator for whether the individual was working at the time of selection into his or her cohort, as well as marital status and presence of children at the time the individual was selected into his or her cohort). Standard errors [in brackets] clustered at the person level. *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Gender Gaps in Representation in Top Positions within Firms, Ages 35-55.
Dependent variable: I(Top 5 earner in firm and year)

	All		Dropping Board Members		Dropping Board Members-- Last three years only	
Affected labor market group:	Pscore>99.5	P98 & bus	Pscore>99.5	P98 & bus	Pscore>99.5	P98 & bus
Panel A: Basic Specification						
Female*(2004-2010)	-0.0520**	-0.0481	-0.0649***	-0.0614	-0.0639**	-0.0135
	[0.023]	[0.038]	[0.025]	[0.042]	[0.032]	[0.056]
Female*(1992-1998)	0.0757***	0.0742**	0.0765***	0.0880**	0.0721**	0.111**
	[0.023]	[0.034]	[0.023]	[0.037]	[0.029]	[0.049]
Female	-0.0580***	-0.0680**	-0.0628***	-0.0863**	-0.0632**	-0.109**
	[0.020]	[0.033]	[0.021]	[0.036]	[0.028]	[0.048]
1998-2003 Male mean	*0.362*	*0.464*	*0.339*	*0.438*	*0.393*	*0.514*
1998-2003 Female mean	*0.299*	*0.384*	*0.275*	*0.345*	*0.330*	*0.396*
1998-2003 N women	*2026*	*810*	*1759*	*672*	*719*	*270*
N	*111,224*	*45,232*	*98,183*	*38,415*	*38,093*	*14,968*
% obs from women	*0.0729*	*0.0680*	*0.0680*	*0.0622*	*0.0709*	*0.0622*
Panel B: controlling for lagged Y						
Female*(2004-2010)	9.49e-05	-0.00156	-0.00466	-0.00384	-0.0209*	-0.00502
	[0.009]	[0.015]	[0.010]	[0.017]	[0.012]	[0.022]
Female*(1992-1998)	0.0284***	0.0306**	0.0274***	0.0351**	0.0138	0.0209
	[0.009]	[0.014]	[0.009]	[0.015]	[0.011]	[0.018]
Female	-0.0227***	-0.0292**	-0.0227***	-0.0355**	-0.00882	-0.0218
	[0.008]	[0.014]	[0.008]	[0.015]	[0.011]	[0.018]
1998-2003 Male mean	*0.362*	*0.464*	*0.339*	*0.438*	*0.393*	*0.514*
1998-2003 Female mean	*0.299*	*0.384*	*0.275*	*0.345*	*0.330*	*0.396*
1998-2003 N women	*2026*	*810*	*1759*	*672*	*719*	*270*
N	*111,223*	*45,232*	*98,182*	*38,415*	*38,093*	*14,968*
% obs from women	*0.0729*	*0.0680*	*0.0680*	*0.0622*	*0.0709*	*0.0622*

The regressions also control for year dummies, age, age squared, potential experience dummies, and fixed individual characteristics (an indicator for whether the individual was working at the time of selection into his or her cohort, as well as marital status and presence of children at the time the individual was selected into his or her cohort). Standard errors [in brackets] clustered at the person level. *** p<0.01, ** p<0.05, * p<0.1.

Table 9: Gender Gaps in (Log) Earnings Among Cohorts of Recent Graduates

Sample:	Recent Graduate Degree		Recent Graduate Degree--Last three years only	
Treated defined as having degree in:	Business	Business, law, or social studies	Business	Business, law, or social studies
Female*(2004-2010)	-0.0135	0.00336	0.0184	0.0189
	[0.019]	[0.012]	[0.023]	[0.014]
Female*(1992-1998)	0.0825***	0.0588***	0.0782**	0.0606***
	[0.026]	[0.016]	[0.032]	[0.019]
Female	-0.223***	-0.273***	-0.307***	-0.337***
	[0.015]	[0.009]	[0.019]	[0.011]
N	75,495	151,003	32,041	64,182

Table 10: Awareness, Attitudes, and Expectations of Business Students, Fall 2013

	Men	Women
Are You Aware of the Board Gender Quota Law?		
Yes	0.75	0.7
	(0.43)	(0.46)
Impact on Earnings 10 Years After Graduation?		
Increased	0.12	0.54
	(0.33)	(0.50)
Decreased	0.27	0.05
	(0.44)	(0.21)
Impact on Likelihood of Attaining Top 5 Executive Position		
Increased	0.05	0.69
	(0.23)	(0.46)
Decreased	0.49	0.01
	(0.50)	(0.11)
Likely Impact on Businesses?		
Good for Businesses	0.29	0.45
	(0.45)	(0.50)
Bad for Businesses	0.43	0.21
	(0.50)	(0.41)
Likely Impact on Women in Business?		
Good for Women in Business	0.63	0.7
	(0.48)	(0.46)
Bad for Women in Business	0.2	0.12
	(0.40)	(0.32)
Impact on Desired Number of Children		
Increased	0	0.01
		(0.10)
Decreased	0.03	0.05
	(0.17)	(0.22)
Impact on Timing of Children		
Later	0.04	0.12
	(0.20)	(0.32)
Sooner	0.01	0.02
	(0.11)	(0.13)
N	350	414

Appendix Table A1: ASA Firms

Year	N of ASA firms	N of ASA firms, conditional on ASA in 2003	N of ASA firms with non-missing board data	Mean Percentage Women on Board	Median Percentage Women on Board	Mean Number of Women on Board	Median Number of Women on Board	Mean Board Size	Median Board Size
2002	567	507	485	0.06	0.00	0.33	0	5.25	5
2003	563	563	463	0.07	0.00	0.38	0	5.22	5
2004	570	528	472	0.10	0.00	0.53	0	5.26	5
2005	453	346	436	0.17	0.17	0.98	1	5.43	5
2006	453	296	438	0.23	0.25	1.30	1	5.42	5
2007	423	214	420	0.36	0.40	1.94	2	5.34	5
2008	367	179	364	0.40	0.40	2.18	2	5.45	5
2009	321	157	310	0.40	0.40	2.13	2	5.54	5
2010	279	126	275	0.40	0.40	2.10	2	5.33	5

Appendix Table A2: ASA Parents and Business Groups: Descriptive Statistics

Panel A: "Treated" Sample

Year	N of ASA parents, conditional on ASA in 2003	N of ASA parents, conditional of ASA in 2003, with non-missing board data	Mean Percentage Women on Board	Median Percentage Women on Board	Total number of firms (parents and affiliates)	Mean corporate layer (0=ultimate parent; 1=ultimate parent owns 50% or more; etc)
2002	371	316	0.06	0	3320	1.55
2003	381	324	0.07	0	3386	1.54
2004	340	302	0.10	0	3439	1.66
2005	229	219	0.18	0.2	1783	1.59
2006	201	190	0.24	0.25	1589	1.63
2007	154	152	0.35	0.4	1518	1.73
2008	133	133	0.41	0.4	1542	1.81
2009	114	113	0.40	0.4	1408	1.85
2010	94	92	0.41	0.4	1255	1.89

Panel B: "Intent-to-Treat" Sample

Year	N of parents, conditional on ASA in 2003	N of parents, conditional on ASA in 2003, with non-missing board data	Mean Percentage Women on Board	Median Percentage Women on Board	Total number of firms (parents and affiliates)	Mean corporate layer (0=ultimate parent; 1=ultimate parent owns 50% or more; etc)
2002	365	308	0.06	0.00	3115	1.57
2003	381	324	0.07	0.00	3386	1.54
2004	374	332	0.10	0.00	3482	1.69
2005	297	291	0.16	0.17	1716	1.59
2006	290	277	0.20	0.20	1592	1.63
2007	267	264	0.25	0.33	1384	1.69
2008	259	255	0.28	0.33	1346	1.72
2009	252	247	0.27	0.33	1259	1.75
2010	246	237	0.26	0.33	1117	1.80

Notes: statistics reported in columns 3 to 6 are based on the subsample in column 2 with non-missing board data.

Appendix Table 3: First-Stage Regressions

Dependent Variable: Percentage Women on Board								
Sample:	Treated				Intent-to-Treat			
Unit of analysis:	Individual		Parent Company		Individual		Parent Company	
Pct Women on Board in 2003*:								
2004 Dummy	-0.310***	-0.334***	-0.0839*	-0.0849*	-0.219**	-0.226**	-0.0715	-0.0829*
	[0.099]	[0.102]	[0.050]	[0.051]	[0.104]	[0.104]	[0.045]	[0.046]
2005 Dummy	-0.529***	-0.549***	-0.261***	-0.250***	-0.540***	-0.555***	-0.306***	-0.318***
	[0.112]	[0.113]	[0.074]	[0.076]	[0.108]	[0.109]	[0.072]	[0.073]
2006 Dummy	-0.452***	-0.471***	-0.370***	-0.357***	-0.394***	-0.413***	-0.480***	-0.492***
	[0.109]	[0.110]	[0.084]	[0.086]	[0.106]	[0.110]	[0.088]	[0.089]
2007 Dummy	-0.823***	-0.844***	-0.710***	-0.707***	-0.646***	-0.666***	-0.657***	-0.677***
	[0.096]	[0.097]	[0.078]	[0.080]	[0.083]	[0.086]	[0.098]	[0.099]
2008 Dummy	-0.957***	-0.983***	-0.791***	-0.777***	-0.766***	-0.797***	-0.670***	-0.688***
	[0.079]	[0.080]	[0.072]	[0.076]	[0.073]	[0.086]	[0.104]	[0.108]
2009 Dummy	-0.973***	-1.006***	-0.747***	-0.740***	-0.761***	-0.804***	-0.682***	-0.719***
	[0.092]	[0.094]	[0.076]	[0.079]	[0.096]	[0.110]	[0.112]	[0.115]
2010 Dummy	-1.162***	-1.200***	-0.739***	-0.736***	-0.813***	-0.855***	-0.584***	-0.625***
	[0.120]	[0.117]	[0.111]	[0.115]	[0.134]	[0.131]	[0.129]	[0.132]
2004 Dummy	0.0683***	0.0761***	0.0339***	0.0336***	0.0635***	0.0653***	0.0301***	0.0328***
	[0.017]	[0.018]	[0.007]	[0.007]	[0.017]	[0.016]	[0.006]	[0.006]
2005 Dummy	0.182***	0.189***	0.110***	0.107***	0.176***	0.180***	0.102***	0.105***
	[0.025]	[0.025]	[0.013]	[0.013]	[0.021]	[0.021]	[0.010]	[0.011]
2006 Dummy	0.211***	0.217***	0.173***	0.170***	0.176***	0.181***	0.153***	0.157***
	[0.022]	[0.022]	[0.016]	[0.017]	[0.023]	[0.025]	[0.013]	[0.013]
2007 Dummy	0.328***	0.334***	0.312***	0.310***	0.258***	0.263***	0.225***	0.231***
	[0.020]	[0.020]	[0.017]	[0.018]	[0.024]	[0.026]	[0.016]	[0.016]
2008 Dummy	0.371***	0.379***	0.373***	0.369***	0.290***	0.299***	0.252***	0.257***
	[0.017]	[0.017]	[0.011]	[0.012]	[0.024]	[0.029]	[0.016]	[0.017]
2009 Dummy	0.371***	0.382***	0.364***	0.361***	0.272***	0.286***	0.240***	0.249***
	[0.018]	[0.019]	[0.012]	[0.013]	[0.027]	[0.033]	[0.016]	[0.017]
2010 Dummy	0.430***	0.442***	0.374***	0.373***	0.271***	0.284***	0.222***	0.232***
	[0.033]	[0.034]	[0.021]	[0.022]	[0.042]	[0.044]	[0.018]	[0.019]
Firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Fixed Effects*Year Tren	No	Yes	No	Yes	No	Yes	No	Yes
Observations	763,454	763,454	1,368	1,368	731,696	731,696	1,942	1,942
R-squared	0.836	0.839	0.833	0.834	0.715	0.720	0.681	0.687

Note: Industry fixed effects correspond to 20 industry categories. Standard errors are clustered at the parent company level.
*** p<0.01, ** p<0.05, * p<0.1.

Appendix Table 4: Summary Statistics : Employees of ASA firms (2003-2010)

Sample		*All*		*Females*		*Males*	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Female		0.297	0.457				
Age		42.590	10.980	42.143	10.892	42.779	11.011
MBA (Y=1)		0.039	0.194	0.040	0.197	0.039	0.193
Kid(Y=1)		0.697	0.460	0.700	0.458	0.695	0.460
Working part-time		0.070	0.255	0.142	0.349	0.039	0.195
Earnings above Xth pcile in group and year:							
	50th	0.500	0.500	0.302	0.459	0.583	0.493
	75th	0.250	0.433	0.113	0.317	0.308	0.462
	90th	0.101	0.301	0.036	0.186	0.128	0.334
	95th	0.051	0.220	0.016	0.125	0.066	0.247
Top 1 earner in group and year (Y=1)		0.0018	0.0425	0.0003	0.0163	0.0025	0.0496
Top 5 earner in group and year (Y=1)		0.008	0.092	0.002	0.048	0.011	0.105

Note: Reported in the table are summary statistics for individuals employed in treated ASA business groups between 2003 and 2010.