The Importance of Signaling for Women's Careers

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Abstract

Signals of leadership qualification, specifically higher education and professional experience, are more important for women's career advancement than men's. For male directors, these signals increase the probability of entering a leadership position by 6.0% and raise their compensation by 6.8% ($294,800). Female directors are 12.9% more likely to enter a leadership position, and their compensation is 24.2% ($979,400) higher. Results are stronger when information asymmetries are larger: successions after the sudden death of a CEO and in firms with all-male nomination committees, outside hires, and lack of board connections, suggesting that statistical discrimination plays a significant role in these outcomes.

Keywords: Signaling, Gender differences, Corporate Governance, Executive Compensation

JEL Classifications: A14, G34, G35, J16, J31

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1 Introduction

Women are still underrepresented in leadership positions. According to the U.S. Department of Labor, women constituted 46.8% of the labor force in 2023. However, they only held 29.3% of board seats, and made up only 6.4% of all CEOs at firms of the Russell 3000 universe in the second quarter of 2023.[1] Women, on average, also earn less than men. In the US, the gender pay gap amounted to 16.0% in 2023[2] and is particularly pronounced in leadership positions (Bertrand, 2018).

What is the reason for these persisting gender differences? The literature has provided several explanations: They range from differences in preferences for competition and negotiation (Niederle and Vesterlund, 2007; Bowles et al., 2007; Leibbrand and List, 2015), and differences in educational and occupational choices (Blau and Kahn, 2017; Goldin, 2014; Bertrand, 2018) to fertility related choices and motherhood (Bertrand, 2020; Kleven et al., 2019). On top of these differences, double-standards or unequal treatment of male and female employees (e.g., Egan et al. (2022)) up to outright discrimination (e.g., Goldin and Rouse (2000)) have also been shown to contribute to gender gaps on the labor market, suggesting that equally qualified women face systematic disadvantages in hiring and compensation decisions.

According to models of statistical discrimination, female candidates may face a lower hiring probability even when the underlying group characteristics of women and men are equivalent (e.g. Phelps, 1972; Cornell and Welch, 1996; Flabbi et al., 2019). Hiring decisions rely on both observable and unobservable job qualifications, with the latter inferred from noisy skill signals. Statistical discrimination models propose that employers interpret skill signals more accurately for candidates of their own gender due to gender-specific discourse systems (e.g. Scollon et al., 2011; Morgan and Várdy, 2009). Consequently, male employers are better at estimating unobservable qualifications for male candidates, finding it more challenging to assess female applicants' suitability for positions. This uncertainty is particularly relevant for leadership roles, which demand a broad set of unobservable qualifications often associated with masculine traits (i.e., the "think manager-think male" paradigm, e.g. Koenig et al., 2011). Therefore, providing more observable signals of qualification

[1] See `https://www.equilar.com/reports/103-q2-2023-equilar-gender-diversity-index.html` .
[2] See `https://www.dol.gov/agencies/wb/data/earnings/earnings-ratio-wage-gap-race-ethnicity`

for a leadership position might be particularly important for women to counterbalance the higher uncertainty regarding their unobservable qualifications.

In this paper, we empirically show that easily observable signals of leadership qualification are indeed more important for women's career advancement than for men's. Specifically, signals of higher education and professional experience increase male directors' probability of entering a leadership (CEO) position by 6.0% (7.5%) on average, while they increase female directors' probability by 12.9% (38.1%). We find a similar effect for executive compensation. While male executives receive a 6.8% increase in compensation for additional signals of leadership qualification, the effect is significantly stronger for female executives, who receive 24.2% higher total compensation.

Our analysis is based on biographic information for a large sample of 103,461 directors included in the BoardEx database between 2000 and 2019, of whom 15,757 (15.2%) are female. We investigate two categories of leadership qualification signals that have been shown to increase the probability of entering a leadership position and receiving higher compensation: signals of higher education (Useem and Karabel, 1986; Graham et al., 2012) and signals of professional experience (Murphy and Zabojnik, 2004; Custódio et al., 2013). Our proxies for signals of higher education are an education score, which increases with degree levels as in Graham et al. (2012), and a variable indicating whether a director graduated from a Top 50 US college (Useem and Karabel, 1986; Falato et al., 2015). For professional experience, we follow Custódio et al. (2013) and compute a Generalist Index Score for each director in our sample, reflecting general management skills from past work experience. Additionally, we use industry experience as a skill signal, as Denis et al. (2015) highlight its importance in new board formations.

We then run fixed effect regressions where the dependent variable is a dummy variable indicating whether a director is in a leadership position in a given year.[3] Our main independent variables are signals of leadership qualification and their interaction with a female dummy variable. The regressions include standard firm-level and manager-level control variables as well as year and firm fixed effects, or year×firm fixed effects.

Our results show that all signals of leadership qualification increase the likelihood that female directors enter a leadership position more strongly than for male directors. We find that signals

[3]We follow Bertrand and Hallock (2001) and define leadership positions as all executive officers, (vice) chairs and presidents.

of higher educational degrees increase the probability of entering a leadership position by 3.4% for male directors and by 8.3% for female directors relative to the respective baseline probabilities. Graduating from a top 50 US college increases the likelihood of entering a leadership position by 0.3% for male directors and by 6.9% for female directors. Regarding signals of professional experience, we find that general management skills increase the likelihood of male directors reaching a leadership position by 12.4%, while female directors experience a 19.4% increase. Having industry-specific experience is even more important for female directors, increasing the likelihood of entering a leadership position by 7.9% for male directors and 16.8% for female directors, relative to their respective baseline probabilities. It is important to note that in all regressions, the baseline probability of a female director entering a leadership position remains significantly negative, and the provision of observable qualification signals mitigates, but does not eliminate the gender gap in leadership positions.

We complement our main analysis with a survival analysis to assess the impact of leadership qualification signals on directors' career trajectories. Directors are categorized as either high-skill or low-skill, and we estimate hazard functions to examine gender differences in the probability of entering a leadership position. The results confirm that skill signals have a more pronounced impact on female directors' likelihood of entering a leadership position. The disparity in likelihood between high-skill and low-skill directors is greater for women than for men.

Our analysis faces the challenge of identifying the appropriate pool of potential candidates for a given leadership position. Our main results are based on the full BoardEx sample. BoardEx includes all directors working for publicly listed companies with a market cap of at least 10 million USD irrespective of the socio-demographic composition of the board. Thus, we do not expect gender-driven selection when using the full BoardEx sample. Moreover, our analysis reveals no significant gender-based disparities in skill signals between female and male directors, consistent with findings by Kaplan and Sorensen (2021) for female and male CEO candidates. However, including the full BoardEx sample may raise concerns that directors in our sample may actually not belong to the pool of potential candidates for a given leadership position. To mitigate these concerns, we repeat our analysis using the ExecuComp database, which includes only the top five executive directors at a given firm. These directors are likely comparable in their preferences and willingness to lead,

and they should more likely be candidates for CEO positions. Regarding the relative importance of leadership qualification signals for female and male directors, we find the same results as in the BoardEx sample.

Our results could be driven by either a demand side or a supply side channel. On the demand side, models of statistical discrimination (e.g. Phelps, 1972; Cornell and Welch, 1996; Flabbi et al., 2019) predict a higher uncertainty of male employers in judging female applicants' unobservable qualifications for leadership positions. To reduce information asymmetries, the provision of observable signals of leadership qualification should then be more beneficial for female directors. Taste-based discrimination could also play a role (Becker, 1957; Ferreira and Pikulina, 2023), resulting in only the most qualified women reaching leadership positions. Alternatively, our results could be driven by gender differences on the supply side. Exley and Kessler (2022); Cortés et al. (2023) show that female directors often have lower confidence and are less likely to self-promote. As a result, they may only apply for a leadership position if they can provide outstanding qualification signals.[4] A supply-side explanation might be less likely in our setting because our sample consists of BoardEx and ExecuComp directors, who are already in advanced positions, potentially leveling out gender differences in preferences for leadership roles. Moreover, leadership positions at large publicly listed firms are typically filled by a nomination committee and an executive search firm. Directors do not apply for these positions; they are suggested by the search firm, often without their knowledge. The firm then selects candidates to approach for an interview. Therefore, the demand side likely plays a stronger role in the executive search process than the supply side.

To differentiate between a demand side and a supply side explanation, we conduct several tests. First, we exploit CEO death cases as an exogenous shock to the demand side. If a CEO passes away unexpectedly, there is a sudden demand for a new CEO and little time for the firm to engage in extensive background research on potential candidates, i.e., information asymmetries between firms and candidates should be more relevant. In this situation, observable and easily verifiable skill signals may be particularly beneficial for female candidates. At the same time, CEO death cases should not affect the supply side, i.e., gender differences in self promotion or differences in female candidates' willingness to enter a leadership position. Supporting a demand side explanation, we

[4]Note, that recent work by Salwender and Stahlberg (2023) does not find any gender differences in the propensity to apply for a job conditional on self-perceived qualification for the job.

find that our results are stronger for CEO successions after the incumbent CEO has suddenly passed away. Second, we analyze whether our results are weaker for female directors who share professional connections with the board of the company, as this should reduce information asymmetries (Engelberg et al. (2013). We find that skill signals are indeed less important for female directors who are already connected to the board. Third, we conjecture that information asymmetries between female directors and a company should be larger if the nomination committee is composed of male directors only. Again supporting a demand-side channel, our results are stronger for firms that have an all male nomination committee.[5] Finally, we examine inside vs. outside hires, arguing that information asymmetries between female candidates and male employers should be larger for outside hires, and find some supporting evidence. The distinction between inside and outside hires helps identify the type of discrimination driving our main result. Only statistical discrimination predicts stronger effects for outside hires, as information asymmetries are irrelevant for taste-based discrimination. Since we find stronger effects for outside hires, statistical discrimination appears to be a key factor. This, however, does not rule out that alternative channels are also at play.

In the final step, we assess whether leadership qualification signals impact compensation, particularly if they benefit female directors more than male directors. While highly qualified women among top executives might be reluctant to pursue CEO roles, it is implausible they would be more reluctant to accept higher pay. Models of statistical discrimination (e.g. Flabbi et al., 2019) suggest that male employers' difficulty to accurately judge female directors' unobservable leadership skills may also translate into higher uncertainty regarding the value a female director adds to the firm. We find that all skill signals increase female directors' compensation more than male directors' compensation. For example, graduating from a Top 50 college raises male directors' total compensation by 5.2% ($223,900), while female directors receive a 31.7% increase ($1,282,500). Observable skill signals mitigate, but do not eliminate, the gender pay gap, with baseline compensation consistently lower for women.

[5]Note that these results also rule out another alternative story, according to which the same skill signal may be more informative if it is obtained by a female director than by a male director. For example, employers may put more weight on a degree from a Top 50 college obtained by a woman if it was more difficult for women to enter these schools. This, however, would be hard to reconcile with the fact that our results differ based on the gender composition of nomination committees.

The main contribution of our paper is to show that female directors' careers benefit more from the provision of objective leadership-qualification signals than careers of male directors. Our results provide empirical support for models of statistical discrimination (e.g. Phelps, 1972; Cornell and Welch, 1996; Flabbi et al., 2019). They also show that the overall probability of entering a leadership position and the level of executive compensation is still lower for female directors than for male directors, even if female directors engage more in signaling.

The following papers provide comparable insights and augment our findings. Benson et al. (2024) investigate promotion decisions in a large retail chain and find that men's promotions are more strongly based on future potential, while women's promotion depends more on their past performance. Egan et al. (2022) provide evidence of unequal treatment of female financial advisers compared to their male counterparts, i.e., female advisers are 20% more likely to lose their jobs after misconduct incidents than male advisers even though they generally engage in misconduct that is 20% less costly than that of male advisers and have a significantly lower likelihood of repeat offenses. In an academic context, Sherman and Tookes (2022) and Heckman and Moktan (2020) examine the likelihood of finance and economics assistant professors to get tenure. For later sample years, Sherman and Tookes (2022) show that the marginal impact of sole-authored top publications on the likelihood to get tenure is significantly higher for female finance professors than for male finance professors. Similarly, Heckman and Moktan (2020) show that female faculty in economics need to provide more top five publications than male faculty to get tenure. They also show that there are no gender differences in the quality of these articles. Finally, Lang and Manove (2011) show that educational attainment conditional on participating in the Armed Forces Qualification Test is higher for African Americans than for Caucasian candidates. They explain this with African Americans' higher needs of signaling due to statistical discrimination in the labor market. Even though these papers focus on other settings, their results point in the same direction as ours: Members of minority groups may face different hiring standards which make it more important for them to document past achievements to advance their careers.

2 Data and summary statistics

2.1 Sample Construction

Our main sample comprises variables from BoardEx Northamerica, provided by Management Diagnostic Limited, and from Compustat's ExecuComp database. In the first step, we compute proxies for directors' skill signals from their biographic information in the BoardEx database. The data cover active and inactive US publicly traded companies with a market capitalization of at least 10 million dollars. BoardEx data enable us to identify each director's educational background and professional experience, as well as detailed information about their current job, including, the company they work for and their position. Our analysis is based on a sample running from 2000 to 2019, as the reliability of BoardEx data decreases considerably before 2000 (Engelberg et al., 2013).

In the second step, we merge company information from CRSP/Compustat with the BoardEx sample. We include the following firm characteristics in our analysis: total assets, book to market ratio, annual stock return and idiosyncratic volatility. They are defined in detail in Variable Appendix A1. To merge the data, we proceed in two steps. First, BoardEx provides ISINs for most active companies. We use these ISINs to construct the CUSIP numbers and merge firms with CRSP/Compustat data by CUSIPs. If this does not result in a match or if BoardEx does not provide an ISIN, we apply the Levenshtein algorithm to the company names in both databases and manually check the matches. This process results in 9,399 unique companies in our combined BoardEx/Compustat sample. We winsorize all company control variables at the 1% and 99% level.

In the third step, we follow Bertrand and Hallock (2001) and classify directors into different occupations based on their role name in BoardEx. We categorize directors as CEO, Chair, Vice Chair, President, CFO, COO, Other Chief Officers, Executive VP, Senior VP, Group VP and VP. We exclude observations of directors in management positions below those classified by Bertrand and Hallock (2001), as BoardEx provides less accurate and comprehensive information for those roles. We then define a dummy variable, Leadership position, which equals one if a director is a CEO, Chair, Vice Chair, President, CFO, COO, or Other Chief Officer of the company, and zero if a director's position is one of the other categories. Alternatively, we define a dummy variable, CEO, which equals one if a director is a CEO in a given year, and zero otherwise.

The sample consists of 15,757 unique female directors and 87,704 unique male directors working for 6,932 companies. We observe at least one female director in 5,216 companies, while 1,716 companies have no female director. Figure 1 shows that 13.1% of all directors in a leadership position are female. In 2000, there are only 809 (6.7%) female directors in leadership positions in the sample, compared to 11,307 male directors. This fraction increases to 16.6% (2,626) of female directors in leadership positions by 2019.

Finally, we merge compensation data from ExecuComp to CRSP/Compustat company information based on the common company identifier (gvkey). Since there is no common unique identifier for directors in ExecuComp and BoardEx, we manually verify that compensation is correctly matched to each director based on directors' names. Overall, we match 84% of the director-year observations in ExecuComp with the combined BoardEx and CRSP/Compustat data set.[6] We use this smaller sample of 7,613 unique directors who are already member of the board (375 female and 7,238 male) to address the trade-off between comparability of directors and inclusion of all potential candidates for leadership positions.

2.2 Variable Construction

We use directors' biographical information in BoardEx to compute proxies for skill signals reflecting education and professional experience, as these variables have been shown to predict career advancement and compensation (Spilerman and Lunde, 1991; Custódio et al., 2013; Kaplan and Sorensen, 2021).

Education. Following Graham et al. (2012), we define an Education Score for each director in our sample. A director's Education Score is assigned a value of one if her highest degree is a Bachelor's degree, two if her highest degree is a Master's, advanced law degree and/or MBA, three if her highest degree is a PhD, and zero otherwise. Alternatively, we measure the prestige of the university/college from which a director graduated and define a dummy variable, Top 50 ranked college, which equals one if a director obtained a Bachelor's degree, Master's degree, law degree or

[6] We use compensation data from ExecuComp instead of compensation data from BoardEx for two reasons. First, ExecuComp provides compensation data for a larger fraction of directors. In our final sample, only 30% of the director-company-year observations have compensation data in BoardEx. Second, as most US studies use ExecuComp data, using ExecuComp data allows us to compare our results to the existing literature on CEO pay in the US (Fernandes et al., 2013).

a PhD degree from a Top 50 ranked college, and zero otherwise. A Top 50 ranked college is defined according to Forbes America's Top Colleges List.[7]

Professional experience. We proxy for signals of professional experience based on directors' employment history in BoardEx. All professional skill measures are based on job experience before the current employment. First, we follow Custódio et al. (2013), and estimate a Generalist Index as:

$$\begin{aligned} Generalist\ Index = {} & 0.268 * \ Number\ of\ Positions + 0.312 * \ Number\ of\ Firms \\ & + 0.309 * \ Number\ of\ Industries + 0.281 * \ CEO\ Experience \\ & + 0.153 * \ Conglomerate\ Experience \end{aligned} \tag{1}$$

where *Number of Positions* (*Firms / Industries*) is defined as the number of different positions (firms/industries) the director worked in before the current employment, *CEO Experience* is a dummy variable that is equal to one if the director was CEO at a listed firm before, and zero otherwise. *Conglomerate Experience* is an indicator that equals one if the director worked at a listed firm with more than one segment before her current employment, and zero otherwise. Second, as directors' industry experience is considered a crucial criterion during the formation of new boards (Denis et al., 2015), we define a dummy variable capturing job experience within the same industry. It equals one if a director has already worked in the same industry before her current employment, and zero otherwise.

2.3 Summary statistics

Panel A of Table 1 shows summary statistics of director characteristics. Directors are on average 50 years old, and 15% are female. 45% of directors hold leadership positions, and 10% are CEO. The average annual compensation for directors is $4.29 million. While the bottom 1% of directors in our sample earn less than $200,000 per year, the top 1% of directors earn more than $19.80 million per year, indicating a right-skewed distribution of total compensation. Hence, we use the

[7] See Appendix Table OA1 for a list of all schools included in the Top 50 rank.

inverse hyperbolic sine of total compensation in our regression analysis (Aihounton and Henningsen, 2021).[8] It is also reported in Panel A to facilitate effect size calculations.

Panel B of Table 1 presents summary statistics of firm characteristics. Total assets range from $12 million to $159.10 billion. Given the right-skewed distribution, we again use the inverse hyperbolic sine of total assets in our regression analysis to proxy for firm size. The median company in our sample has a stock return of 7.8% over the last year and a market to book ratio of 2.15.

In Panel C, we show summary statistics for the full BoardEx sample by director gender.[9] Female directors are, on average, 2.6 years younger than male directors. 32% (47%) of female (male) directors held a company leadership position at some point during the sample period. Additionally, 2% of female directors and 11% of male directors are CEO. Normalized mean differences for these variables are all above 0.25, indicating significant gender differences in age and the likelihood of holding in a leadership position. In contrast, we do not find any significant gender differences in the skill variables, suggesting that female and male directors in our sample possess similar educational and professional backgrounds. This findings aligns with results by Kaplan and Sorensen (2021) for female and male CEO candidates. Results differ when we restrict the sample to ExecuComp and examine gender differences between female and male executive directors (Panel D). Female executive directors have stronger educational and professional backgrounds, suggesting that these women have acquired more skill signals than their male counterparts.[10]

3 Skill signals and the likelihood of entering a leadership position

In this section, we examine whether and to what extent signaling is more important for female directors' career advancement than for male directors'. The empirical challenge is to correctly define the pool of potential candidates considered for a given leadership position. In our baseline analysis, we focus on all directors in the BoardEx database. BoardEx collects the full list of directors working

[8] All directors in our data have compensation greater than zero, thus avoiding issues with zero values in our analysis (Thakral and Tô, 2023).

[9] We report normalized differences calculated following Imbens and Woolridge (2009), as they are independent of sample size and more suitable in our case than t-statistics. Imbens and Wooldridge suggest a threshold of 0.25 to assess systematic differences between subsamples.

[10] Table OA2 provides details on which top schools most female BoardEx directors graduated from. While Harvard, Stanford, and the University of Pennsylvania produce the largest absolute number of female directors, the ratio of female to male directors graduating from the same university is higher for institutions such as Boston University and Georgetown University.

for all publicly listed companies in the US with a market capitalization of at least 10 million USD (Engelberg et al., 2013). It then adds all available information about those directors, i.e., employment history and educational background. When formally examining whether female or male directors might be selected for the BoardEx sample based on different criteria, we find no gender differences between female and male directors (see Panel B of Table 1). However, one could argue that including all BoardEx directors as potential candidates for a leadership position creates a pool that is too large and includes too many individuals who may not be eligible for a given leadership position. Moreover, this large pool includes a very heterogeneous group of individuals who may, for example, differ in preferences for competition and negotiation that are relevant for obtaining a leadership position. Therefore, we repeat our analysis using a smaller sample based on the ExecuComp database. This database only includes the top five executive directors at a given firm, and we investigate their likelihood of becoming CEO. This narrow set of individuals is very likely to belong to the set of potential candidates for a CEO position and should exhibit greater homogeneity in preferences and leadership aspirations. However, the ExecuComp pool may be too small to include all candidates for a leadership position. We believe that showing robust results for both the largest and smallest pool of potential candidates in two different databases is the best way to deal with potential selection concerns. We start our analysis with the following regression for the full BoardEx sample at the director-firm-year level:

(2)

$$\begin{aligned} LeadershipPosition_{\mathrm{d,c,t}} = & \beta_1 Skill\ Signal_{\mathrm{d,t}} + \beta_2 Skill\ Signal_{\mathrm{d,t}}\ x\ Female\ dummy_{\mathrm{d}} \\ & + \beta_3 Female\ dummy_{\mathrm{d}} + \beta_4\ Director\ Age_{\mathrm{d,t}} + \beta_5\ Director\ Age\ Squared_{\mathrm{d,t}} \\ & + \beta_6\ Total\ Assets_{\mathrm{c,t\text{-}1}} + \beta_7\ Return_{\mathrm{c,t\text{-}1}} + \beta_8\ Volatility_{\mathrm{c,t\text{-}1}} \\ & + \beta_9\ Market\ to\ Book_{\mathrm{c,t\text{-}1}} + \alpha_c + \alpha_t + \varepsilon_{\mathrm{d,c,t}} \end{aligned}$$

The dependent variable, *Leadership Position*$_{d,c,t}$, is a dummy variable equal to one if director d is in a leadership position at company c in year t, and zero otherwise. The main independent variables are our various proxies for skill signals, $Skill\ Signal_{\mathrm{d,t}}$. They are measured over directors' lifespan, excluding their current employment.

We interact each skill proxy with a female dummy, $Female\ dummy_{\mathrm{d}}$, which is equal to one for female directors, and zero otherwise. The impact of each signal on male directors' probability to enter a leadership position is captured by coefficient β_1. The marginal impact of each signal for female relative to male directors is captured by the coefficient on the interaction term, β_2. Finally, the baseline gender difference with respect to the likelihood of entering a leadership position is captured by the coefficient on the female dummy, β_3.

Next, we focus on the ExecuComp sample and examine the probability that one of the non-CEO top executives becomes CEO in a given year, conditional on the provision of observable signals of leadership qualification. We focus on the CEO position, because it represents the top of the corporate hierarchy (Baker et al., 1988) and can be considered as the ultimate prize in a tournament for promotion (Kale et al., 2009). We then re-estimate the same regression as in Equation 2, but replace the dependent variable with a dummy variable $CEO_{d,c,t}$, which is equal to one if an executive d is CEO at a given firm c in year t, and zero otherwise.

Following previous literature, we include the following control variables. $Director\ Age_{\mathrm{d,t}}$ and $Director\ Age\ Squared_{\mathrm{d,t}}$ account for the non-linear relationship between director age and the likelihood of becoming CEO (Weisbach, 1988), Murphy and Zimmerman (1993) and Bushman et al. (2010). We also control for firm characteristics that might have an influence on the likelihood that a certain type of CEO is selected by different types of firms. Specifically, we include a firm's total assets, $Total\ Assets_{\mathrm{c,t\text{-}1}}$, as a proxy for size, and the market to book ratio, $Market\ to\ Book_{\mathrm{c,t\text{-}1}}$, as a proxy for its growth opportunities. Previous research shows that large firms and firms with high growth potential select different types of CEOs (Schoar and Zuo, 2017). Firm performance has an impact on CEO turnover and selection (Jenter and Lewellen, 2021). Therefore, the stock return over the past year, $Return_{\mathrm{c,t\text{-}1}}$, is added as control variable. We also include a stock's idiosyncratic volatility, $Volatility_{\mathrm{c,t\text{-}1}}$, as Bushman et al. (2010) show that there is a relationship between CEO turnover (new CEO appointments) and idiosyncratic risk.

Finally, we include firm and year fixed effects (α_c and α_t) or firm×year fixed effects ($\alpha_{c,t}$). In our main specification, we estimate linear probability models and cluster standard errors by firm-year to account for dependencies due to multiple directors working at the same firm in a given year.[11]

[11] Alternatively, we estimate logit regressions with industry and year fixed effects, cluster standard errors by firm only, and add interactions of our control variables and the female dummy, to account for the possibility that our

3.1 Signals of higher education

Higher education in general and degrees from top-ranked colleges in particular have been shown to be crucial for reaching a managerial position (Useem and Karabel, 1986). If statistical discrimination affects recruiting for leadership positions, these objective and observable skill signals may be even more important for female directors. We run fixed effects regressions as described in equation 2 and subsequently include our proxies for education signals, interacted with a female dummy variable, as main independent variables. Results are reported in Table 2. We include firm and year fixed effects in columns (1) and (2) and firm×year fixed effects in columns (3) and (4).

Panel A shows the impact of education signals on (female) directors' likelihood of entering a leadership position, based on the BoardEx sample. First, we include Education Score as a proxy for education-based skill signals in columns (1) and (3). This score ranges from zero to three, reflecting the highest degree (Bachelor, Master, PhD) obtained by a director. We find that increasing the Education Score by one point (i.e., having a Master's instead of a Bachelor's degree) corresponds to a 1.6pp (columns (1) and (3)), or 3.4% (relative to the baseline probability) increase in the likelihood for male directors of entering a leadership position. The Education Score is even more important for female directors. A one point increase of the Education Score increases the likelihood that a female director enters a leadership position by 2.7pp (columns (1) and (3)), or 8.3% in relative terms. Across all specifications, results are statistically significant at the 1% level.

Second, we analyze whether graduating from a Top 50 ranked college increases female and male directors' likelihood of entering a leadership position. This variable is equal to one if a director graduated from a Top 50 ranked college in the US, and zero otherwise.[12] Columns (2) and (4) show that graduating from a Top 50 ranked college has no statistically significant benefit for male directors. However, having graduated from a Top 50 ranked college is a valuable skill signal for female directors. The interaction between Top 50 ranked college and the female dummy is positive and statistically significant at the 1% level. It increases female directors' likelihood of entering a leadership position by 2.2pp (column (2)) to 2.3pp (column (4)) or 6.8% to 7.1% in relative terms.

results are driven by different company characteristics of firms in which male and female directors work. Additionally, we estimate the regressions with person fixed effects and split our sample in two periods, to account for the possibility that our results change over time. Our results are robust to these variations (see Appendix Tables OA3 - OA7).

[12] In Appendix Table OA8, we alternatively use a Top 10 school ranking based on the National University Ranking by Washington Monthly. Our results remain economically and statistically significant.

Panel B presents results from the ExecuComp sample with a CEO dummy as dependent variable. Columns (1) and (3) present results for the Education Score. They show that a one point increase in the Education Score leads to a 3.4pp (column (1)) to 3.7pp (column (3)) increase in the likelihood that a male executive becomes CEO. As indicated by the statistically significant interaction term between Education Score and the female dummy, a one point increase in the Education Score increases the likelihood that a female executive becomes CEO by 7.5pp (column (1)) to 9.1pp (column (3)). In relative terms, this corresponds to a 5.7% to 6.2% increase for male executives, and a 16.3% to 19.8% increase for female executives. In columns (2) and (4) we examine the benefit of a Top 50 ranked college degree for the probability of becoming CEO. We find that graduating from a Top 50 ranked college increases male executives' likelihood of becoming CEO by 6.7pp (column (2)) to 9.5pp (column (4)). We again find an even stronger effect for female executives. Graduating from a Top 50 ranked college increases their likelihood of becoming CEO by 22.5pp (column (2)) to 31.9pp (column (4)). Relative to the baseline probability of becoming CEO, this corresponds to a 11.1% to 15.8% increase for male executives, and a 49.0% to 69.5% increase for female executives.

Results for control variables are broadly in line with the previous literature ((Weisbach, 1988; Murphy and Zimmerman, 1993; Bushman et al., 2010)). Most importantly, we find that female directors are significantly less likely than male directors to enter a leadership position and to become CEO, supporting the vast literature on gender differences in leadership positions (Blau and DeVaro, 2007; Bertrand, 2018; Kaplan and Sorensen, 2021). Adding up coefficients on the baseline gender dummy and the interaction term shows that skill signals mitigate, but do not eliminate, this gap.

3.2 Signals of professional experience

According to Murphy and Zabojnik (2004), general managerial skills have become more important for leadership positions than firm specific skills. In addition, Denis et al. (2015) show that directors' industry experience is a key selection criterion during the formation of new boards. Therefore, we now analyze whether and to what extent general managerial skills and same industry experience gained before working at the current firm are more important for female relative to male directors with respect to the likelihood of entering a leadership position and of becoming CEO. Results are reported in Table 3.

Panel A examines the impact of professional experience and (female) directors' likelihood of entering a leadership position. First, we use the Generalist Index score, following Custódio et al. (2013), as a measure for professional experience in columns (1) and (3). A one standard deviation increase in the Generalist Index score, indicative of stronger general management skills, increases male directors' probability of entering a leadership position by 5.7pp (column (1)) to 5.9pp (column (3)). This corresponds to 12.2% to 12.6% relative to the baseline probability. The interaction term between the Generalist Index and the female dummy is positive and statistically significant at the 1% level in column (1) and at the 10% level in column (3). A one standard deviation increase of the Generalist Index increases female directors' likelihood of entering a leadership position by 6.3pp (columns (1) and (3)) or 19.4% in relative terms. Second, we use same industry experience as a proxy for professional experience, represented by a dummy variable equal to one if a director has worked in the same industry before, and zero otherwise. Columns (2) and (4) show that having same industry experience increases male directors' probability of entering a leadership position by 3.6pp (column (2)) to 3.8pp (columns (4)). Having same industry experience is even more important for female directors. It increases their likelihood of entering a leadership position by 5.4pp (column (4)) to 5.5pp (columns (2)). Relative to the baseline probability, this corresponds to a 7.7% to 8.1% increase for male directors and a 16.7% to 17.0% increase for female directors.

Panel B shows similar results for the ExecuComp sample and the likelihood of female and male executive directors of becoming CEO.[13]

3.3 First-time promotions into leadership positions

We also examine the impact of skill signals for (female) directors' likelihood of entering a leadership position for the first time only. We redefine our dependent variable, *First Leadership Position*$_{d,c,t}$, as one if a director enters a leadership position at a given company for the first time, and zero otherwise, excluding subsequent years where the director remains in that position.

We run the same fixed effect regressions as described in Equation 2. Results, reported in Table 4, show that three skill signals (Education Score, Top50 ranked college and Same Industry Experience) are associated with a higher likelihood of being promoted to a leadership position. This impact is

[13] In a further analysis, we split the generalist index into its components. Appendix Table OA9 shows that all index components increase female directors' likelihood of entering a leadership position more strongly than male directors'.

more pronounced for female directors, who benefit significantly more from these skill signals. Thus, our results hold even when focusing on first-time leadership promotions only.

3.4 Changes over time: Survival analysis

We also conduct a survival analysis, which allows us to analyze the impact of skill signals on male and female directors' career trajectories and see if the importance of these skill signals for entering a leadership position changes over time. Specifically, we estimate hazard functions conditional on directors' skill signals and gender. Our survival analysis examines the probability of a director entering a leadership position at a certain age based on her skill signals, and crucially, whether the impact of these skill signals differs by gender. This enables us to determine whether skill signals lead to earlier promotions and if there are any gender differences. We define directors as high-skilled if their skill signals that are above the median of all four skill signals, and as low-skilled if their skill signals are below the median of all four skill signals. Specifically, a high-skilled director has an above-median Education Score and Generalist Index, has graduated from a Top 50 ranked US college, and possesses industry experience. A low-skill director has a below-median Education Score and Generalist Index, has not graduated from a Top 50 ranked US college, and lacks industry experience. The results are plotted in Figure 2.[14]

The figure shows directors' probability of entering a leadership position by age for four groups: High-skilled male directors (squares), high-skilled female directors (triangles), low-skilled male directors (circles) and low-skilled female directors (diamonds). Until the age of 40, the career trajectories of all groups are quite similar, with less than 2% of directors in a leadership position. After the age of 40, the trajectories start to diverge. Highly skilled female and male directors are most likely to enter a leadership position. By age of 55, 20.78% of female and 20.59% male high-skill directors have entered a leadership position. Between ages of 55 and 70, high-skilled female directors are 3.20pp more likely to have entered a leadership position than their male counterparts (55.02% vs. 51.82%). Above the age of 70, the probability of high-skilled female directors remains constant as no entries into leadership positions are observed in our sample. There are larger differences between male and female directors in the low-skill group. By age 55, 11.76% of low-skilled female directors and 13.93%

[14]Results for each of the four skill signals separately are shown in Figure OA1.

of low-skilled male directors have entered a leadership position. This gap widens with age. By age of 70, low-skilled female directors are 11.81pp less likely to have entered a leadership position than low-skilled male directors (24.64% vs. 36.45%).

Within gender, the difference in the likelihood of entering a leadership position between high- and low-skilled female directors is larger than the corresponding difference between their male counterparts. For example, by age 70, low-skilled female directors are 55.21% less likely to have entered a leadership position than high-skilled female directors (24.64% vs. 55.02%). In contrast, low-skilled male directors are only 29.66% less likely to have entered a leadership position than high-skilled male directors (36.45% vs. 51.82%). This supports our main finding that skill signals are more important for female directors' probability of entering a leadership position than for male directors'.

3.5 Results for vice presidencies

We also examine the second level of corporate hierarchy to assess whether our results are similar for the likelihood of becoming Executive Vice President. Specifically, we repeat the regression outlined in equation 2 substituting the dependent variable with a dummy equal to one if a director is Executive Vice President in a given year, and zero otherwise. To determine the pool of potential candidates for Executive Vice President positions correctly, we restrict the sample to Executive VP, Senior VP, Group VP and VP, i.e., the second level of corporate hierarchy, and exclude all directors in a higher leadership position, i.e. the first level of corporate hierarchy. Results are reported in Table 5. They show that all skill signals are associated with a higher likelihood of becoming Executive Vice President. The impact is again more pronounced for female directors who benefit more from each skill signal, reflected by a larger increase in the likelihood of becoming Executive Vice President. Hence, our findings extend to the second tier of corporate hierarchy, reinforcing their robustness.

4 Demand side vs. supply side channel

Our results can be explained by either a demand side or a supply side channel. On the demand side, statistical or taste-based discrimination could be driving our results. According to models of statistical discrimination, female directors aspiring to attain a leadership position need to provide

more qualification signals because of higher information asymmetries between female candidates and male employers, i.e., male employers find it more difficult to judge on their (unobservable) leadership skills. This effect should be particularly pronounced for leadership positions, as they often have less precise job descriptions and require a complex skill set across many dimensions, including human resource management, financial and strategic planning, and securing new business for the firm. Consequently, there is higher uncertainty regarding a potential match between the job's requirements and the applicant's skill set compared to standardized jobs with primarily routine tasks. As a result, only women with a larger number of easily verifiable skill signals might be able to overcome the hurdle of hiring discrimination.

Alternatively, taste-based discrimination on the demand side could explain our results, i.e., a general distaste of firms for women in leadership positions. While this effect should mostly show up in the gender dummy itself, rather than in the interaction of gender with skill signals, employers' prejudice or dislike of female candidates may result in a higher bar for female directors to reach a leadership position (Becker, 1957), i.e., only those with the largest number of observable skill signals manage to offset gender-stereotypes and prejudice. Similarly, more recent models of subtle discrimination (Ferreira and Pikulina (2023)) would predict that equally qualified women have a lower probability of being appointed to a leadership position. However, unlike statistical discrimination, variation in information asymmetries between female candidates and the firm should not lead to different results, because employers have a general distaste for female candidates in these models.

Our results could also be driven by the supply side, i.e., women being less self-confident than men and only applying for a leadership position if they can provide clearly outstanding qualification signals. In line with this view, Exley and Kessler (2022); Cortés et al. (2023) document gender gaps in self-promotion and job search. However, these gaps are more likely to apply to the broader labor market, as Kaplan and Sorensen (2021) show that female and male candidates for a CEO position are not appreciably different from each other when it comes to risk-taking, career path, or personality. Women and men in our sample are also in top ranked job position and do not differ with respect to their educational or professional backgrounds (see Table 1). Furthermore, the hiring process for CEO appointments is quite different from more general job hirings and is usually overseen by a

nomination committee, which identifies suitable candidates and prepares the corresponding director election. There is usually no formal application process in which potential CEO candidates submit their CVs and job package. Rather, they are approached by members of the nomination committee and/or external search firms. The latter usually create a long list of potential candidates who fulfill the search criteria. The client firm then decides which of these candidates enter the short list, and only then candidates are contacted and learn that they are considered for the position.[15] This casts doubt on a supply side explanation being the main driver of our results and suggests that a demand side channel may play a larger role in the executive search process, which we explore more formally in this section.

4.1 CEO death cases as a shock to the demand side

First, we examine CEO death cases as an unexpected shock to the demand side. According to a survey of board members, roughly half of the firms in the U.S. do not have a CEO succession plan and many of them have not even identified an interim CEO in case a CEO leaves abruptly.[16] Thus, if a CEO suddenly passes away, the firm will have to find a replacement CEO under time pressure with little time left for extensive background research on each candidate. In this situation of increased information asymmetry, observable signals of leadership qualification may be particularly valuable for female candidates if a demand side channel drives our results. At the same time, unexpected CEO death cases should not have an impact on the supply side, i.e., gender differences in self-promotion or differences in female candidates' willingness to lead the firm should be independent of the reasons for a CEO position becoming vacant.

To identify CEO death cases, we use the database of CEO turnover and dismissals at S&P 1500 firms provided by Gentry et al. (2021). This database reports the reasons for CEO departures in ExecuComp based on SEC filings and news articles. As a result, we can identify all CEOs who passed away unexpectedly while still in office (CEO departure code (1) in Gentry et al., 2021). We then define an indicator variable equal to one if a CEO in our ExecuComp sample died while in office, and zero otherwise. Overall, there are 41 CEO death cases in our sample (38 male CEOs

[15] Figure 3 displays a stylized version of the executive search process. It is based on an anonymized outline of the search process we received from a well-known executive search firm.

[16] See `https://hbr.org/2020/05/your-ceo-succession-plan-cant-wait` and `https://edition.cnn.com/2019/09/06/success/ceo-succession/index.html`

and 3 female CEOs). We do not have variation in same industry experience of subsequent female CEOs. Therefore, we estimate triple interactions for Education Score, Top 50 ranked college and the Generalist Index, only.

Results in Table 6 show that observable skill signals are indeed more beneficial for female candidates if a CEO succession follows the sudden death of the incumbent CEO. Coefficient estimates are quite large which may be due to the small number of CEO death cases in our sample. We also find that female candidates are generally less likely to become CEO after a sudden CEO death, which provides further support for the view that information asymmetries between male employers and female candidates are even more relevant if the new CEO needs to be hired under time pressure. This makes objective and easily verifiable signals of leadership qualification even more valuable for female candidates.[17] At the same time, taste-based discrimination appears to be a less likely driver of our results, since a general distaste for women in leadership positions should not hinge on whether the incumbent CEO has suddenly passed away.

4.2 Do professional networks reduce information asymmetries?

Larger information asymmetries between female candidates and male employers imply that being part of professional networks may benefit women by facilitating information transmission (Cohen et al., 2008) and increasing the precision of skill signals women send to recruiters. Network membership may thus help female directors overcome the systematic disadvantage in hiring and promotion decisions they face due to statistical discrimination (e.g. Phelps, 1972; Cornell and Welch, 1996; Flabbi et al., 2019).

To examine whether access to professional networks decreases the relative importance of skill signals for female directors, we run the same fixed effect regressions as described in Equation 2 and include triple interactions between director gender, skill signal, and a board connection dummy (*Netw*). The board connection dummy is equal to one if a director is connected to at least one other director who is connected to at least one board member of the company the focal director

[17] We find that after the death of a CEO, more insiders are hired. Additionally, female CEOs are even more likely to be insiders compared to their male counterparts following the death of a CEO. This suggests that our results can be explained by higher information asymmetries rather than by the hiring of more (female) outside CEOs in cases of CEO death.

works for, and zero otherwise. Connections are measured based on common educational background, professional experience, or social activities (following Engelberg et al. (2013)).

Table 7 Panel A examines the impact of professional networks and (female) directors' likelihood of entering a leadership position and Panel B examines (female) executives' likelihood of becoming CEO. The board connection dummy is positive and statistically significant across all specifications. Being connected increases the likelihood of directors entering a leadership position by 9.6pp (column 3) to 11.2pp (column 4), and the likelihood of becoming CEO by 31.4pp (column 1) to 43.3pp (column 4). Most importantly, the triple interactions between director gender, skill signal, and a board connection dummy variable are negative and statistically significant for three of the skill signals in both panels. For example, the coefficient of the triple interaction between director gender, Education Score, and the board connection dummy is -0.020 (Panel A column (1)) and -0.211 (Panel B column (1)). In economic terms, this indicates that increasing the Education Score by one point is 2.0pp (21.1pp) less important for female directors' likelihood of entering a leadership position (of becoming CEO) when the director is already connected to the board.

These results further support the demand side channel operating through statistical discrimination, i.e., skill signals of female directors are more noisy from the perspective of potential employers and being part of professional networks benefits female directors more than male directors, because network membership facilitates information transmission and reduces information asymmetries.

4.3 Gender composition of the nomination committee

In the next step, we analyze the gender composition of the nomination committee, because CEO successions are usually managed by members of the nomination committee.[18] Committee members, often supported by professional executive search firms, identify potential candidates for the CEO position and eventually propose the most suitable candidate to the firms' shareholders.

We argue that potential female candidates for the CEO job may benefit more from the provision of skill signals than their male counterparts if the (mostly) male members of the nomination committee find it more difficult to judge on their unobservable leadership qualifications. Thus, we should find weaker effects for firms with nomination committees that have a female chair, as information

[18] While nomination committees are responsible for CEO appointments, the CEO usually decides on the composition of the top management team (CFO, COO, etc.) Thus, the following analysis is focused on CEO appointments only.

asymmetries between the committee and female candidates should be smaller. At the same time, given that the prospective job of a CEO is the same, a supply side explanation of our results should not depend on the gender composition of the nomination committee.

In Table 8, we include triple interactions between director gender, skill signal, and a female nomination dummy variable (*FemNom*) which is equal to one if the chair of the nomination committee is female, and zero otherwise.[19] The dependent variable is equal to one if a female executive director is CEO, and zero otherwise. The regressions include the same set of control variables as in Table 2.

Results in Table 8 show that the triple interactions between director gender, skill signal, and a female nomination committee dummy variable are negative and statistically significant for all skill signals. For example, the coefficient of the triple interaction between director gender, Top 50 ranked college, and the female nomination committee dummy is -0.230 (Panel A column (2)). Thus, having graduated from a Top 50 ranked college is 23.0pp less important for female directors' likelihood of becoming CEO when the firm has a female nomination committee chair compared to firms with a male nomination committee chair. These results provide further support for the demand side playing an important role in explaining our main results.

4.4 Outside hires

Finally, we distinguish between inside and outside hires. We conjecture that information asymmetries should be larger for outside hires, i.e., it should be easier for a firm to evaluate female candidates from inside the company, because these directors already have an employment history at the firm. Thus, the provision of observable skill signals should be more important for female directors who enter a leadership position from outside the company, if statistical discrimination explains our results. In contrast, taste-based discrimination predicts similar results for inside and outside hires.

In Table 9, we include a triple interaction between director gender, skill signal, and an outside dummy variable equal to one if a director has not worked for the company before entering the

[19]Before 2004, we only have information on firms' nomination committees for 57% of observations. Afterwards, the SEC adopted new rules requiring firms to disclose whether they had a separate nominating committee (https://www.sec.gov/news/press/2003-160.htm). For the subsequent time period, we have information on nomination committees for 94% of observations. To avoid potential differences in firms selecting into disclosing whether or not they have a nomination committee, we restrict the sample to 2004-2019 for the analysis in Table 8.

leadership position, and zero otherwise. We find at least suggestive evidence that signals of leadership qualification are more important for female directors hired from outside compared to inside the firm. For Education Score and Generalist Index, the triple interaction is positive and statistically significant at the 1% level, i.e., increasing the Education Score by 1 point is 1.7pp more important for outside hired female directors' probability of entering a leadership position. We do not observe significant effects for Top 50 ranked college degrees and same industry experience.

Overall, results in this section rather support a demand side than a supply side explanation for our main result, operating through statistical discrimination effects. Alternative explanations based gender differences in preferences among female and male directors and based on taste-based discrimination seem to be less important, and would be harder to reconcile with the cross-sectional differences documented in this section.

5 Skill signals and executive compensation

Previous research shows that signals of higher education (Useem and Karabel, 1986; Graham et al., 2012) and signals of professional experience (Murphy and Zabojnik, 2004; Custódio et al., 2013) have a positive impact on executive compensation. Therefore, we conjecture that observable signals of leadership qualification are also more important for female executives when it comes to determining their compensation.[20] If male employers can better evaluate the unknown leadership skills of male job candidates than those of female candidates, they may also face greater difficulty in assessing the market value of female executives when determining compensation contracts. Indeed, Flabbi et al. (2019) find that male employers tend to offer lower wages to female directors than female employers, as the latter are better at evaluating skill signals of female executives.

To test this conjecture, we run the same set of fixed effect regressions as in Equation 2, but use the inverse hyperbolic sine of total compensation, $Compensation_{\mathrm{d,c,t}}$, as the dependent variable.[21]

Panel A of Table 10 shows the results. In columns (1) and (3), a one point increase of the Education Score corresponds to a 4.1% (column (3)) to 4.6% (column (1)) increase in total compensation

[20] The following results are based on the ExecuComp sample, because BoardEx lacks compensation data for more than 70% of the observations in our sample.

[21] We include the same set of control variables, because the previous literature shows that they are also relevant for executive compensation (Gibbons and Murphy, 1992; Kuhnen and Niessen, 2012; Gabaix and Landier, 2008; Tervio, 2008; Graham et al., 2012; Core et al., 1999).

for male executives. In absolute terms, this corresponds to $176,600 to $198,100 higher compensation for the average male executive in our sample. The interaction between Education Score and the female dummy variable is positive and statistically significant at the 10% level in column (1) and at the 5% level in column (3). Economically, a one point increase in the Education Score (i.e., obtaining a Master's degree instead of a Bachelor's degree) increases total compensation of female executives between 8.4%, or $340,400 in column (1) and 10.7% or $433,600 in column (3). Columns (2) and (4) show that graduating from a Top 50 ranked college increases male executives' total compensation by 5.0% in column (2) and by 5.4% in column (4). We again find that educational skill signals are even more valuable for female executives. Graduating from a Top 50 ranked college increases female executives' total compensation between 26.3% (column (1)) and 37.0% (column (3)). This corresponds to an increase of $215,300 to $232,500 for male executives, and $1,065,700 to $1,499,300 for female executives in absolute terms.[22]

Again, the female dummy is negative in all specifications, indicating that female executives earn approximately 29% less than their male counterparts (columns (1)-(2)). This finding supports the extensive literature on the gender pay gap (Blau and Kahn, 2017), aligning closely with the 25% gap reported in Bell (2005). Additionally, our result supports findings of Bertrand and Hallock (2001), suggesting that the gender pay gap is more pronounced among women and men in leadership positions.

In Panel B of Table 10, we examine whether signals of professional experience increase female executives' compensation more than male executives'. We find that a one standard deviation increase of the Generalist Index corresponds to an 8.6% (column (1)) to 10.5% (column (3)) increase in total compensation for male executives. In absolute terms, this translates to a $371,900 to $453,400 higher compensation. Firms generally pay higher compensation to executives with greater general management skills, as indicated by the Generalist Index (and each of its components as shown in Appendix Table OA11). This finding aligns with Custódio et al. (2013), who report that a one standard deviation increase of the Generalist Index leads to a pay increase of up to 12% ($500,000). More importantly, the interaction term between the Generalist Index and the female dummy variable is positive and statistically significant at the 1% in column (1) and at the 5% level in column (3).

[22]Our results are not mainly driven by the CEOs in our sample and are robust to excluding CEOs (see Table OA10).

Economically, a one standard deviation increase in the Generalist Index increases total compensation of female executives by 18.0% (column (1)) to 21.7% (column (3)), translating to $731,200 to $880,100 in absolute terms. Additionally, same industry experience is positively associated with total compensation (columns (2) and (4)). For male executives, having prior industry experience increases total compensation by 7.9% (column (4)) to 8.6% (columns (2)), equivalent to $340,200 to $370,300. For female executives, the increase is more pronounced, with total compensation increasing by 31.5% (column (2)) to 39.7% (column (4)), or $1,276,400 to $1,608,700.[23]

6 Discussion and Conclusion

This paper shows that female directors benefit more from leadership qualification signals than male directors. We observe substantial increases in the likelihood of entering a leadership position, becoming CEO, and in the level of compensation for female directors with more objective and easily verifiable skill signals.

A natural question that arises from our findings is to what extent gender gaps in leadership positions are reduced between female and male directors with a larger number of skill signals. As a back of the envelope calculation, in Table 11, we sort female and male directors into terciles based on their skill signals. For each tercile, we compute the gender gap in the likelihood of reaching a leadership position and a CEO position, respectively. Results show that gender gaps are more pronounced among directors with fewer signals, while they decrease and are significantly smaller among those with more signals. Further calculations show that a one point increase in the Education Score increases female directors' likelihood of entering a leadership position by 2.7pp, while graduating from a Top 50 ranked colleges adds another 2.2pp and having industry experience adds an additional 5.5pp. Collectively, these factors reduce the gender gap in entering a leadership position from 14% to 3.6%. Notably, a one standard deviation increase in the Generalist Index, which results in a 6.3pp increase, has the largest impact among our skill signals and eliminates the gender gap in entering a leadership position completely.

[23]For robustness, we re-run the same regressions but cluster standard errors by firm only. We also add interactions of all control variables and the female dummy, to account for the possibility that our results are driven by different company characteristics of firms in which male and female directors work which does not affect our results (see Appendix Tables OA5 - OA4).

We believe that statistical discrimination is a key factor driving our results, as they are more pronounced in situations with higher information asymmetries: when hiring decisions are made exclusively by men, when female directors lack connections to the board, when they are hired from outside the firm, and in instances of sudden CEO deaths where search committees must quickly find a new CEO. While other channels such as supply side effects or taste-based discrimination may also be at play, they appear less consistent with our cross-sectional evidence compared to statistical discrimination.

Are women aware of these effects? Blau and Kahn (2017) and Bertrand (2020) show that women today, on average, have more years of schooling and higher educational degrees than men. Our data support this trend (see Figure 4), showing that over time, women accumulate more skill signals than men. Whether this accumulation is a strategic effort to overcome hiring barriers related to information asymmetries about soft skills remains an open question for future research.

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Figure 1: Fraction of Female Directors

This figure shows the fraction of female directors in our sample. The time period is from 2000 to 2019. The fraction of female directors is defined as the number of unique female directors in each year divided by the total number of unique male and female directors in each year. The fraction of female leaders is defined as the number of unique female directors in a leadership position (CEO, Chairwoman, Vice Chair, President, CFO, COO and Other Chief Officers) divided by the total number of unique male and female directors in a leadership position (CEO, Chairwoman, Vice Chair, President, CFO, COO and Other Chief Officers). The fraction of female CEOs is defined as the number of unique female CEOs each year divided by the total number of unique male and female CEOs in each year. All numbers are based on the BoardEx sample.

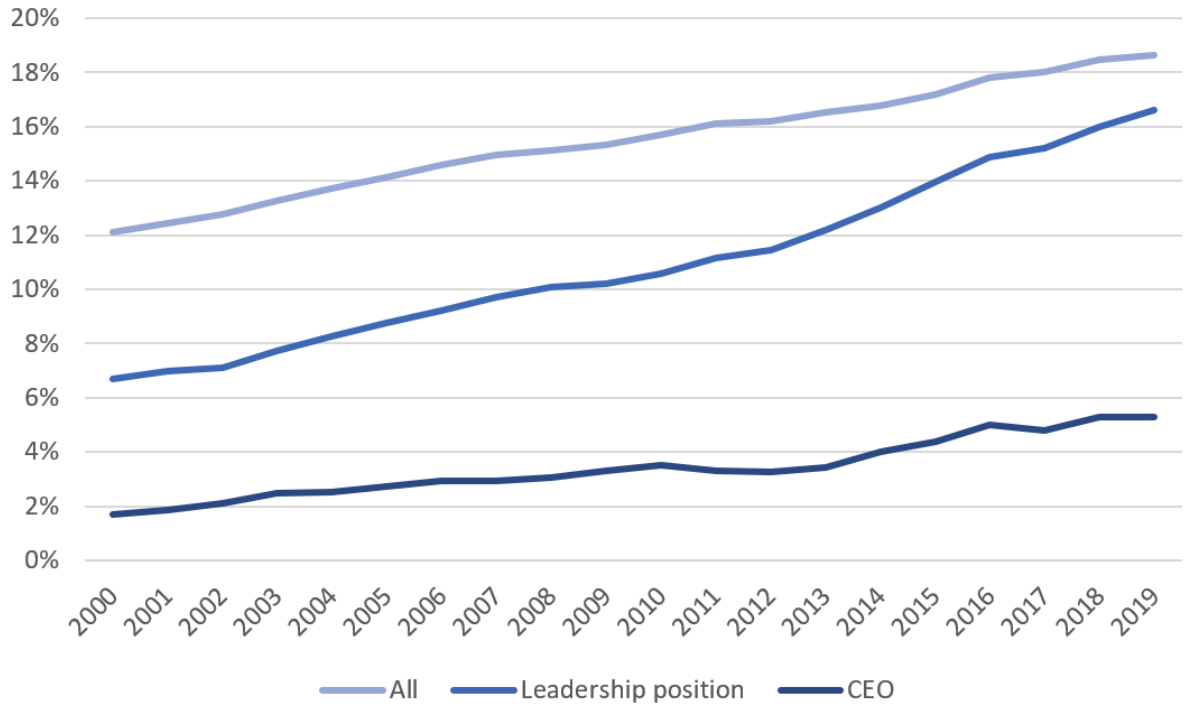

Figure 2: Survival Analysis

This figure shows the probability that a director has entered a leadership position at a certain age based on the skill signals. We estimate the hazard function conditional on directors' skill signals and gender. High-skill directors have skill signals that are above the median for all four skill signals. And low-skill directors have skill signals that are below the median for all four skill four signals. Education Score is defined according to Graham et al. (2012). Top 50 ranked college is an indicator that is equal to one if a director graduated from a Top 50 ranked college, and zero otherwise. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. The time period is from 2000 to 2019. All numbers are based on the BoardEx sample.

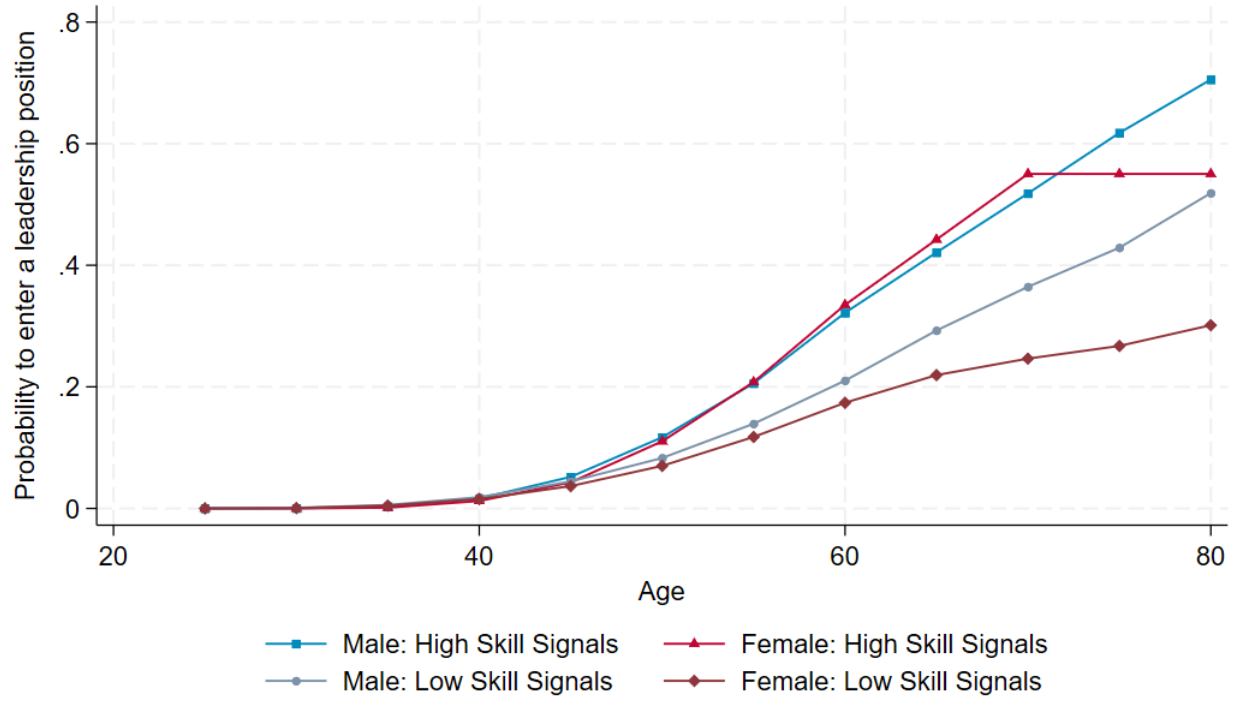

Figure 3: The executive search process

This figure shows the executive search process applied in a large and well-known executive search firm. The process is displayed in a stylized and anonymized version per request of the executive search firm who provided us with this graph.

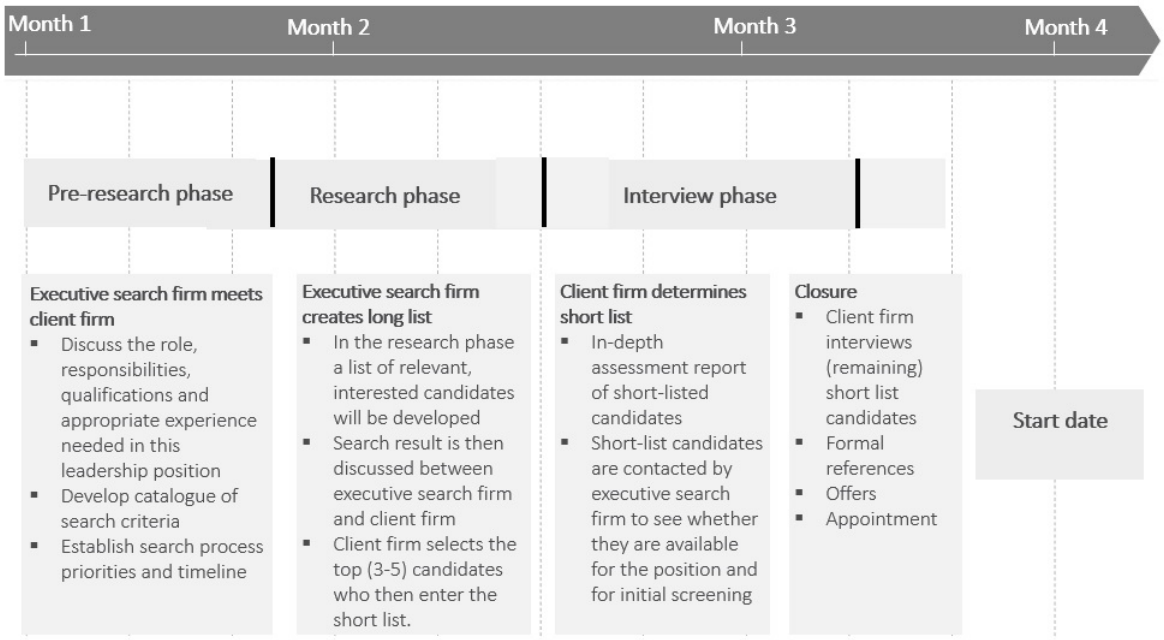

Figure 4: Skill Signals over Time

This figure shows the development of the skill signals separately for female and male directors over time. Education Score is defined according to Graham et al. (2012). Top 50 ranked college is an indicator that is equal to one if a director graduated from a Top 50 ranked college, and zero otherwise. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. The time period is from 2000 to 2019. All numbers are based on the BoardEx sample.

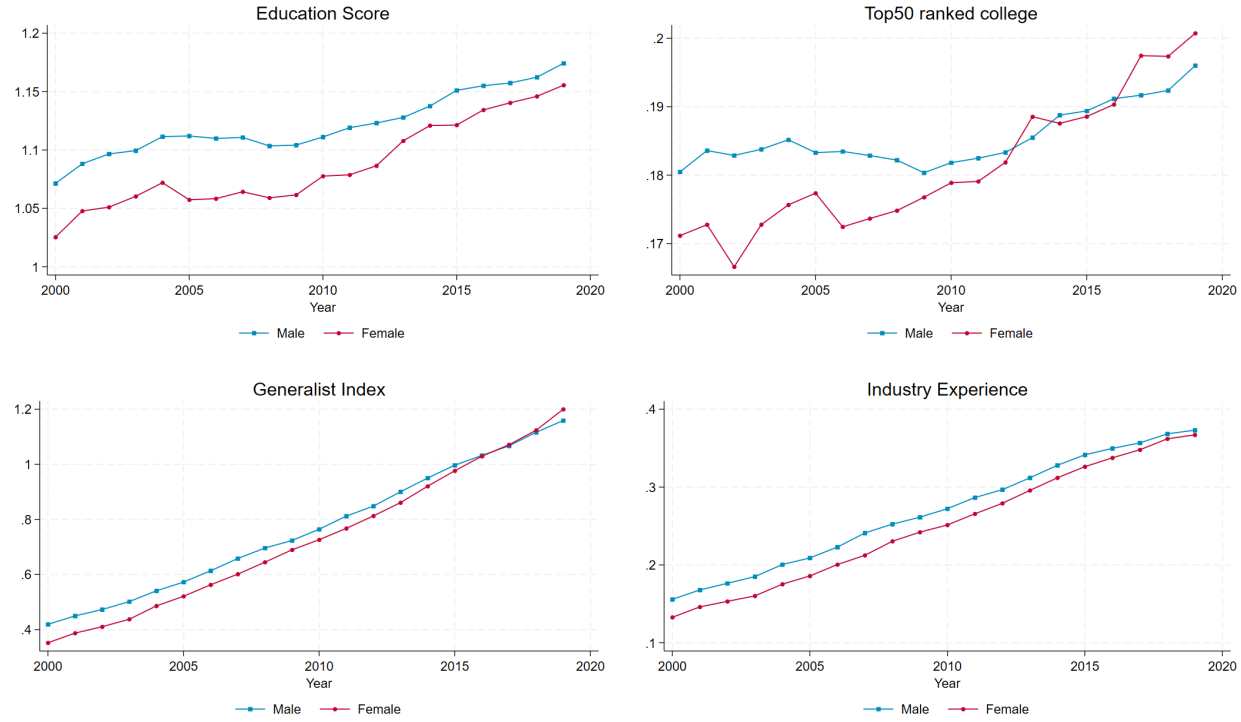

Table 1: Summary Statistics

This table presents summary statistics on all variables used in the paper. Data are obtained from BoardEx, Compustat, CRSP and ExecuComp. The sample runs from 2000 to 2019. Panel A presents director characteristics. Female is a dummy variable equal to one for female directors, and zero otherwise. Age is the age of the director in years. Leadership Position is a dummy variable equal to one if director is in a leadership position (CEO, Chairwoman, Vice Chair, President, CFO, COO and Other Chief Officers), and zero otherwise. CEO position is an indicator variable that takes the value of one if the director is CEO, and zero otherwise. Total compensation is in thousands. Asinh(Total Compensation) is the inverse hyperbolic sine of total compensation. Education Score is defined according to Graham et al. (2012). Top 50 ranked college is an indicator that is equal to one if the director graduated from a Top 50 ranked college, and zero otherwise. Generalist Index is defined as the Generalist Ability Index from Custódio et al. (2013). Same Industry Experience is an indicator that is equal to one if the director worked in the same industry before, and zero otherwise. Panel B presents firm characteristics. Assets are from Compustat. Last year return is the annual stock return from CRSP. Idiosyncratic Volatility is defined as the squared residual estimated in a five-year rolling window CAPM regression of monthly returns. Market to book is the ratio of the market value of equity at the fiscal year end divided by the book equity for the fiscal year. Panel C presents gender differences for the full BoardEx sample, Panel D presents gender differences for the ExecuComp sample. Columns (1) and (2) report mean values of different director characteristics for female and male directors separately. Column (3) reports the difference between female and male directors. In column (4), we report normalized mean differences as in Imbens and Woolridge (2009). All variables are winsorized at the 1st and 99th percentile, and described in detail in Variable Appendix A1.

Panel A: Director characteristics

	Mean (1)	Median (2)	SD (3)	1^{th} (4)	99^{th} (5)	Obs. (6)
Female	0.15	0.00	0.36	0.00	1.00	728,143
Age	50.18	50.00	9.15	31.00	75.00	728,143
Leadership position	0.45	0.00	0.50	0.00	1.00	728,143
CEO position	0.10	0.00	0.30	0.00	1.00	728,143
Total Compensation	4,294.63	2,645.237	4,577.34	189.17	19,797.45	49,117
Asinh(Total Compensation)	8.54	8.57	1.07	5.94	10.60	49,117
Education Score	1.09	1.00	0.91	0.00	3.00	728,143
Top 50 ranked college	0.18	0.00	0.39	0.00	1.00	728,143
Generalist Index	0.74	0.00	1.06	0.00	4.29	728,143
Same Industry Experience	0.26	0.00	0.44	0.00	1.00	728,143

Panel B: Firm characteristics

	Mean (1)	Median (2)	SD (3)	1^{th} (4)	99^{th} (5)	Obs. (6)
Assets	14,566.95	1,817.43	32,236.32	12.35	159,103.00	728,143
Asinh(Assets)	8.23	8.20	2.28	3.21	12.67	728,143
Last year return in %	15.14	7.84	61.31	-79.41	251.86	728,143
Idiosyncratic Volatility in %	1.33	0.25	4.07	0.00	17.56	728,143
Market to Book	3.21	2.15	5.21	-10.37	23.97	728,143

Table 1: cont'd

Panel C: Gender differences (BoardEx sample)

	Female (1)	Male (2)	Difference (3)	Normalized diff. (< 0.25) (4)
Age	47.92	50.59	-2.63	-0.29
Leadership position	0.32	0.47	-0.14	-0.29
CEO position	0.02	0.11	-0.09	-0.31
Number of Board Seats	0.23	0.45	-0.22	-0.19
Education Score	1.059	1.091	-0.032	-0.04
Top 50 ranked college	0.180	0.183	-0.003	-0.01
Generalist Index	0.736	0.735	0.001	0.00
Same Industry Experience	0.248	0.257	-0.009	-0.02

Panel D: Gender differences (ExecuComp sample)

	Female (1)	Male (2)	Difference (3)	Normalized diff. (< 0.25) (4)
Age	53.18	55.54	-2.36	-0.29
CEO position	0.46	0.60	-0.14	-0.29
Number of Board Seats	1.77	1.70	0.07	0.04
Education Score	1.190	1.193	-0.003	-0.02
Top 50 ranked college	0.294	0.219	0.075	0.18
Generalist Index	1.582	1.180	0.402	0.29
Same Industry Experience	0.335	0.275	0.060	0.13

Table 2: Do signal of higher education increase female directors' probability of entering a leadership position?

This table presents results on the impact of female directors' educational background on their likelihood of entering a leadership position in Panel A and of becoming CEO in Panel B. Results in Panel A are based on the full BoardEx sample, results in Panel B are based on the ExecuComp sample. Education Score is defined according to Graham et al. (2012). Top 50 ranked college is an indicator that is equal to one if a director graduated from a Top 50 ranked college, and zero otherwise. Female dummy is an indicator variable that takes the value of one if a director is female, and zero otherwise. Age (squared) is the age (squared) of a director. Assets is the inverse hyperbolic sine transformation of firm's book value of total assets. Market to Book is the ratio of the market value of equity divided by the book value of equity. Last year return is the raw annual stock return ending on the fiscal year-end date. Idiosyncratic volatility is the squared residual estimated from a CAPM regression of monthly returns. The regression includes firm and year fixed effects in columns (1) and (2), and firm×year fixed effects in columns (3) and (4). t-statistics based on standard errors clustered by firm-year level are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Panel A: Likelihood of entering a leadership position				
	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.016***		0.016***	
	(21.76)		(21.39)	
Education Score$_{d,t}$ x Female dummy$_{d}$	0.011***		0.011***	
	(6.48)		(6.58)	
Top 50 ranked college$_{d,t}$		0.002		0.001
		(1.14)		(0.59)
Top 50 ranked college$_{d,t}$ x Female dummy$_{d}$		0.022***		0.023***
		(5.66)		(5.81)
Female dummy$_{d}$	-0.130***	-0.124***	-0.131***	-0.124***
	(54.47)	(69.93)	(54.15)	(69.34)
Age$_{d,t}$	0.043***	0.043***	0.043***	0.043***
	(84.75)	(84.98)	(82.91)	(83.17)
Age squared$_{d,t}$	-0.000***	-0.000***	-0.000***	-0.000***
	(69.53)	(69.83)	(67.63)	(67.94)
Assets$_{c,t-1}$	-0.025***	-0.024***		
	(23.22)	(22.95)		
Last year return in %$_{c,t-1}$	-0.000*	-0.000*		
	(1.67)	(1.65)		
Idiosyncratic Volatility in %$_{c,t-1}$	0.000	0.000		
	(1.17)	(1.23)		
Market to Book$_{c,t-1}$	-0.000	-0.000*		
	(1.63)	(1.65)		
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm x Year FE	No	No	Yes	Yes
Adjusted R^2	0.152	0.151	0.112	0.111
Observations	728143	728143	727552	727552

Table 2: cont'd

Panel B: Likelihood of becoming CEO	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.034***		0.037***	
	(8.39)		(6.34)	
Education Score$_{d,t}$ x Female dummy$_d$	0.041**		0.054***	
	(2.55)		(2.60)	
Top 50 ranked college$_{d,t}$		0.067***		0.095***
		(8.23)		(7.92)
Top 50 ranked college$_{d,t}$ x Female dummy$_d$		0.158***		0.224***
		(4.78)		(5.06)
Female dummy$_d$	-0.243***	-0.240***	-0.321***	-0.327***
	(10.96)	(15.09)	(11.44)	(15.41)
Age$_{d,t}$	0.105***	0.107***	0.120***	0.123***
	(35.01)	(35.65)	(28.95)	(29.62)
Age squared$_{d,t}$	-0.001***	-0.001***	-0.001***	-0.001***
	(32.29)	(32.91)	(25.92)	(26.67)
Total Assets$_{c,t-1}$	-0.032***	-0.032***		
	(9.15)	(9.25)		
Last year return in %$_{c,t-1}$	0.000***	0.000***		
	(3.91)	(3.94)		
Idiosyncratic Volatility in %$_{c,t-1}$	0.001	0.001*		
	(1.64)	(1.82)		
Market to Book$_{c,t-1}$	-0.000	-0.000		
	(0.74)	(0.79)		
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm×Year FE	No	No	Yes	Yes
Adjusted R^2	0.185	0.186	-0.530	-0.525
Observations	49674	49674	32608	32608

Table 3: Do signals of professional experience increase female directors' probability of entering a leadership position?

This table presents results on the impact of professional experience signals on female directors' likelihood of entering a leadership position in Panel A and on female directors' likelihood of becoming CEO in Panel B. Results in Panel A are based on the full BoardEx sample, results in Panel B are based on the ExecuComp sample. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. Female dummy is an indicator variable that takes the value of one if a director is female, and zero otherwise. All variables are defined in detail in Appendix Table A1. The regression includes firm and year fixed effects in columns (1) and (2), and firm×year fixed effects in columns (3) and (4). *t*-statistics based on standard errors clustered by firm-year level are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Panel A: Likelihood of entering a leadership position				
	(1)	(2)	(3)	(4)
Generalist Index$_{d,t}$	0.054***		0.056***	
	(82.14)		(82.31)	
Generalist Index$_{d,t}$x Female dummy$_{d}$	0.005***		0.003*	
	(3.46)		(1.79)	
Same Industry Experience$_{d,t}$		0.036***		0.038***
		(22.82)		(23.52)
Same Industry Experience$_{d,t}$x Female dummy$_{d}$		0.019***		0.016***
		(5.42)		(4.40)
Female dummy$_{d}$	-0.123***	-0.124***	-0.122***	-0.124***
	(64.61)	(67.76)	(63.07)	(66.65)
Age$_{d,t}$	0.040***	0.042***	0.040***	0.042***
	(78.75)	(83.22)	(77.12)	(81.37)
Age squared$_{d,t}$	-0.000***	-0.000***	-0.000***	-0.000***
	(65.63)	(68.25)	(64.04)	(66.35)
Assets$_{c,t-1}$	-0.025***	-0.025***		
	(23.95)	(23.16)		
Last year return in %$_{c,t-1}$	-0.000	-0.000		
	(1.31)	(1.60)		
Idiosyncratic Volatility in %$_{c,t-1}$	0.000	0.000		
	(1.18)	(1.24)		
Market to Book$_{c,t-1}$	-0.000	-0.000		
	(1.26)	(1.58)		
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm×Year FE	No	No	Yes	Yes
Adjusted R^2	0.161	0.152	0.123	0.112
Observations	728143	728143	727552	727552

Table 3: cont'd

Panel B: Likelihood of becoming CEO	(1)	(2)	(3)	(4)
Generalist Index$_{d,t}$	0.040***		0.063***	
	(15.64)		(14.60)	
Generalist Index$_{d,t}$x Female dummy$_{d}$	0.051***		0.043***	
	(6.70)		(3.76)	
Same Industry Experience$_{d,t}$		0.011		-0.004
		(1.37)		(0.31)
Same Industry Experience$_{d,t}$ x Female dummy$_{d}$		0.167***		0.212***
		(5.55)		(4.64)
Female dummy$_{d}$	-0.287***	-0.253***	-0.329***	-0.319***
	(17.24)	(15.13)	(15.98)	(15.22)
Age$_{d,t}$	0.099***	0.105***	0.112***	0.121***
	(33.14)	(35.07)	(26.82)	(29.11)
Age squared$_{d,t}$	-0.001***	-0.001***	-0.001***	-0.001***
	(30.80)	(32.34)	(24.23)	(26.07)
Assets$_{c,t-1}$	-0.031***	-0.032***		
	(8.92)	(9.12)		
Last year return in %$_{c,t-1}$	0.000***	0.000***		
	(4.22)	(3.92)		
Idiosyncratic Volatility in %$_{c,t-1}$	0.001	0.001*		
	(1.28)	(1.69)		
Market to Book$_{c,t-1}$	-0.000	-0.000		
	(0.46)	(0.66)		
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm×Year FE	No	No	Yes	Yes
Adjusted R^2	0.192	0.184	-0.510	-0.532
Observations	49674	49674	32608	32608

Table 4: First-time promotions into leadership positions

This table presents results on female directors' likelihood of entering a leadership position for the first time. Results are based on the full BoardEx sample. First Leadership Position is equal to one if a director enters a leadership position at a given company for the first time, and zero otherwise. We exclude subsequent director years where a director remains in a leadership position at the company. Education Score is defined as in Graham et al. (2012). Top 50 ranked college is an indicator equal to one if a director graduated from a Top 50 ranked college, and zero otherwise. Panel B presents results for signals of professional experience. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. Controls are the same as in Tables 2 - 3. The regression includes firm and year fixed effects. *t*-statistics based on standard errors clustered by firm-year level are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.009***			
	(13.76)			
Education Score$_{d,t}$ x Female dummy$_{d}$	0.004***			
	(2.89)			
Top50 ranked college$_{d,t}$		-0.001		
		(0.78)		
Top50 ranked college$_{d,t}$ x Female dummy$_{d}$		0.007**		
		(2.29)		
Generalist Index$_{d,t}$			0.039***	
			(52.42)	
Generalist Index$_{d,t}$x Female dummy$_{d}$			-0.001	
			(0.77)	
Same Industry Experience$_{d,t}$				0.044***
				(29.30)
Same Industry Experience$_{d,t}$x Female dummy$_{d}$				0.006**
				(2.04)
Female dummy$_{d}$	-0.040***	-0.038***	-0.036***	-0.038***
	(21.54)	(27.73)	(24.97)	(27.47)
Age$_{d,t}$	0.016***	0.016***	0.015***	0.015***
	(44.95)	(44.95)	(41.54)	(42.52)
Age squared$_{d,t}$	-0.000***	-0.000***	-0.000***	-0.000***
	(46.38)	(46.53)	(44.40)	(44.26)
Assets$_{c,t-1}$	-0.013***	-0.012***	-0.014***	-0.013***
	(9.53)	(9.40)	(10.35)	(9.77)
Last year return in %$_{c,t-1}$	-0.000***	-0.000***	-0.000***	-0.000***
	(9.28)	(9.26)	(8.93)	(9.19)
Idiosyncratic Volatility in %$_{c,t-1}$	0.000**	0.000**	0.000**	0.000**
	(2.04)	(2.07)	(2.04)	(2.11)
Market to Book$_{c,t-1}$	-0.000***	-0.000***	-0.000***	-0.000***
	(3.11)	(3.13)	(3.00)	(3.13)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.121	0.120	0.131	0.123
Observations	452476	452476	452476	452476

Table 5: Do skill signals increase (female) directors' likelihood of becoming Executive Vice President?

This table presents results on the impact of female directors' skill signals on their likelihood of becoming Executive Vice President. Results are based on the full BoardEx sample. We exclude all directors in a leadership position. Panel A presents results for signals of higher education. Education Score is defined according to Graham et al. (2012). Top 50 ranked college is an indicator that is equal to one if a director graduated from a Top 50 ranked college, and zero otherwise. Panel B presents results for signals of professional experience. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. Female dummy is an indicator variable that takes the value of one if a director is female, and zero otherwise. We include the same control variables as in Tables 2 - 3. In columns (3) - (6), the control variables are interacted with the female indicator variable. The regression includes firm and year fixed effects in columns (1) - (4) and firm×year fixed effects in columns (5) and (6). *t*-statistics based on standard errors clustered by firm-year level are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Panel A: Signals of higher education						
	(1)	(2)	(3)	(4)	(5)	(6)
Education Score$_{d,t}$	0.008***		0.008***		0.008***	
	(12.72)		(12.88)		(12.88)	
Education Score$_{d,t}$ x Female dummy$_d$	0.012***		0.011***		0.011***	
	(9.20)		(8.81)		(8.06)	
Top 50 ranked college$_{d,t}$		0.024***		0.024***		0.024***
		(16.35)		(16.60)		(16.54)
Top 50 ranked college$_{d,t}$		0.006**		0.004		0.006*
x Female dummy$_d$		(2.01)		(1.45)		(1.83)
Female dummy$_d$	-0.048***	-0.037***	0.124***	0.126***	0.126***	0.127***
	(25.96)	(27.53)	(6.12)	(6.24)	(5.89)	(5.92)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Controls×Female dummy	No	No	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	No	No
Year FE	Yes	Yes	Yes	Yes	No	No
Firm×Year FE	No	No	No	No	Yes	Yes
Adjusted R^2	0.303	0.303	0.304	0.304	0.287	0.287
Observations	403240	403240	403240	403240	394783	394783

Table 5: cont'd

Panel B: Signals of professional experience						
	(1)	(2)	(3)	(4)	(5)	(6)
Generalist $\text{Index}_{d,t}$	0.002***		0.002***		0.002***	
	(2.99)		(2.63)		(2.90)	
Generalist $\text{Index}_{d,t}$ x Female dummy_d	0.015***		0.016***		0.016***	
	(10.63)		(11.74)		(10.86)	
Same Industry $\text{Experience}_{d,t}$		0.003**		0.003*		0.002*
		(2.32)		(1.88)		(1.66)
Same Industry $\text{Experience}_{d,t}$		0.022***		0.025***		0.022***
x Female dummy_d		(7.80)		(8.78)		(7.49)
Female dummy_d	-0.045***	-0.041***	0.147***	0.132***	0.148***	0.131***
	(31.67)	(29.79)	(7.32)	(6.52)	(6.92)	(6.14)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Controls×Female dummy	No	No	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	No	No
Year FE	Yes	Yes	Yes	Yes	No	No
Firm×Year FE	No	No	No	No	Yes	Yes
Adjusted R^2	0.303	0.303	0.303	0.303	0.286	0.286
Observations	403240	403240	403240	403240	394783	394783

Table 6: The impact of sudden CEO deaths on (female) directors' likelihood of becoming CEO

This table investigates whether a sudden death of a CEO matters for female executives' likelihood of becoming CEO. Results are based on the ExecuComp sample. Education Score is defined as in Graham et al. (2012). Top 50 ranked college is an indicator equal to one if a director graduated from a Top 50 ranked college, and zero otherwise. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. CEO Death is an indicator variable that takes the value of one if the previous CEO of the firm died while in office, and zero otherwise. Controls are the same as in Tables 2 - 3. The regression includes firm and year fixed effects in columns (1) to (3), and firm×year fixed effects in columns (4) to (6). t-statistics based on standard errors clustered by firm-year level are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)	(6)
Education Score$_{d,t}$	0.037***			0.041***		
	(9.03)			(6.98)		
Education Score$_{d,t}$ x Female dummy$_d$	0.030*			0.034		
	(1.82)			(1.58)		
Education Score$_{d,t}$ x CEO Death$_{c,t}$	-0.174***			-0.202***		
	(6.59)			(6.03)		
Education Score$_{d,t}$ x CEO Death$_{c,t}$x Female dummy$_d$	0.418***			0.514***		
	(6.52)			(6.68)		
Top50 ranked college$_{d,t}$		0.072***			0.102***	
		(8.71)			(8.41)	
Top50 ranked college$_{d,t}$ x Female dummy$_d$		0.137***			0.183***	
		(4.06)			(3.95)	
Top50 ranked college$_{d,t}$ x CEO Death$_{c,t}$		-0.290***			-0.374***	
		(4.85)			(5.25)	
Top50 ranked college$_{d,t}$ x CEO Death$_{c,t}$ x Female dummy$_d$		0.875***			1.091***	
		(6.45)			(7.04)	
Generalist Index$_{d,t}$			0.040***			0.064***
			(15.60)			(14.69)
Generalist Index$_{d,t}$ x Female dummy$_d$			0.048***			0.039***
			(6.37)			(3.38)
Generalist Index$_{d,t}$ x CEO Death$_{c,t}$			-0.010			-0.062*
			(0.45)			(1.93)
Generalist Index$_{d,t}$ x CEO Death$_{c,t}$x Female dummy$_d$			0.130			0.258*
			(1.34)			(1.95)
CEO Death$_{c,t}$ x Female dummy$_d$	-0.690***	-0.568***	-0.205**	-0.723***	-0.587***	-0.221**
	(7.75)	(6.96)	(2.55)	(6.83)	(6.55)	(2.46)
CEO Death$_{c,t}$	0.036	-0.126***	-0.170***			
	(0.91)	(5.01)	(5.37)			
Female dummy$_d$	-0.223***	-0.226***	-0.279***	-0.291***	-0.306***	-0.321***
	(9.80)	(14.08)	(16.54)	(9.97)	(14.06)	(15.22)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	No	No	No
Year FE	Yes	Yes	Yes	No	No	No
Firm×Year FE	No	No	No	Yes	Yes	Yes
Adjusted R^2	0.187	0.188	0.193	-0.527	-0.522	-0.509
Observations	49674	49674	49674	32608	32608	32608

Table 7: Are connections to the board important?

This table presents results on the impact of connections to the board on female directors' likelihood of entering a leadership position in Panel A and on female directors' likelihood of becoming CEO in Panel B. Results in Panel A are based on the full BoardEx sample, results in Panel B are based on the ExecuComp sample. Board connections (Netw) is an indicator equal to one if the director is connected to at least one other director which is connected to at least one board member of the company the director works for, and zero otherwise. Connected is measured as in Engelberg et al. (2013). Education Score is defined as in Graham et al. (2012). Top 50 ranked college is an indicator equal to one if a director graduated from a Top 50 ranked college, and zero otherwise. Panel B presents results for signals of professional experience. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. Controls are the same as in Tables 2 - 3. The regression includes firm×year fixed effects. *t*-statistics based on standard errors clustered by firm-year level are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Panel A: Likelihood of entering a leadership position	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.014***			
	(7.58)			
Education Score$_{d,t}$ x Female dummy$_{d}$	0.029***			
	(6.73)			
Education Score$_{d,t}$ x Netw$_{c,d,t}$	0.002			
	(0.99)			
Education Score$_{d,t}$ x Female dummy$_{d}$ x Netw$_{c,d,t}$	-0.020***			
	(4.41)			
Top50 ranked college$_{d,t}$		0.000		
		(0.09)		
Top50 ranked college$_{d,t}$ x Female dummy$_{d}$		0.019*		
		(1.87)		
Top50 ranked college$_{d,t}$ x Netw$_{c,d,t}$		-0.002		
		(0.34)		
Top50 ranked college$_{d,t}$ x Female dummy$_{d}$ x Netw$_{c,d,t}$		0.004		
		(0.40)		
Generalist Index$_{d,t}$			0.031***	
			(17.97)	
Generalist Index$_{d,t}$x Female dummy$_{d}$			0.035***	
			(9.41)	
Generalist Index$_{d,t}$x Netw$_{c,d,t}$			0.032***	
			(17.54)	
Generalist Index$_{d,t}$x Female dummy$_{d}$ x Netw$_{c,d,t}$			-0.038***	
			(9.37)	
Same Industry Experience$_{d,t}$				0.037***
				(9.52)
Same Industry Experience$_{d,t}$x Female dummy$_{d}$				0.044***
				(4.88)
Same Industry Experience$_{d,t}$x Netw$_{c,d,t}$				0.003
				(0.71)
Same Industry Experience$_{d,t}$x Female dummy$_{d}$ x Netw$_{c,d,t}$				-0.032***
				(3.31)
Female dummy$_{d}$ x Netw$_{c,d,t}$	-0.008	-0.029***	0.004	-0.019***
	(1.19)	(6.09)	(0.73)	(3.76)
Netw$_{c,d,t}$	0.108***	0.111***	0.096***	0.112***
	(34.02)	(44.26)	(33.74)	(41.90)
Female dummy$_{d}$	-0.124***	-0.100***	-0.126***	-0.108***
	(21.40)	(22.73)	(25.61)	(23.40)
Controls	Yes	Yes	Yes	Yes
Firm x Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.115	0.115	0.127	0.116
Observations	727472	727472	727472	727472

Table 7: cont'd

Panel B: Likelihood of becoming CEO	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	-0.093***			
	(7.74)			
Education Score$_{d,t}$ x Female dummy$_{d}$	0.251***			
	(5.31)			
Education Score$_{d,t}$ x Netw$_{c,d,t}$	0.136***			
	(10.30)			
Education Score$_{d,t}$ x Female dummy$_{d}$ x Netw$_{c,d,t}$	-0.211***			
	(4.04)			
Top50 ranked college$_{d,t}$		-0.032		
		(1.15)		
Top50 ranked college$_{d,t}$ x Female dummy$_{d}$		0.297***		
		(2.97)		
Top50 ranked college$_{d,t}$ x Netw$_{c,d,t}$		0.125***		
		(4.20)		
Top50 ranked college$_{d,t}$ x Female dummy$_{d}$ x Netw$_{c,d,t}$		-0.086		
		(0.79)		
Generalist Index$_{d,t}$			0.002	
			(0.28)	
Generalist Index$_{d,t}$x Female dummy$_{d}$			0.080***	
			(3.19)	
Generalist Index$_{d,t}$x Netw$_{c,d,t}$			0.069***	
			(7.89)	
Generalist Index$_{d,t}$x Female dummy$_{d}$ x Netw$_{c,d,t}$			-0.047*	
			(1.68)	
Same Industry Experience$_{d,t}$				-0.078***
				(3.06)
Same Industry Experience$_{d,t}$x Female dummy$_{d}$				0.385***
				(3.86)
Same Industry Experience$_{d,t}$x Netw$_{c,d,t}$				0.086***
				(3.09)
Same Industry Experience$_{d,t}$x Female dummy$_{d}$ x Netw$_{c,d,t}$				-0.208*
				(1.88)
Female dummy$_{d}$ x Netw$_{c,d,t}$	0.153**	-0.075	-0.020	-0.008
	(2.28)	(1.47)	(0.42)	(0.18)
Netw$_{c,d,t}$	0.314***	0.427***	0.369***	0.433***
	(16.19)	(30.62)	(23.56)	(29.52)
Female dummy$_{d}$	-0.465***	-0.256***	-0.303***	-0.306***
	(7.67)	(5.48)	(6.85)	(7.24)
Controls	Yes	Yes	Yes	Yes
Firm x Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	-0.445	-0.446	-0.428	-0.452
Observations	32606	32606	32606	32606

Table 8: Does female representation in the nomination committee matter?

This table investigates whether female representation in the nomination committee matters for female executives' likelihood of becoming CEO. Results are based on the ExecuComp sample. Panel A presents results for signals of higher education. Education Score is defined as in Graham et al. (2012). Top 50 ranked college is an indicator equal to one if a director graduated from a Top 50 ranked college, and zero otherwise. Panel B presents results for signals of professional experience. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. FemNom is an indicator variable that takes the value of one if the chair of the nomination committee of a company is female, and zero otherwise. Female dummy is an indicator variable that takes the value of one if a director is female, and zero otherwise. Controls are the same as in Tables 2 - 3. The regression includes firm and year fixed effects in columns (1) and (2), and firm×year fixed effects in columns (3) and (4). *t*-statistics based on standard errors clustered by firm-year level are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Panel A: Signals of higher education				
	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.038***		0.037***	
	(7.17)		(5.07)	
Education Score$_{d,t}$ x Female dummy$_{d}$	0.054***		0.088***	
	(2.62)		(3.34)	
Education Score$_{d,t}$ x FemNom$_{c,t}$	0.002		0.031*	
	(0.24)		(1.69)	
Education Score$_{d,t}$ x FemNom$_{c,t}$ x Female dummy$_{d}$	-0.081**		-0.180***	
	(2.71)		(2.96)	
Top50 ranked college$_{d,t}$		0.067***		0.088***
		(6.41)		(5.94)
Top50 ranked college$_{d,t}$ x Female dummy$_{d}$		0.225***		0.308***
		(5.35)		(5.71)
Top50 ranked college$_{d,t}$ x FemNom$_{c,t}$		-0.004		0.003
		(0.19)		(0.07)
Top50 ranked college$_{d,t}$ x FemNom$_{c,t}$ x Female dummy$_{d}$		-0.230***		-0.418***
		(3.06)		(3.24)
FemNom$_{c,t}$ x Female dummy$_{d}$	0.059	0.030	0.076	0.001
	(1.13)	(1.72)	(0.93)	(0.01)
FemNom$_{c,t}$	-0.006	-0.002		
	(1.69)	(0.27)		
Female dummy$_{d}$	-0.244***	-0.246***	-0.315***	-0.312***
	(8.51)	(12.05)	(8.65)	(11.62)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm×Year FE	No	No	Yes	Yes
Adjusted R^2	0.195	0.195	-0.525	-0.521
Observations	38326	38326	25126	25126

Table 8: cont'd

Panel B: Signals of professional experience				
	(1)	(2)	(3)	(4)
Generalist $\text{Index}_{d,t}$	0.036***		0.054***	
	(10.59)		(10.52)	
Generalist $\text{Index}_{d,t}$x Female dummy_d	0.058***		0.063***	
	(6.42)		(4.89)	
Generalist $\text{Index}_{d,t}$x $\text{FemNom}_{c,t}$	-0.006		0.001	
	(0.96)		(0.05)	
Generalist $\text{Index}_{d,t}$x $\text{FemNom}_{c,t}$ x Female dummy_d	-0.051***		-0.107***	
	(2.89)		(3.28)	
Same Industry $\text{Experience}_{d,t}$		0.006		-0.011
		(0.61)		(0.74)
Same Industry $\text{Experience}_{d,t}$ x Female dummy_d		0.202***		0.293***
		(5.22)		(5.30)
Same Industry $\text{Experience}_{d,t}$ x $\text{FemNom}_{c,t}$		-0.018		0.019
		(0.96)		(0.47)
Same Industry $\text{Experience}_{d,t}$ x $\text{FemNom}_{c,t}$		-0.208***		-0.414***
x Female dummy_d		(3.24)		(3.65)
$\text{FemNom}_{c,t}$ x Female dummy_d	0.100**	0.099**	0.033	0.008
	(2.26)	(2.48)	(0.13)	(0.17)
$\text{FemNom}_{c,t}$	-0.001	-0.007		
	(0.09)	(0.86)		
Female dummy_d	-0.337***	-0.303***	-0.313***	-0.299***
	(16.02)	(13.80)	(12.03)	(11.05)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm×Year FE	No	No	Yes	Yes
Adjusted R^2	0.200	0.193	-0.509	-0.528
Observations	38326	38326	25126	25126

Table 9: Inside vs. outside hires

This table investigates whether our main results are stronger for outside hires. Results are based on the full BoardEx sample. Education Score is defined as in Graham et al. (2012). Top 50 ranked college is an indicator equal to one if a director graduated from a Top 50 ranked college, and zero otherwise. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. Outside is an indicator variable that takes the value of one if a director has not worked for the company before the current employment, and zero otherwise. Female dummy is an indicator variable that takes the value of one if a director is female, and zero otherwise. Controls are the same as in Tables 2 - 3. The regression includes firm×year fixed effects. t-statistics based on standard errors clustered by firm-year level are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Likelihood of entering a leadership position	(1)	(2)	(3)	(4)
$\text{Education Score}_{d,t}$	0.027***			
	(26.97)			
$\text{Education Score}_{d,t}$ x Female dummy_{d}	0.003			
	(1.39)			
$\text{Education Score}_{d,t}$ x $\text{Outside}_{d,c,t}$	-0.020***			
	(14.27)			
$\text{Education Score}_{d,t}$ x $\text{Outside}_{d,c,t}$ x Female dummy_{d}	0.017***			
	(4.98)			
$\text{Top50 ranked college}_{d,t}$		0.015***		
		(6.49)		
$\text{Top50 ranked college}_{d,t}$ x Female dummy_{d}		0.028***		
		(5.08)		
$\text{Top 50 ranked college}_{d,t}$ x $\text{Outside}_{d,c,t}$		-0.028***		
		(8.75)		
$\text{Top 50 ranked college}_{d,t}$ x $\text{Outside}_{d,c,t}$ x Female dummy_{d}		-0.011		
		(1.45)		
$\text{Generalist Index}_{d,t}$			0.081***	
			(86.17)	
$\text{Generalist Index}_{d,t}$x Female dummy_{d}			-0.006**	
			(2.57)	
$\text{Generalist Index}_{d,t}$ x $\text{Outside}_{d,c,t}$			-0.031***	
			(25.25)	
$\text{Generalist Index}_{d,t}$ x $\text{Outside}_{d,c,t}$ x Female dummy_{d}			0.017***	
			(5.59)	
$\text{Same Industry Experience}_{d,t}$				0.055***
				(23.74)
$\text{Same Industry Experience}_{d,t}$x Female dummy_{d}				0.014***
				(2.58)
$\text{Same Industry Experience}_{d,t}$ x $\text{Outside}_{d,c,t}$				-0.002
				(0.65)
$\text{Same Industry Experience}_{d,t}$ x $\text{Outside}_{d,c,t}$				0.000
x Female dummy_{d}				(0.03)
$\text{Outside}_{d,c,t}$ x Female dummy_{d}	0.0009	0.022***	0.004	0.0179***
	(0.20)	(6.42)	(0.95)	(5.00)
Female dummy_{d}	-0.131***	-0.134***	-0.124***	-0.131***
	(40.13)	(55.70)	(49.69)	(54.66)
$\text{Outside}_{d,c,t}$	-0.070***	-0.086***	-0.087***	-0.097***
	(32.77)	(54.40)	(50.47)	(57.28)
Controls	Yes	Yes	Yes	Yes
Firm×Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.120	0.119	0.134	0.120
Observations	727552	727552	727552	727552

Table 10: The impact of skill signals on (female) executives' compensation

This table presents results on the impact of skill signals on female directors' compensation. Results are based on the ExecuComp sample. Compensation is measured as the inverse hyperbolic sine of ExecuComp's total compensation variable. Panel A presents results for signals of higher education. Education Score is defined as in Graham et al. (2012). Top 50 ranked college is an indicator equal to one if a director graduated from a Top 50 ranked college, and zero otherwise. Panel B presents results for signals of professional experience. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. All variables are defined in detail in Appendix Table A1. The regression includes firm and year fixed effects in columns (1) and (2), and firm×year fixed effects in columns (3) and (4). *t*-statistics based on standard errors clustered by firm-year level are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Panel A: Signals of higher education				
	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.046***		0.041***	
	(8.15)		(6.12)	
Education Score$_{d,t}$ x Female dummy$_{d}$	0.038*		0.066**	
	(1.65)		(2.40)	
Top 50 ranked college$_{d,t}$		0.050***		0.054***
		(4.54)		(3.95)
Top 50 ranked college$_{d,t}$ x Female dummy$_{d}$		0.213***		0.316***
		(4.54)		(5.67)
Female dummy$_{d}$	-0.239***	-0.252***	-0.323***	-0.338***
	(7.08)	(10.72)	(8.24)	(11.66)
Age$_{d,t}$	0.097***	0.099***	0.090***	0.092***
	(18.91)	(19.24)	(15.75)	(16.07)
Age squared$_{d,t}$	-0.001***	-0.001***	-0.001***	-0.001***
	(18.70)	(18.99)	(14.95)	(15.25)
Total Assets$_{c,t-1}$	0.236***	0.236***		
	(23.67)	(23.63)		
Last year return in %$_{c,t-1}$	0.001***	0.001***		
	(15.32)	(15.32)		
Idiosyncratic Volatility in %$_{c,t-1}$	-0.001	-0.001		
	(0.91)	(0.86)		
Market to Book$_{c,t-1}$	0.007***	0.006***		
	(6.46)	(6.46)		
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm×Year FE	No	No	Yes	Yes
Ad Adjusted R^2	0.603	0.603	0.600	0.601
Observations	49117	49117	31892	31892

Table 10: cont'd

Panel B: Signals of professional experience	(1)	(2)	(3)	(4)
Generalist Index$_{d,t}$	0.073***		0.089***	
	(18.44)		(16.60)	
Generalist Index$_{d,t}$x Female dummy$_d$	0.040***		0.047**	
	(3.01)		(2.42)	
Same Industry Experience$_{d,t}$		0.086***		0.079***
		(7.23)		(4.98)
Same Industry Experience$_{d,t}$ x Female dummy$_d$		0.229***		0.318***
		(5.21)		(5.26)
Female dummy$_d$	-0.280***	-0.277***	-0.329***	-0.342***
	(11.02)	(11.53)	(11.07)	(12.50)
Age$_{d,t}$	0.088***	0.096***	0.078***	0.089***
	(17.00)	(18.63)	(13.57)	(15.61)
Age squared$_{d,t}$	-0.001***	-0.001***	-0.001***	-0.001***
	(17.08)	(18.38)	(13.13)	(14.79)
Assets$_{c,t-1}$	0.237***	0.238***		
	(23.78)	(23.80)		
Last year return in %$_{c,t-1}$	0.001***	0.001***		
	(15.45)	(15.32)		
Idiosyncratic Volatility in %$_{c,t-1}$	-0.002	-0.001		
	(1.06)	(0.92)		
Market to Book$_{c,t-1}$	0.007***	0.007***		
	(6.68)	(6.53)		
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm×Year FE	No	No	Yes	Yes
Adjusted R^2	0.608	0.604	0.609	0.601
Observations	49117	49117	31892	31892

Table 11: Gender gaps across skill signals terciles

This table presents gender gaps conditional on female and male directors belonging to the same tercile of a given skill signal. We group all directors with the lowest number of a given skill signal into Tercile 1, and directors with the highest number of skill signals into Tercile 3. For skill signals based on binary variables, we only group directors into two groups, correspondingly. In the next step, for each tercile, we calculate the difference between female and male directors' likelihood to be in a leadership position in Panel A, to be CEO in Panel B, and the difference between female and male directors' compensation in Panel C. Results in Panel A are based on the full BoardEx sample, results in Panel B and Panel C are based on the ExecuComp sample. Compensation is measured as the inverse hyperbolic sine of ExecuComp's total compensation variable. Average differences between female and male directors for each tercile are reported in columns (1) to (3). The difference in gender gaps between the lowest (Tercile 1) and highest (Tercile 3) tercile are reported in column (4). *t*-statistics based on robust standard errors are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Panel A: Gender gaps in the likelihood to be in a leadership position				
	Tercile 1 (low)	Tercile 2	Tercile 3 (high)	Difference T1 - T3
	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	-0.155***	-0.131***	-0.112***	-0.043***
	(-78.35)	(-49.94)	(-13.52)	(-5.10)
Top 50 ranked college$_{d,t}$	-0.148***		-0.129***	-0.019***
	(-87.09)		(-35.79)	(-4.64)
Generalist Index$_{d,t}$	-0.152***	-0.146***	-0.124***	-0.028***
	(-77.18)	(-41.37)	(-37.78)	(-7.26)
Industry Experience$_{d,t}$	-0.150***		-0.125***	-0.025***
	(-85.80)		(-39.52)	(-7.05)
Panel B: Gender gaps in the likelihood to be CEO				
	Tercile 1 (low)	Tercile 2	Tercile 3 (high)	Difference T1 - T3
	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	-0.143***	-0.141***	-0.105	-0.037
	(-10.33)	(-8.05)	(-1.44)	(-0.50)
Top 50 ranked college$_{d,t}$	-0.180***		-0.067***	-0.113***
	(-14.26)		(-3.39)	(-4.80)
Generalist Index$_{d,t}$	-0.280***	-0.119***	-0.060***	-0.220***
	(-19.40)	(-4.55)	(-3.83)	(-10.37)
Industry Experience$_{d,t}$	-0.187***		-0.070***	-0.117***
	(-14.47)		(-3.81)	(-5.20)
Panel C: Gender gaps in compensation				
	Tercile 1 (low)	Tercile 2	Tercile 3 (high)	Difference T1 - T3
	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	-0.099***	-0.046	0.404**	-0.503***
	(-3.41)	(-1.23)	(2.38)	(-2.92)
Top 50 ranked college$_{d,t}$	-0.165***		0.108**	-0.273***
	(-6.16)		(2.54)	(-5.44)
Generalist Index$_{d,t}$	-0.306***	-0.115**	0.030	-0.336***
	(-9.36)	(-2.02)	(0.97)	(-7.50)
Industry Experience$_{d,t}$	-0.219***		0.174***	-0.393***
	(-7.88)		(4.79)	(-8.60)

Appendix: Data Sources and Variable Definitions

Table A1: Data sources and variable definitions

(i) BoardEx: Information about directors including employment and professional experience,

(ii) Compustat: Firm characteristics based on annual reports,

(iii) CRSP: Share price information from the Center for Research in Security Prices,

(iv) ExecuComp: Compensation data for S&P 1500 companies derived from company's annual reports,

(v) KFL: Kenneth French's data library,

(vi) Gentry et al. (2021): Database reporting the reasons for CEO turnover and dismissal in S&P 1500 firms.

Table A1: cont'd

Variable name	Description	Source
$\text{Age}_{\text{d,t}}$	Age of a director d in years in year t.	BoardEx, ExecuComp
$\text{Assets}_{\text{c,t}}$	Assets are firm's c book value of total assets in year t.	BoardEx, ExecuComp
Board Connections ($\text{Netw}_{\text{c,d,t}}$)	Indicator equal to one if the director d is connected to at least one other director which is connected to at least one board member of the company c the director works for, and zero otherwise. Connected is measured as in Engelberg et al. (2013).	BoardEx
$\text{CEO}_{\text{d,t}}$	Indicator equal to one if a director d is the CEO of the firm in year t, and zero otherwise.	BoardEx, ExecuComp
CEO $\text{Death}_{\text{c,t}}$	Indicator equal to one if the previous CEO of the firm c in year t died while in office, and zero otherwise.	ExecuComp, Gentry et al. (2021)
CEO $\text{Experience}_{\text{d,t}}$	Indicator equal to one if a director d was CEO in a listed firm before the current employment in year t, and zero otherwise.	BoardEx
Conglomerate $\text{Experience}_{\text{d,t}}$	Indicator equal to one if a director d worked at a listed firm with more than one segment before the current employment in year t, and zero otherwise.	BoardEx
Education $\text{Score}_{\text{d,t}}$	A variable equal to one if in year the highest degree of director d is a Bachelor's degree, 2 if the highest degree is a Master's degree, 3 if the highest degree is a PhD, and 0 otherwise (Graham et al., 2012). Education Score of director d in year t is based on the Education Score of director d before the current employment in year t.	BoardEx
$\text{Female dummy}_{\text{d}}$	Indicator equal to one if a director d is female, and zero otherwise.	BoardEx
$\text{FemNom}_{\text{c,t}}$	Indicator equal to one if the chair of the nomination committee of a company c in year t is female, and zero otherwise.	BoardEx

Table A1: cont'd

First Leadership Position$_{d,c,t}$	Indicator that as equal to one if a director d enters a leadership position at a given company c in year t for the first time, and zero otherwise. We exclude subsequent director years where a director remains in a leadership position at the company.	BoardEx
Generalist Index$_{d,t}$	Generalist Index is defined as in Custódio et al. (2013), estimated as 0.268 x Number of Positions + 0.312 x Number of Firms + 0.309 x Number of Industries + 0.281 x CEO Experience + 0.153 x Conglomerate Experience. Generalist Index of director d in year t is based on the professional experience of director d before the current employment in year t.	BoardEx
Idiosyncratic Volatility$_{c,t}$	Idiosyncratic volatility of firm c in year t, computed as the squared residual estimated from a five-year rolling window CAPM regression of monthly returns.	CRSP, KFL
Industry$_{c,t}$	Industry of of firm c in year t, classified according to the 2-digit SIC classification.	BoardEx, Compustat
Last year return (in%)$_{c,t}$	Annual stock return of firm c in year t.	CRSP
Leadership position$_{d,t}$	A dummy variable equal to one if a director d in year t is CEO, Chairman/-woman, Vice Chair, President, CFO, COO, or Other Chief Officer, and zero otherwise.	BoardEx
Market to Book$_{c,t}$	Market to book of firm c in year t, computes as the ratio of the market value of equity at the fiscal year end divided by the book value of equity for the fiscal year. The book value of equity is calculated as shareholder equity, plus deferred taxes and credits, minus the book value of preferred stock. The market value of equity is the product of price and number of shares outstanding.	Compustat, CRSP
Nom$_{c,t}$	Indicator equal to one if there is at least one female director in the nomination committee of a firm c in year t, and zero otherwise.	BoardEx
Number of Board Seats$_{d,t}$	Number of Board Seats of a director d in year t.	BoardEx

Table A1: cont'd

Number of Industries$_{d,t}$	Number of different four-digit SIC code industries a director d worked in before the current employment in year t.	BoardEx
Number of Firms$_{d,t}$	Number of different firms a director d worked in before the current employment in year t.	BoardEx
Number of Positions$_{d,t}$	Number of different positions a director d worked in before the current employment in year t.	BoardEx
Outside$_{d,t}$	Indicator that is equal to one if a director d has not worked for the company before the current employment in year t, and zero otherwise.	BoardEx
Same Industry Experience$_{d,t}$	Indicator that is equal to one if a director d worked in the same industry before the current employment in year t, and zero otherwise.	BoardEx
Top 50 ranked college$_{d,t}$	Indicator that is equal to one if the director d graduated from a Top 50 ranked college, and zero otherwise. Top 50 ranked college is defined according to Forbes America's Top Colleges List. Top 50 ranked college of director d in year t is based on the Top 50 rank college of of director d before the current employment in year t.	BoardEx, Forbes
Total Assets$_{c,t}$	Total assets of firm c in year t, computed as firm's book value of total assets. We use the inverse hyperbolic sine transformation of total assets in our regressions.	Compustat
Total Compensation$_{d,t}$	Total compensation of a director d in year t (tdc1). We use the inverse hyperbolic sine of total compensation in our regressions.	ExecuComp

Internet Appendix

This Online Appendix contains additional empirical results for the paper "The Importance of Signaling for Women's Careers".

Additional Results

Figure OA1: Survival Analysis

This figure shows the probability that a director has entered a leadership position at a certain age based on the skill signals. We estimate the hazard function conditional on directors' gender and for each skill signal separately. High-skill directors have a skill signal that is above the median and low-skill directors have a skill signal that is below the median. Education Score is defined according to Graham et al. (2012). Top 50 ranked college is an indicator that is equal to one if a director graduated from a Top 50 ranked college, and zero otherwise. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. Female dummy is an indicator variable that takes the value of one if a director is female, and zero otherwise. The time period is from 2000 to 2019. All numbers are based on the BoardEx sample.

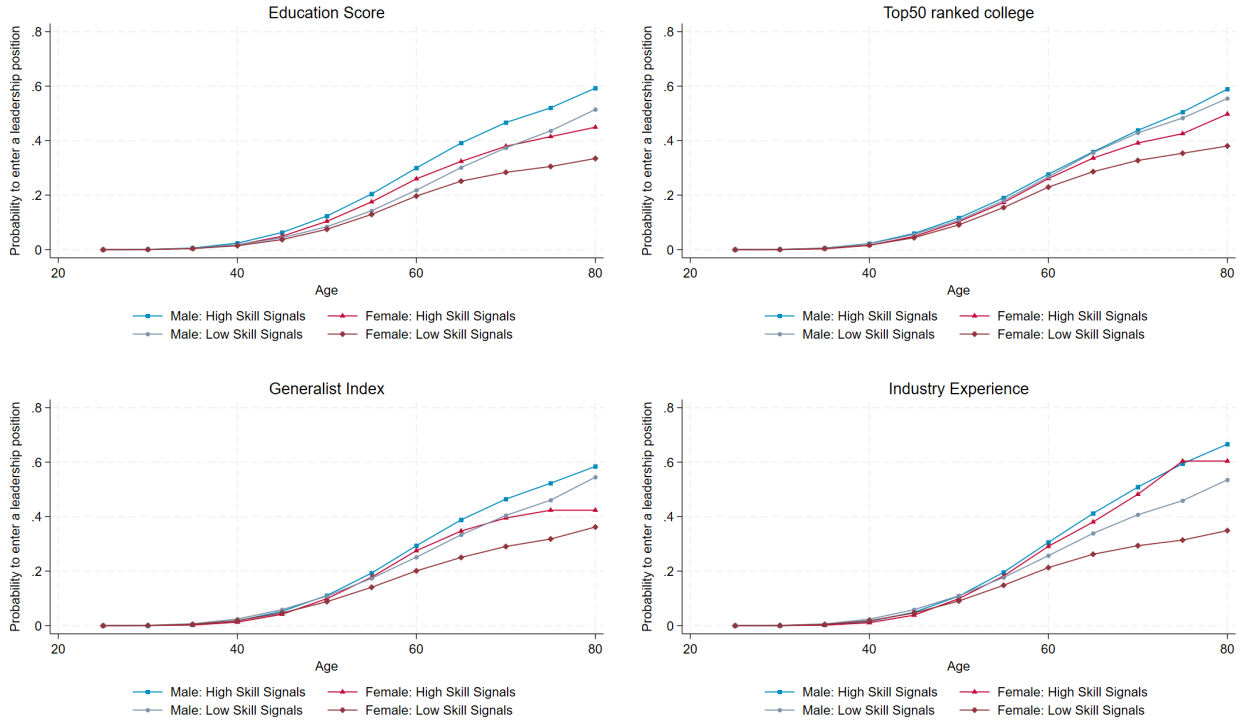

Table OA1: List of Top 50 ranked colleges

This table shows the Top 50 colleges in the US according to the Forbes top colleges ranking taken from https://www.forbes.com/top-colleges/.

1	University of California, Berkeley	26	Brown University
2	Yale University	27	University of Washington, Seattle
3	Princeton University	28	University of North Carolina, Chapel Hill
4	Stanford University	29	United States Military Academy
5	Columbia University	30	University of Virginia
6	Massachusetts Institute of Technology	31	University of Illinois, Urbana-Champaign
7	Harvard University	32	Wellesley College
8	University of California, Los Angeles	33	Washington University in St. Louis
9	University of Pennsylvania	34	Georgia Institute of Technology
10	Northwestern University	35	Emory University
11	Dartmouth College	36	Bowdoin College
12	Duke University	37	Johns Hopkins University
13	Cornell University	38	Tufts University
14	Vanderbilt University	39	University of California, Santa Barbara
15	University of California, San Diego	40	California Institute of Technology
16	Amherst College	41	University of Notre Dame
17	University of Southern California	42	University of Maryland, College Park
18	Williams College	43	Swarthmore College
19	Pomona College	44	Middlebury College
20	University of California, Davis	45	University of Texas, Austin
21	Georgetown University	46	Claremont McKenna College
22	University of Michigan, Ann Arbor	47	University of California, Irvine
23	University of Chicago	48	Colgate University
24	Rice University	49	Carnegie Mellon University
25	University of Florida	50	Texas A&M University, College Station

Table OA2: Where did female directors in a leadership position graduate?

This table shows the number of female and male directors in a leadership position that graduated from a given university. Percentage is the number of female directors in a leadership position divided by the total number of directors in a leadership position who graduated from the same university. We only include universities where at least 50 female directors in a leadership position graduated.

Rank	Percentage	# All	# Male	# Female	University
1	19.6%	363	292	71	Boston University
2	16.1%	627	526	101	Indiana University
3	15.9%	490	412	78	Georgetown University
4	14.9%	370	315	55	University of Washington
5	14.6%	1139	973	166	University of California Berkeley
6	14.5%	759	649	110	Cornell University
7	14.3%	460	394	66	University of Minnesota
9	14.2%	386	331	55	Boston College
10	13.8%	465	401	64	University of North Carolina Chapel Hill
11	13.6%	1145	989	156	Northwestern University
12	13.5%	2469	2135	334	Harvard University
13	13.4%	448	388	60	Michigan State University
14	13.2%	589	511	78	Duke University
15	13.2%	881	765	116	Columbia University
16	13.0%	747	650	97	New York University
17	12.8%	452	394	58	Ohio State University
18	12.8%	924	806	118	University of Chicago
19	12.4%	1603	1405	198	Stanford University
20	12.3%	745	653	92	University of Illinois
21	12.3%	471	413	58	University of California Los Angeles
22	12.2%	572	502	70	University of Wisconsin
23	11.9%	1024	902	122	University of Michigan
24	11.9%	860	758	102	University of Texas at Austin
25	11.5%	1589	1407	182	University of Pennsylvania
26	11.0%	499	444	55	Purdue University
27	11.0%	518	461	57	Pennsylvania State University
28	11.0%	529	471	58	California State University
29	10.6%	555	496	59	State University of New York of Brockport
30	10.6%	671	600	71	University of Virginia
31	9.9%	515	464	51	Yale University
32	9.5%	567	513	54	University of Southern California
33	9.3%	803	728	75	Massachusetts Institute of Technology

Table OA3: Do skill signals increase female directors' probability of entering a leadership position? - Logit regressions

This table presents average marginal effects for the likelihood of a director of entering a leadership position in Panel A and of becoming CEO in Panel B using logit regressions. Results in Panel A are based on the full BoardEx sample, results in Panel B are based on the ExecuComp sample. Education Score is defined according to Graham et al. (2012). Top 50 ranked college is an indicator that is equal to one if a director graduated from a Top 50 ranked college, and zero otherwise. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. Controls are the same as in Tables 2 - 3 and interacted with the female indicator variable. Since we are estimating logit regressions, this table only includes industry fixed effects (based on 2-digit industry classification) and year fixed effects. *t*-statistics based on standard errors clustered by firm-year level are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Panel A: Likelihood of entering a leadership position				
	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.011***			
	(15.64)			
Education Score$_{d,t}$ x Female dummy$_d$	0.011***			
	(6.48)			
Top 50 ranked college$_{d,t}$		-0.001		
		(0.56)		
Top 50 ranked college$_{d,t}$ x Female dummy$_d$		0.019***		
		(4.60)		
Generalist Index$_{d,t}$			0.042***	
			(67.34)	
Generalist Index$_{d,t}$x Female dummy$_d$			0.013***	
			(8.70)	
Same Industry Experience$_{d,t}$				0.021***
				(13.93)
Same Industry Experience$_{d,t}$x Female dummy$_d$				0.030***
				(8.37)
Female dummy$_d$	-0.533***	-0.539***	-0.449***	-0.509***
	(12.11)	(12.21)	(10.18)	(11.58)
Controls	Yes	Yes	Yes	Yes
Controls×Female dummy	Yes	Yes	Yes	Ye
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	728149	728149	728149	728149

Table OA3: cont'd

Panel B: Likelihood of becoming CEO	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.042***			
	(16.27)			
Education Score$_{d,t}$ x Female dummy$_d$	0.052***			
	(3.98)			
Top 50 ranked college$_{d,t}$		0.064***		
		(12.36)		
Top 50 ranked college$_{d,t}$ x Female dummy$_d$		0.143***		
		(5.91)		
Generalist Index$_{d,t}$			0.050***	
			(27.83)	
Generalist Index$_{d,t}$x Female dummy$_d$			0.047***	
			(5.65)	
Same Industry Experience$_{d,t}$				0.057***
				(11.63)
Same Industry Experience$_{d,t}$ x Female dummy$_d$				0.096***
				(4.29)
Female dummy$_d$	-2.732***	-2.718***	-1.625**	-2.202***
	(3.73)	(3.53)	(2.44)	(3.14)
Controls	Yes	Yes	Yes	Yes
Controls×Female	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	49712	49712	49712	49712

Table OA4: Do skill signals increase female directors' probability of entering a leadership position? - One-way clustered standard errors

This table shows the robustness of our main results on female directors' likelihood of entering a leadership position (Panel A), of becoming CEO (Panel B) and to receive higher compensation (Panel C) using one-way clustered standard errors. Results in Panel A are based on the full BoardEx sample, results in Panel B and Panel C are based on the ExecuComp sample. Education Score is defined according to Graham et al. (2012). Top 50 ranked college is an indicator that is equal to one if the director graduated from a Top 50 ranked college, and zero otherwise. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. Female dummy is an indicator variable that takes the value of one if a director is female, and zero otherwise. We include the same control variables as in Tables 2 - 10. The regression includes firm and year fixed effects in columns (1) and (2), and firm×year fixed effects in columns (3) and (4). *t*-statistics based on standard errors clustered by firm are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Panel A: Likelihood of entering a leadership position				
	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.016***		0.016***	
	(7.69)		(7.55)	
Education Score$_{d,t}$ x Female dummy$_{d}$	0.011***		0.011***	
	(2.58)		(2.62)	
Top 50 ranked college$_{d,t}$		0.002		0.001
		(0.41)		(0.21)
Top 50 ranked college$_{d,t}$ x Female dummy$_{d}$		0.022**		0.023**
		(2.29)		(2.35)
Female dummy$_{d}$	-0.130***	-0.124***	-0.131***	-0.124***
	(19.91)	(25.11)	(19.89)	(24.91)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm×Year FE	No	No	Yes	Yes
Adjusted R^2	0.152	0.151	0.112	0.111
Observations	728143	728143	727552	727552

Table OA4: cont'd

	(1)	(2)	(3)	(4)
Generalist Index$_{d,t}$	0.054***		0.056***	
	(30.51)		(30.73)	
Generalist Index$_{d,t}$x Female dummy$_d$	0.005		0.003	
	(1.44)		(0.75)	
Same Industry Experience$_{d,t}$		0.036***		0.038***
		(8.85)		(9.16)
Same Industry Experience$_{d,t}$x Female dummy$_d$		0.019**		0.016*
		(2.30)		(1.87)
Female dummy$_d$	-0.123***	-0.124***	-0.122***	-0.124***
	(23.00)	(23.82)	(22.45)	(23.40)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm×Year FE	No	No	Yes	Yes
Adjusted R^2	0.161	0.152	0.123	0.112
Observations	728143	728143	727552	727552

Table OA4: cont'd

Panel B: Likelihood of becoming CEO				
	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.034***		0.037***	
	(3.64)		(2.73)	
Education Score$_{d,t}$ x Female dummy$_d$	0.041		0.054	
	(1.34)		(1.33)	
Top 50 ranked college$_{d,t}$		0.067***		0.095***
		(3.69)		(3.46)
Top 50 ranked college$_{d,t}$ x Female dummy$_d$		0.158**		0.224***
		(2.53)		(2.68)
Female dummy$_d$	-0.244***	-0.240***	-0.321***	-0.328***
	(5.59)	(7.58)	(5.70)	(7.64)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm×Year FE	No	No	Yes	Yes
Adjusted R^2	0.185	0.186	-0.530	-0.525
Observations	49674	49674	32608	32608
	(1)	(2)	(3)	(4)
Generalist Index$_{d,t}$	0.040***		0.063***	
	(8.23)		(7.66)	
Generalist Index$_{d,t}$x Female dummy$_d$	0.051***		0.043**	
	(4.36)		(2.35)	
Same Industry Experience$_{d,t}$		0.011		-0.004
		(0.65)		(0.14)
Same Industry Experience$_{d,t}$ x Female dummy$_d$		0.167***		0.212**
		(2.95)		(2.50)
Female dummy$_d$	-0.287***	-0.253***	-0.329***	-0.319***
	(8.60)	(7.19)	(7.73)	(7.07)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm×Year FE	No	No	Yes	Yes
Adjusted R^2	0.192	0.184	-0.510	-0.532
Observations	49674	49674	32608	32608

Table OA4: cont'd

Panel C: Gender gaps in compensation	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.046***		0.041***	
	(4.10)		(2.97)	
Education Score$_{d,t}$ x Female dummy$_d$	0.037		0.066	
	(0.94)		(1.35)	
Top 50 ranked college$_{d,t}$		0.050**		0.054**
		(2.32)		(1.97)
Top 50 ranked college$_{d,t}$ x Female dummy$_d$		0.213**		0.316***
		(2.55)		(3.22)
Female dummy$_d$	-0.239***	-0.252***	-0.323***	-0.338***
	(3.86)	(5.73)	(4.39)	(5.96)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm x Year FE	No	No	Yes	Yes
Adjusted R^2	0.603	0.603	0.600	0.601
Observations	49117	49117	31892	31892
	(1)	(2)	(3)	(4)
Generalist Index$_{d,t}$	0.073***		0.089***	
	(10.79)		(9.83)	
Generalist Index$_{d,t}$x Female dummy$_d$	0.040**		0.047*	
	(2.06)		(1.66)	
Same Industry Experience$_{d,t}$		0.086***		0.079***
		(3.97)		(2.65)
Same Industry Experience$_{d,t}$ x Female dummy$_d$		0.229***		0.318***
		(3.02)		(3.01)
Female dummy$_d$	-0.280***	-0.277***	-0.329***	-0.342***
	(5.69)	(5.92)	(5.93)	(6.23)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Firm×Year FE	No	No	Yes	Yes
Adjusted R^2	0.608	0.604	0.609	0.601
Observations	49117	49117	31892	31892

Table OA5: Do skill signals increase female directors' probability of entering a leadership position? - Controls interacted with the female indicator variable

This table shows the robustness of our main results on female directors' likelihood of entering a leadership position (Panel A), of becoming CEO (Panel B) and to receive higher compensation (Panel C) interacting the control variables with the female indicator variable. Results in Panel A are based on the full BoardEx sample, results in Panel B and Panel C are based on the ExecuComp sample. Education Score is defined according to Graham et al. (2012). Top 50 ranked college is an indicator that is equal to one if the director graduated from a Top 50 ranked college, and zero otherwise. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. Female dummy is an indicator variable that takes the value of one if a director is female, and zero otherwise. We include the same control variables as in Tables 2 - 10. Regressions include firm×year fixed effects. t-statistics based on standard errors clustered by firm-year are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Panel A: Likelihood of entering a leadership position				
	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.016***			
	(21.89)			
Education Score$_{d,t}$ x Female dummy$_d$	0.007***			
	(3.97)			
Top 50 ranked college$_{d,t}$		0.002		
		(1.07)		
Top 50 ranked college$_{d,t}$ x Female dummy$_d$		0.016***		
		(3.93)		
Generalist Index$_{d,t}$			0.055***	
			(81.48)	
Generalist Index$_{d,t}$x Female dummy$_d$			0.005***	
			(3.63)	
Same Industry Experience$_{d,t}$				0.036***
				(22.19)
Same Industry Experience$_{d,t}$x Female dummy$_d$				0.026***
				(7.26)
Female dummy$_d$	-0.172***	-0.181***	-0.126***	-0.161***
	(5.55)	(5.81)	(4.02)	(5.18)
Controls	Yes	Yes	Yes	Yes
Controls×Female dummy	Yes	Yes	Yes	Yes
Firm×Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.114	0.113	0.124	0.114
Observations	727472	727472	727472	727472

Table OA5: cont'd

Panel B: Likelihood of becoming CEO	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.037***			
	(6.39)			
Education Score$_{d,t}$ x Female dummy$_d$	0.055**			
	(2.57)			
Top 50 ranked college$_{d,t}$		0.095***		
		(7.89)		
Top 50 ranked college$_{d,t}$ x Female dummy$_d$		0.239***		
		(5.11)		
Generalist Index$_{d,t}$			0.062***	
			(14.55)	
Generalist Index$_{d,t}$x Female dummy$_d$			0.047***	
			(3.96)	
Same Industry Experience$_{d,t}$				-0.003
				(0.26)
Same Industry Experience$_{d,t}$ x Female dummy$_d$				0.206***
				(4.40)
Female dummy$_d$	-1.325***	-1.237***	-0.340	-0.859**
	(3.16)	(2.96)	(0.85)	(2.13)
Controls	Yes	Yes	Yes	Yes
Controls×Female dummy	Yes	Yes	Yes	Yes
Firm×Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	-0.530	-0.525	-0.510	-0.532
Observations	32606	32606	32606	32606

Table OA5: cont'd

Panel C: Gender gaps in compensation	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.041***			
	(6.14)			
Education Score$_{d,t}$ x Female dummy$_d$	0.073***			
	(2.64)			
Top 50 ranked college$_{d,t}$		0.054***		
		(3.97)		
Top 50 ranked college$_{d,t}$ x Female dummy$_d$		0.332***		
		(5.70)		
Generalist Index$_{d,t}$			0.088***	
			(16.55)	
Generalist Index$_{d,t}$x Female dummy$_d$			0.054***	
			(2.66)	
Same Industry Experience$_{d,t}$				0.079***
				(4.93)
Same Industry Experience$_{d,t}$ x Female dummy$_d$				0.324***
				(5.24)
Female dummy$_d$	-0.804	-0.672	0.448	-0.151
	(1.25)	(1.05)	(0.72)	(0.24)
Controls	Yes	Yes	Yes	Yes
Controls×Female dummy	Yes	Yes	Yes	Yes
Firm×Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.600	0.601	0.609	0.601
Observations	31890	31890	31890	31890

Table OA6: Do skill signals increase female directors' probability of entering a leadership position? - Including Person FE

This table shows the robustness of our main results on female directors' likelihood of entering a leadership position (Panel A) and of becoming CEO (Panel B) using person fixed effects. Results in Panel A are based on the full BoardEx sample and results in Panel B are based on the ExecuComp sample. Education Score is defined according to Graham et al. (2012). Top 50 ranked college is an indicator that is equal to one if the director graduated from a Top 50 ranked college, and zero otherwise. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. Female dummy is an indicator variable that takes the value of one if a director is female, and zero otherwise. We include the same control variables as in Tables 2 - 10. The regression includes firm and year fixed effects and person fixed effects. t-statistics based on standard errors clustered by firm are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.003			
	(0.35)			
Education Score$_{d,t}$ x Female dummy$_d$	-0.011			
	(0.72)			
Top50 ranked college$_{d,t}$		-0.100**		
		(2.21)		
Top50 ranked college$_{d,t}$ x Female dummy$_d$		0.239***		
		(3.58)		
Generalist Index$_{d,t}$			0.017***	
			(14.85)	
Generalist Index$_{d,t}$x Female dummy$_d$			0.026***	
			(10.50)	
Same Industry Experience$_{d,t}$				0.019***
				(7.20)
Same Industry Experience$_{d,t}$x Female dummy$_d$				0.013**
				(2.17)
Controls	Yes	Yes	Yes	Yes
Director FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.749	0.749	0.749	0.749
Observations	718853	718853	718853	718853

Table OA7: Time Split

This table shows the robustness of our main results on female directors' likelihood of entering a leadership position. Results are based on the full BoardEx sample. We split our analysis in two periods: 2000-2009 and 2010-2019. Education Score is defined according to Graham et al. (2012). Top 50 ranked college is an indicator that is equal to one if the director graduated from a Top 50 ranked college, and zero otherwise. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. Female dummy is an indicator variable that takes the value of one if a director is female, and zero otherwise. We include the same control variables as in Tables 2 - 10. The regression includes firm and year fixed effects. *t*-statistics based on standard errors clustered by firm are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

	(1) 2000-2009	(2) 2010-2019	(3) 2000-2009	(4) 2010-2019	(5) 2000-2009	(6) 2010-2019	(7) 2000-2009	(8) 2010-2019
Education Score$_{d,t}$	0.025***	0.006***						
	(24.25)	(5.53)						
Education Score$_{d,t}$ x Female dummy$_d$	0.007***	0.016***						
	(3.23)	(6.52)						
Top50 ranked college$_{d,t}$			0.010***	-0.009***				
			(4.58)	(3.70)				
Top50 ranked college$_{d,t}$ x Female dummy$_d$			0.029***	0.018***				
			(5.58)	(3.20)				
Generalist Index$_{d,t}$					0.062***	0.050***		
					(59.44)	(58.23)		
Generalist Index$_{d,t}$ x Female dummy$_d$					-0.006**	0.006***		
					(2.17)	(3.31)		
Same Industry Experience$_{d,t}$							0.033***	0.041***
							(14.50)	(18.29)
Same Industry Experience$_{d,t}$ x Female dummy$_d$							0.013**	0.012***
							(2.41)	(2.60)
Female dummy$_d$	-0.142***	-0.120***	-0.142***	-0.107***	-0.132***	-0.111***	-0.139***	-0.107***
	(44.54)	(33.68)	(58.72)	(41.14)	(51.48)	(37.85)	(56.36)	(38.60)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.157	0.150	0.155	0.149	0.165	0.161	0.156	0.151
Observations	390125	338012	390125	338012	390125	338012	390125	338012

Table OA8: Is graduating from a Top 10 college more beneficial for female directors?

This table presents results on the impact of having graduated from a Top 10 ranked college on the likelihood of entering a leadership position in columns (1) and (2), of becoming CEO in columns (3) and (4) and on directors' compensation in column (5) and (6). Results in columns (1) and (2) are based on the full BoardEx sample, results in columns (3) to (6) are based on the ExecuComp sample. Top 10 ranked college is an indicator that is equal to one if a director graduated from Stanford University, University of Pennsylvania, Massachusetts Institute of Technology, Princeton University, Duke University, Harvard University, Yale University, Cornell University, University of California–Berkeley or University of Notre Dame, and zero otherwise. Female dummy is an indicator variable that takes the value of one if a director is female, and zero otherwise. All variables are defined in detail in Appendix Table A1.The regression includes firm and year fixed effects in columns (1), (3) and (5), and firm×year fixed effects in columns (2), (4) and (6). t-statistics based on standard errors clustered by firm-year level are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

	Enter a Leadership position		Become CEO		Compensation	
	(1)	(2)	(3)	(4)	(5)	(6)
Top 10 ranked college$_{d,t}$	0.017***	0.016***	0.035***	0.023	0.049***	0.029
	(6.42)	(5.96)	(2.93)	(1.27)	(2.98)	(1.40)
Top 10 ranked college$_{d,t}$	0.018***	0.019***	0.214***	0.249***	0.277***	0.306***
x Female dummy$_{d}$	(2.68)	(2.89)	(4.67)	(4.10)	(4.42)	(4.64)
Female dummy$_{d}$	-0.121***	-0.121***	-0.221***	-0.290***	-0.226***	-0.284***
	(72.66)	(72.01)	(14.80)	(14.46)	(10.35)	(10.40)
Age$_{d,t}$	0.043***	0.043***	0.106***	0.121***	0.099***	0.091***
	(85.11)	(83.31)	(35.41)	(29.24)	(19.21)	(15.98)
Age squared$_{d,t}$	-0.000***	-0.000***	-0.001***	-0.001***	-0.001***	-0.001***
	(69.95)	(68.07)	(32.66)	(26.19)	(18.96)	(15.14)
Assets$_{c,t-1}$	-0.024***		-0.032***		0.236***	
	(22.98)		(9.19)		(23.65)	
Last year return in %$_{c,t-1}$	-0.000*		0.000***		0.001***	
	(1.66)		(3.91)		(15.32)	
Idiosyncratic Volatility in %$_{c,t-1}$	0.000		0.001*		-0.001	
	(1.21)		(1.76)		(0.87)	
Market to Book$_{c,t-1}$	-0.000		-0.000		0.007***	
	(1.64)		(0.72)		(6.48)	
Firm FE	Yes	No	Yes	No	Yes	No
Year FE	Yes	No	Yes	No	Yes	No
Firm x Year FE	No	Yes	No	Yes	No	Yes
Adjusted R^2	0.151	0.112	0.184	-0.532	0.603	0.600
Observations	728143	727552	49674	32608	49117	31892

Table OA9: Which components of the Generalist index increase (female) directors' likelihood of entering a leadership position?

This table presents results on the impact of general management skills on (female) directors' likelihood of entering a leadership position in Panel A and of becoming CEO in Panel B. Results in Panel A are based on the full BoardEx sample, results in Panel B are based on the ExecuComp sample. Number of Positions (Firms/Industries) is defined as the number of different positions (firms/industries) the director worked in before the current employment in year t. CEO Experience is a dummy variable that is equal to one if a director was CEO in another firm before the current employment in year t, and zero otherwise. Conglomerate Experience is an indicator that is equal to one if a director worked at a firm with more than one segment before the current employment in year t, and zero otherwise. We include the same control variables as in Table 3. All variables are defined in detail in Appendix Table A1. The regressions include firm×year fixed effects. t-statistics based on standard errors clustered by firm-year level are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

Panel A: Likelihood of entering a leadership position					
	(1)	(2)	(3)	(4)	(5)
Number of Positions$_{d,t}$	0.037***				
	(77.58)				
Number of Positions$_{d,t}$ x Female dummy$_d$	0.002**				
	(2.07)				
Number of Firms$_{d,t}$		0.048***			
		(51.59)			
Number of Firms$_{d,t}$ x Female dummy$_d$		0.006***			
		(3.74)			
Number of Industries$_{d,t}$			0.053***		
			(74.81)		
Number of Industries$_{d,t}$			0.002		
x Female dummy$_d$			(1.44)		
CEO Experience$_{d,t}$				0.247***	
				(56.41)	
CEO Experience$_{d,t}$ x Female dummy$_d$				0.042*	
				(1.93)	
Conglomerate$_{d,t}$					0.079***
					(54.17)
Conglomerate$_{d,t}$					0.001
x Female dummy$_d$					(0.24)
Female dummy$_d$	-0.122***	-0.124***	-0.123***	-0.118***	-0.1205***
	(65.09)	(64.13)	(64.22)	(71.67)	(59.65)
Controls	Yes	Yes	Yes	Yes	Yes
Firm×Year FE	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.122	0.121	0.121	0.115	0.116
Observations	727552	727552	727552	727552	727552

Table OA9: cont'd

Panel B: Likelihood of becoming CEO	(1)	(2)	(3)	(4)	(5)
Number of Positions$_{d,t}$	0.037***				
	(12.30)				
Number of Positions$_{d,t}$ x Female dummy$_d$	0.029***				
	(3.11)				
Number of Firms$_{d,t}$		0.052***			
		(12.33)			
Number of Firms$_{d,t}$ x Female dummy$_d$		0.035***			
		(3.21)			
Number of Industries$_{d,t}$			0.058***		
			(13.16)		
Number of Industries$_{d,t}$			0.048***		
x Female dummy$_d$			(4.04)		
CEO Experience$_{d,t}$				0.190***	
				(9.20)	
CEO Experience$_{d,t}$ x Female dummy$_d$				0.233**	
				(2.33)	
Conglomerate Experience$_{d,t}$					0.176***
					(16.97)
Conglomerate Experience$_{d,t}$					0.193***
x Female dummy$_d$					(5.03)
Female dummy$_d$	-0.312***	-0.319***	-0.335***	-0.266***	-0.353***
	(14.98)	(15.51)	(16.20)	(13.77)	(16.30)
Controls	Yes	Yes	Yes	Yes	Yes
Firm×Year FE	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	-0.517	-0.514	-0.512	-0.525	-0.506
Observations	32608	32608	32608	32608	32608

Table OA10: The impact of skill signals on (female) executives' compensation - The impact of CEOs

This table presents results on the impact of professional experience on (female) executives' compensation. Results are based on the ExecuComp sample. We exclude all CEOs from our sample. Compensation is measured as the inverse hyperbolic sine of ExecuComp's total compensation variable (tdc1). Education Score is defined according to Graham et al. (2012). Top 50 ranked college is an indicator that is equal to one if a director graduated from a Top 50 ranked college, and zero otherwise. Generalist Index is defined as in Custódio et al. (2013). It is based on the professional experience of a director before the current employment in year t. Same Industry Experience is an indicator equal to one if a director worked in the same industry before the current employment in year t, and zero otherwise. We include the same control variables as in Table 10. All variables are defined in detail in Appendix Table A1. The regression includes firm and year fixed effects. *t*-statistics based on standard errors clustered by firm-year level are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

	(1)	(2)	(3)	(4)
Education Score$_{d,t}$	0.021**			
	(2.16)			
Education Score$_{d,t}$ x Female dummy$_d$	0.033			
	(1.06)			
Top 50 ranked college$_{d,t}$		0.031		
		(1.53)		
Top 50 ranked college$_{d,t}$ x Female dummy$_d$		0.105		
		(1.57)		
Generalist Index$_{d,t}$			0.039***	
			(5.26)	
Generalist Index$_{d,t}$x Female dummy$_d$			0.039*	
			(1.80)	
Same Industry Experience$_{d,t}$				0.087***
				(4.07)
Same Industry Experience$_{d,t}$ x Female dummy$_d$				0.184***
				(2.87)
Female dummy$_d$	-0.153***	-0.145***	-0.170***	-0.172***
	(3.34)	(4.46)	(4.81)	(5.25)
Controls	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Adjusted R^2	0.619	0.619	0.620	0.620
Observations	19389	19389	19389	19389

Table OA11: Which components of the Generalist Index matter for (female) executives' compensation?

This table presents results on the impact of the components of the Generalist Index on (female) executives' compensation. Results are based on the ExecuComp sample. Compensation is measured as the inverse hyperbolic sine of ExecuComp's total compensation (tdc1). Number of Positions (Firms/Industries) is defined as the number of different positions (firms/industries) a director worked in before the current employment in year t. CEO Experience is a dummy variable that is equal to one if a director was CEO in another firm before the current employment in year t, and zero otherwise. Conglomerate Experience is an indicator that is equal to one if a director worked at firm with more than one segment before the current employment in year t, and zero otherwise. We include the same control variables as in Table 10. All variables are defined in detail in Appendix Table A1. The regressions include firm×year fixed effects. t-statistics based on standard errors clustered by firm-year level are shown in parentheses. *, ** and *** denote significance at the 10%, 5% and 1% levels, respectively.

	(1)	(2)	(3)	(4)	(5)
Number of Positions$_{d,t}$	0.054***				
	(14.38)				
Number of Positions$_{d,t}$ x Female dummy$_d$	0.031**				
	(2.13)				
Number of Firms$_{d,t}$		0.072***			
		(12.95)			
Number of Firms$_{d,t}$ x Female dummy$_d$		0.041**			
		(2.26)			
Number of Industries$_{d,t}$			0.083***		
			(15.40)		
Number of Industries$_{d,t}$ x Female dummy$_d$			0.047**		
			(2.52)		
CEO Experience$_{d,t}$				0.207***	
				(7.32)	
CEO Experience$_{d,t}$ x Female dummy$_d$				0.593***	
				(3.88)	
Conglomerate Experience$_{d,t}$					0.222***
					(18.54)
Conglomerate Experience$_{d,t}$					0.212***
x Female dummy$_d$					(4.16)
Female dummy$_d$	-0.306***	-0.321***	-0.329***	-0.272***	-0.3515***
	(10.63)	(11.17)	(11.59)	(10.93)	(11.59)
Controls	Yes	Yes	Yes	Yes	Yes
Firm×Year FE	Yes	Yes	Yes	Yes	Yes
Adjusted R^2	0.606	0.607	0.608	0.602	0.608
Observations	31892	31892	31892	31892	31892

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