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“The Gender Gap in Executive Promotions”

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**Presenter:** Jing Xu, Assistant Professor, University of  
Technology Sydney

**Discussant:** Marianne Bertrand, Professor of  
Economics at the University of Chicago Booth  
School of Business

# The Gender Gap in Executive Promotions

Jing Xu\*

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## Abstract

Using comprehensive executive data in 5,886 U.S. firms from 2000 to 2015, I document that the promotion rate for women is 31% lower than the promotion rate for men. While sorting into executive positions in different functional areas explains a substantial portion of the promotion gap, a gap of 20% remains unexplained. Consistent with the presence of taste-based discrimination, the promotion gap is lower in firms in more competitive product markets. I find no evidence that the gap is lower in firms with more female directors, suggesting that board gender quotas may not increase female management representation.

*JEL classification:* J16; J20; G34; G38

*Keywords:* Gender gap, Promotion, Functional expertise, Discrimination, Diversity

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# 1 Introduction

Women comprise almost half of the total labor force. Yet in 2017, only 5.2% of CEOs in the largest U.S. companies are female.<sup>1</sup> While the absence of women at the top is a serious policy concern, there is still relatively little systematic evidence on supply- and demand-side factors that explain this absence. One reason is that it is difficult to obtain data on the corporate hierarchy. I exploit newly available data on corporate positions to document that female executives are promoted at a lower rate than their male peers. While a substantial portion of the promotion gap can be attributed to supply-side factors such as the sorting of executives into positions with different functional expertise, the remaining gap appears to suggest taste-based discrimination.

Despite the importance of promotions in policy discussions on diversity – and on governance more generally – few studies analyze executive promotions. Studying promotions requires panel data on executives, the firms in which they work, and detailed job titles indicating corporate ranks. The most common dataset for studying executives, ExecuComp, is not suitable for studying promotions below the CEO level because it generally includes only five executives, and the criterion for inclusion is pay rather than rank. While rank is often correlated with pay, there is evidence that this correlation is weaker for women. For example, [Newton and Simutin \(2015\)](#) document that female executives earn less than male executives in the same jobs. This means women are likely to be underrepresented in ExecuComp even if they have a high rank; therefore, their promotions may not be observed. As a result, the promotion patterns of both women and men may be mismeasured.

To provide a complete picture of the pipeline of executive promotions, I use a dataset that has only recently become available, the BoardEx Senior Manager and Disclosed Earners dataset. BoardEx compiles information on directors and senior managers who are at or above the vice president level. My sample period extends from 2000 to 2015. Compared to ExecuComp, BoardEx has more firms (5,886 in BoardEx versus 2,957 in ExecuComp), a higher number of executives in each firm-year (8.3 in BoardEx versus

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<sup>1</sup>[www.catalyst.org/knowledge/womenceosp500](http://www.catalyst.org/knowledge/womenceosp500)

5.7 in ExecuComp), and a higher share of women (12.6% in BoardEx versus 7.5% in ExecuComp). I classify the executive positions into five corporate levels: vice president (VP), senior vice president (SVP), executive vice president (EVP), president, and CEO. Executives are internally promoted when their corporate level increases in the following year.

Even with accurate data on executive positions, it is difficult to study gender differences in executive promotions because job allocations are endogenous. Men and women have different attributes and preferences, which leads them to sort themselves into different industries and companies. For example, some argue that women are generally more risk averse, which may lead them to avoid firms with high employee turnover. Such firms may promote employees frequently, since positions are often available. If women usually avoid working for these firms, their average promotion rate will be lower.

Men and women are also sorted into different functional areas. In the general workforce in 2010, [Blau and Kahn \(2017\)](#) find that occupation explains 33% of the gender wage gap and is the largest single factor. In top management teams, female executives are also disproportionately represented in staff positions, i.e., functions that support the organization, such as human resources and public relations. Unlike positions with profit-and-loss responsibility, staff positions do not prepare managers well for the role of president or CEO ([Helfat et al., 2006](#), [McKinsey, 2017](#)); thus the upward mobility of women is naturally lower.

To address these identification challenges, I estimate a linear probability model for predicting executive promotion with three sets of fixed effects: firm fixed effects, corporate-level fixed effects, and functional expertise fixed effects. Firm fixed effects account for differential sorting by gender into industries and firms. Corporate-level fixed effects account for the fact that women are usually in junior executive positions, which may have a different promotion rate than senior executive positions. Given the importance of functional expertise in explaining gender differences in wages, I first quantify to what extent functional expertise can explain gender differences in promotions. I then include functional expertise fixed effects in the rest of my analysis.

I show that the share of female executives varies greatly across functional areas and corporate levels. Women represent over 30% of executives in human resources and public relations, whereas they represent less than 7% in operations and sales. 15.4% of VPs are female, while the percentage of women declines to 3.8% at CEO positions.

Multivariate analysis reveals that women are promoted at a lower rate than men. After taking functional expertise into account, I find that the promotion gap decreases from 31.3% to 20.2%. The results suggest that women's functional expertise is an important factor that hinders their advancement to leadership positions. Further analysis of promotions from each corporate level shows that functional expertise becomes increasingly important when an executive moves up the corporate ladder.

However, even after accounting for potential sorting, the unexplained promotion gap is still large. There are several possible explanations for this finding. The unexplained gap may result from gender differences in unmeasured characteristics, such as preference or ambition, or it may result from discrimination. Since data on preferences are difficult to obtain, I focus on the latter explanation and investigate whether the gap reflects taste-based discrimination.

[Becker \(1957\)](#) defines taste-based discrimination (hereafter, discrimination) as follows: “[i]f an individual has a ‘taste for discrimination’, he must act as if he were willing to pay something, either directly or in the form of reduced income, to be associated with some persons instead of others.” [Becker \(1957\)](#) argues that discrimination raises costs and is difficult to sustain in a competitive market. The argument implies that firms should reduce discriminatory behavior when competition goes up. On the other hand, if promotion decisions are grounded in valid business reasons, then the promotion gap should remain unchanged. Motivated by this theory, I examine whether the gender promotion gap reflects discrimination by studying how it responds to product market competition.

I use industry concentration, product similarity, and product market fluidity from [Hoberg and Phillips \(2016\)](#) and [Hoberg et al. \(2014\)](#) to measure competition. Overall, I find that the gender promotion gap is larger in firms that are relatively protected from

competitive pressure. For example, the gender promotion gap is 25.4% in firms that have high market power, whereas it is 14.2% in firms that have low market power. The results are consistent with the conjecture that discrimination still plays a role in holding women back from leadership positions.

Even though there is little evidence to date on the importance of discrimination in explaining why so few women are in leadership positions, my evidence is consistent with some regulators' intuition that discrimination may be important. Some regulators respond to the lack of gender diversity in management by instituting board gender quotas because such quotas give firms less discretion in exercising discrimination. But the merits of quotas have been hotly debated. To examine whether these policies are likely to be effective, I examine whether the gender promotion gap is smaller in firms with more female directors. My analysis reveals no evidence that the gender gap is significantly correlated with board gender diversity, consistent with the argument that board gender quotas may not be sufficient to increase female representation in management.

My paper adds to the literature on discrimination. [Black and Strahan \(2001\)](#), [Black and Brainerd \(2004\)](#), and [Heyman et al. \(2013\)](#) document evidence of ongoing discrimination in the general workforce. My study focuses on executives and adds to the debate on what mechanisms hold women back from business leadership positions. In a contemporaneous work, [Heyman et al. \(2017\)](#) develop a theory showing that product market competition can reduce discrimination even when all agents discriminate. Their empirical evidence supports the predictions from their theory: Higher product market competition is associated with increases in wages of female managers, whereas does not affect wages of male managers. They also find that higher competition is associated with higher percentage of female managers in the firm-level data. My study differs from their paper by using individual-level data to study promotions, which allows me to control for functions and to address the concern that some female-dominated functions are in demand when competition goes up. In addition, my study also examines promotions from different corporate levels within the top management team and sheds light on the relative magnitude of the gender gap across these corporate levels.

It also adds to the small literature of gender differences in executive promotions. Using a sample of executives in both ExecuComp and Marquis Who's Who, [Gayle et al. \(2012\)](#) find that female executives are promoted at a higher rate than male executives in U.S. companies. The data differences may explain our inconsistent results. As I suggested above, women tend to earn less than men, and they might have to outperform men by a substantial margin to appear in the ExecuComp data. Because selection into the ExecuComp sample may vary by gender, such estimates of promotion rates using ExecuComp data are likely to be biased for executives as a whole. Additionally, [Smith et al. \(2011\)](#) find little gender gap in VP and CEO appointments in Denmark after taking child-related decisions and functional expertise into account. [Keloharju et al. \(2017\)](#) report that women are less likely to become CEOs and top executives in Sweden and that slow career progression in the five years after the first childbirth explains most of the female disadvantage. Due to lack of data, I cannot control for child-related factors, which leads to a downward omitted variable bias, i.e., a larger gender gap. However, it is unlikely that this bias explains the entire gap documented in my study; otherwise the gender gap could not respond to changes in competition.

My study also yields insight into the quality of current corporate governance. It suggests that product market competition, an external corporate governance mechanism, is associated with management gender diversity. It thereby adds to the corporate governance literature on the disciplinary effect of product market competition ([Giroud and Mueller, 2011](#), [Dasgupta et al., 2014](#)).

Finally, this study contributes to the literature on the influence of female directors on management gender diversity. [Bertrand et al. \(2017\)](#) find little evidence that better female representation on boards has a discernible impact on women's workplace equality in Norway. In addition, [Smith et al. \(2013\)](#) find an insignificant or even negative effect of female CEOs or chairs on the probability that a female candidate will be promoted to a VP position in Denmark. My results are consistent with those of [Bertrand et al. \(2017\)](#) and [Smith et al. \(2013\)](#). But as [La Porta et al. \(1999\)](#) suggest, there are significant differences in ownership structure across countries. Family firms are more prevalent in

Scandinavian countries, where gender equality is high. It's not clear that the results from Scandinavian countries can easily extend to the United States. Similar to my study, [Matsa and Miller \(2011\)](#) also focus on firms in the United States. But they find a positive association between board gender diversity and female executive representation. The inconsistent results are because different measurements of board diversity. The board diversity variable in [Matsa and Miller \(2011\)](#) essentially measures the proportion of female outside directors, whereas I use the proportion of female directors.<sup>2</sup> I find that the higher proportion of female inside directors is associated with a larger gender promotion gap, which suggests that the negative effect of female inside directors counterbalance the positive effect of female outside directors; thus I find insignificant results when I examine the effect of female share of all directors on management diversity.

## 2 Data and Summary Statistics

I use the unbalanced manager-firm-year panel data from the May 2016 version of the BoardEx Senior Manager and Disclosed Earner Summary dataset and the Board Summary dataset. I take the following steps to construct my sample:

- 1) The original data extend from 1999 to 2016. Since only 84 firms are covered in 1999 and the data for 2016 are incomplete, I restrict my sample period to the period from 2000 to 2015.
- 2) I restrict the sample to firms that are listed in the United States.
- 3) I exclude financial (SIC 4900-4999) and utility firms (SIC 6000-6999).
- 4) Though BoardEx tracks managers who are at the corporate level of VP or above, it sometimes backfills the career history and includes some junior positions. I infer

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<sup>2</sup>To address the issue that some executives are also directors, [Matsa and Miller \(2011\)](#) exclude “the individuals who are ever top executive at the same company” when calculating the proportion of female directors. Their board diversity variable essentially measures the percentage of female outside directors. My sample is at the individual level instead of the firm level, and I address the overlapping issue by controlling for the inside director status.



the manager's seniority from the job title and exclude positions that are below the corporate title VP.

- 5) Because 65 is a common full retirement age for many companies' retirement plans, I restrict the sample to executives who are not more than 65 years old and over 30 years old.<sup>3</sup>
- 6) If a manager holds more than one full-time position in a year, perhaps because of changing jobs, I keep the position in which the manager has a longer tenure. This step essentially converts manager-firm-year data to manager-year data.
- 7) I merge the BoardEx dataset with other data.

Measures for product market competition are from the Hoberg-Phillips data library.<sup>4</sup> The financial and stock return data are from Compustat and CRSP. Takeover data are from the Securities Data Corporation's (SDC) Mergers and Acquisitions database.<sup>5</sup>

I use the BoardEx variable Individual Role to identify corporate-level and functional expertise. I classify executives into five corporate levels: VP, SVP, EVP, president, and CEO. The executives whose corporate levels are not clearly specified are deemed to be as senior as VPs. My ranking system is generally consistent with that of [Bertrand and Hallock \(2001\)](#).<sup>6</sup> Since corporate levels are not comparable across firms, I focus on internal promotions that I can identify accurately. Executives are considered to be internally promoted when they stay with the firm and their corporate level increases in the following year. CEOs cannot be internally promoted; thus the promotion variable is set as missing for CEOs. It is also set as missing when an executive leaves the firm in the following year.

Following [Helfat et al. \(2006\)](#) and [Guadalupe et al. \(2014\)](#), I classify the functional areas into fourteen mutually exclusive categories: accounting, administration, finance,

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<sup>3</sup>The results remain robust if I do not filter the observations by positions and ages.

<sup>4</sup>10-K Text-based Network Industry Concentration (TNIC) data and 10-K based Product Market Fluidity data. December 2016 version.

<sup>5</sup> I restrict the takeover sample to the takeovers in which the target is a U.S. company, in which the deal value is more than USD 5 million, and after which control of the target is changed. The results remain robust if I use a USD 10 million as the cut-off of the deal value.

<sup>6</sup>I do not distinguish divisional and regional titles because a small proportion of executives are divisional or regional managers. The results are similar if I distinguish them.

IT, general manager, HR, legal, marketing, operations, PR, R&D, sales, secretary, and strategy.<sup>7</sup> I consider a manager whose functional expertise is not specified to be a general manager. As the next section reports, these executives have a high probability of promotion. Since general managers are well equipped for the role of president or CEO, the high promotion rate supports my classification method.

I construct the experience variables from the BoardEx employment dataset. I do not use observations that miss the start date or the end date because I cannot observe the duration.<sup>8</sup> Industry experience measures the number of years a manager worked in an industry, including years of experience in private firms.<sup>9</sup> Since the average age when an executive's first job is recorded in the BoardEx employment dataset is 30 years, I assume that BoardEx covers all employment history and set the industry experience as zero if an individual has no experience recorded in a given industry. I use the same method to calculate CEO experience. My sample includes 5,886 companies, and the average number of executives in a firm-year is 8.3. These are larger than the corresponding figures from ExecuComp: during my sample period, ExecuComp covers 2,957 companies, and the average number of executives in a firm-year is 5.7.

*⟨Insert Table 1⟩*

Table 1 reports cross-sectional mean values of sample size and female representation for each year. Panel A details the sample size. BoardEx increases its firm coverage significantly over time. The number of firms in the BoardEx data increases from 1,230 in 2000 to 3,165 in 2015, and the number of executives per firm remains relatively constant, ranging from 7.3 in 2015 to 9.3 in 2002.

Panel B details the female representation in each functional area. Five functions have more than 20% managers who are women: human resources, public relations, secretary,

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<sup>7</sup>These categories are not exactly the same as those of Helfat et al. (2006) and Guadalupe et al. (2014) because in my sample, some categories have few observations. For example, Helfat et al. (2006) include real estate as a functional area category, but in my sample, only 0.25% of managers specialize in real estate.

<sup>8</sup>About 20% positions are excluded for this reason.

<sup>9</sup>I exclude experience as an outside director because that is a part-time position. While constructing the industry experience measure, I use the FTSE international industry classification, which is the industry classification used by BoardEx. Some companies in BoardEx, such as private firms, are not in Compustat. Thus, using SIC from Compustat would understate some executives' industry experience.

legal, and administrative positions. The proportion of female managers in such functions varies from 21.2% to 43.5%. In contrast, there are only a few female executives in operations, sales, R&D, general management, strategy, and information technology, in which less than 10% of managers are female.

Panel C details the female representation at each corporate level. 15.4% of VPs are female, while the percentage of women declines to 3.8% at the CEO level. The percentage of women increases across all corporate levels in my sample period. For instance, 1.9% of CEOs are female in 2000, and the percentage rises to 5.6% in 2015.

Table 2 displays the female executive industry representation. For brevity, it reports female representation only for those industries that have more than 3,000 observations in my sample. The percentage of female executives varies from 7.5% in primary metal industries to 27.5% in apparel and accessory stores.

*⟨Insert Table 2⟩*

Table 3 shows the characteristics by gender. There are 9,114 unique female executives and 62,414 unique male executives.<sup>10</sup> The average age of male and female executives is 50.5 and 48.7, respectively. Female executives usually work for bigger firms.<sup>11</sup>

*⟨Insert Table 3⟩*

### 3 Gender differences in promotions

Academic studies on gender differences in top management team usually focus on gender differences in wages (e.g., [Bertrand and Hallock \(2001\)](#), [Newton and Simutin \(2015\)](#)). Although career opportunity is also an important factor, it is underexplored. In this section, I attempt to fill the gap by studying the gender differences in executive promotions.

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<sup>10</sup>These figures include CEOs who are not in the multivariate analysis because they cannot be internally promoted. But the CEO observations help in identifying promotions to CEO positions.

<sup>11</sup>[Bertrand and Hallock \(2001\)](#) study executives in ExecuComp during 1992 to 1997 and report that female executives manage smaller firms. I find the same results when I use ExecuComp data in the period from 1992 to 1997, but I find that female executives manage bigger firms when I use ExecuComp data in my sample period.

A benefit of studying executive promotions is that executives have self-selected into senior managerial positions based on their ability and ambition, which suggests that men and women in this group are more homogenous ([Adams and Kirchmaier, 2012](#), [Adams et al., 2016](#), [Kaplan and Sorensen, 2017](#)).

Table 3 displays the descriptive statistics of promotion rates for men and women. On average, the promotion probability of a woman in any given year is 4.9%, and the promotion probability of a man in any given year is 5.8%. The promotion rate for women is also lower in each subsample of executives at each corporate level. The promotion probability is higher in junior positions than senior positions.

Next, I compare the promotion rates for men and women in a multivariate analysis. Table 4 reports gender differences in promotion probability using linear probability models with various specifications. The dependent variable is a dummy variable, promotion, that indicates an internal promotion in year  $t+1$ . I control for a set of observable characteristics, including age, education, industry experience, CEO experience, firm tenure, insider director status, and firm size. Education and experience are standard human capital determinants. Insider directorship indicates the executive's competency and seniority. Large firms, which are under public scrutiny and have sufficient resources, may implement pro-family employment policies and thereby attract female executives. These control variables are measured at year  $t$ .

*⟨Insert Table 4⟩*

The negative and statistically significant coefficients on the female dummies in each column of Table 4 indicate that the promotion rate for women is lower than the promotion rate for men. In column (1), I include only control variables and year fixed effects. The coefficient of the female dummy is -1.24, which implies a 21.2%  $(-1.24/5.85)$  promotion gap.

Men and women have different attributes and preferences, which leads them to choose different industries and firms. The choice of firms explains a large portion of gender differences in wage. [Goldin et al. \(2017\)](#) document that 44% of the increase in the gender wage gap from age 26 to 39 is because men and women sort themselves into different

firms. Women may choose firms where the promotion rate is lower, perhaps because of lower turnover risk, or they may gravitate toward firms that are more female friendly and have a lower gender promotion gap. These factors can lead to biases. In column (2), I add firm fixed effects to account for selection into industries and firms. The coefficient on the female dummy is of a similar magnitude to the coefficient in column (1).

In column (3), I add in the corporate-level fixed effects. The coefficient on the female dummy changes from -1.36 to -1.83. We usually expect the gender gap to decrease when we account for more personal characteristics, so this increase in the gender gap may seem counterintuitive. In fact, it indicates that women are clustered in junior positions for which the promotion rate is higher.

Column (4) includes functional expertise fixed effects. Both supply- and demand-side factors can explain the disproportionate female representation in staff positions. For instance, women make different job choices from men partly because of differences in preferences and psychological factors ([Bertrand et al., 2010](#), [Pande and Ford, 2012](#)). On the other hand, perceptions of a glass ceiling can discourage women from aspiring to a career in leadership. In the general workforce in 2010, [Blau and Kahn \(2017\)](#) find that occupation explains 33% of the gender wage gap and is the largest single contributing factor. Given the importance of functional expertise in explaining gender differences in wages, I attempt to quantify to what extent the gender promotion gap can be explained by the gender differences in functional expertise.

After controlling for functional expertise, I find that the magnitude of the coefficient on the female dummy is reduced by 35.5% ( $1 - 1.18/1.83$ ), but it still indicates a 20.2% ( $-1.18/5.85$ ) gender promotion gap. The coefficients on the functional expertise indicators are generally consistent with my intuition. The omitted group consists of general managers, whose promotion rate is higher than all other executives except for executives in operations, sales, and marketing.

Several papers investigate whether there is a gender gap in executive promotions and yield mixed results. [Kaplan and Sorensen \(2017\)](#) study the executive appointment using a dataset with detailed characteristics based on structured interviews and report that

women are less likely to become CEOs. [Kelojarju et al. \(2017\)](#) also find a large gender gap in executive appointments in Sweden. They suggest that slow career progression in the five years after the first childbirth explains most of the female disadvantage. [Smith et al. \(2013\)](#) study promotions to VP and CEO positions in Danish companies and find no material gender differences in promotion likelihood once they account for functional expertise. [Gayle et al. \(2012\)](#) use a sample of executives who are in both ExecuComp and Marquis Who's Who to examine executive promotions in the United States and find that female executives are promoted more quickly. The data differences may explain our inconsistent results. As I suggested above, the inclusion criterion of ExecuComp is pay not rank and women tend to earn less than men. They may have to outperform men by a substantial margin to appear in the ExecuComp data. Therefore, the estimations of promotion rate using ExecuComp data are likely to be biased for executives as a whole.

## 4 Product market competition

Even after I account for potential sorting of executives into firms, corporate levels, and functional expertise, the unexplained promotion gap remains large. My next question is whether the unexplained gap at least partially reflects discrimination.

There are several possible explanations for the unexplained gender promotion gap. It may result from gender differences in unmeasured characteristics. For instance, women may be less willing to expand their professional responsibilities because they carry a disproportionately heavy load of domestic duties. On the other hand, the unexplained gender promotion gap may also result from discrimination. Anecdotal evidence and academic research suggest that discrimination against women is an ongoing concern ([Altonji and Blank, 1999](#), [Blau and Kahn, 2017](#)).

[Becker \(1957\)](#) argues that discrimination increases costs and is hard to sustain in a competitive market. Prior studies have relied on this theory to show discrimination in the general workforce. [Black and Strahan \(2001\)](#) use deregulation in the banking industry as a shock to competition and find that when banking competition is limited

male banking employees receive disproportionate share of rents.<sup>12</sup> Black and Brainerd (2004) document that competitive pressure from globalization increases the relative wage of women in manufacturing industries. Heyman et al. (2013) consider takeovers as a similar disciplinary force to competition and find that the share of female employees rises after takeovers.

Unlike Black and Strahan (2001), Black and Brainerd (2004) and Heyman et al. (2013), I focus on senior executives and test whether the gender promotion gap indicates discrimination by examining how the gender gap responds to product market competition. If promotion decisions are well grounded, the gender promotion gap should remain unchanged as the competitive threat increases. If discrimination plays a role in executive promotions, I expect to observe that the gender promotion gap narrows as competition intensifies.

I use three variables from the Hoberg-Phillips data library to measure product market competition (Hoberg and Phillips, 2016, Hoberg et al., 2014). Industry concentration is the Herfindahl-Hirschman index (HHI), which measures firms' market power. Product similarity captures how similar a given firm's products are to the products of all other firms in a given year. Lower product similarity means that a firm's products cannot be easily substituted by the products of its rivals; thus the firm faces a lower competitive threat. The third measure, fluidity, measures the structure and evolution of the product space. Higher fluidity indicates a fast-changing environment that keeps a firm on its toes; therefore the firm faces higher pressure from its competitors.

To capture large changes in competition, I transform these continuous variables into dummy variables. The high competition indicator equals one when a firm's industry concentration is below the median, or when its product similarity (fluidity) is above the median. Since product market competition captures industry-wide characteristics, I cluster the standard errors at the industry level.

*⟨Insert Table 5⟩*

Table 5 reports the results of the linear probability model estimates of the effect of

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<sup>12</sup> They also find that the proportion of female managers at state level increases after deregulation.

competition on the gender promotion gap. The key variable of interest is the interaction term between the female dummy and the high competition dummy. In column (1), high competition is measured by HHI. The coefficient on the female dummy is -1.49, which indicates a gender promotion gap of 25.4% $(-1.49/5.85)$  in firms that have high market power. The coefficient on the interaction term is 0.66, which suggests a gender promotion gap of 14.2%  $((-1.49+0.66)/5.85)$  in firms that have low market power.

Columns (2) and (3) use alternative measures of product market competition, product similarity and fluidity, to examine whether the results are sensitive to the competition measure. The coefficients of interest remain positive and statistically significant, and the economic magnitudes are similar. The results show that the gender promotion gap is lower in firms that face high competition, which are consistent with the conjecture that discrimination still plays a role in holding women back from leadership positions. Because in the long term discrimination discourages women from investing in their human capital, the effect of discrimination on female executive representation is likely to be higher than what I document here.

In a contemporaneous work, [Heyman et al. \(2017\)](#) also find that product market competition and the percentage of female managers are positively correlated. Their results on the percentage of female managers are based on firm-level data, which does not allow them to control individual characteristics such as functional expertise; thus their results may pick up a demand shift that favors female-dominated functions. While their results may suggest that more women are hired or promoted in firms that face high competition, they may also reflect the fact that fewer women exit their firms. Furthermore, gender equality is higher in Sweden, and family-controlled businesses are more prevalent. These country-level differences may make it hard to extend the results based on Swedish companies to U.S. companies.



## 5 Promotions from each corporate level

Until now, I have been studying gender differences in executive promotions using pooled data that include executives at all levels. In this section, I split the sample into subsamples according to corporate level and examine the relative magnitude of the gender promotion gap across different corporate levels.

*⟨Insert Table 6⟩*

Table 6 shows the promotions from each corporate level. Each column corresponds to a subsample of executives at a certain corporate level. This specification essentially allows me to compare executives who are at a given corporate level of the same firm. The significantly negative coefficients on the female dummies indicate a gender gap of 21.0% (-1.53/7.27), 27.3% (-1.71/6.26), and 21.3% (-0.84/3.95) in promotions from VP, SVP, and EVP positions, respectively. The magnitude of the female dummy in promotions from the president position is significantly lower at 2.5% (-0.11/4.38), and it is statistically insignificant.

I then focus on columns (2) – (5) in which executives' seniority can be clearly identified and disregard column (1) in which executives' corporate levels are not specified. The results show an inverted U-shaped relationship between the gender promotion gap and seniority.<sup>13</sup> The promotion rate of women who successfully advance to president positions is similar to the promotion rate of their male peers.

I also examine the effect of functional expertise on the promotion gap. The magnitude of the coefficient on the female dummy declines after I add functional area fixed effects to all regressions. The reduction increases with seniority. Functional expertise explains 24.6% of the gender gap in the subsample of VPs, while it accounts for 67.6% of the gender gap in the subsample of presidents. The results suggest that functional expertise contributes more to the gender promotion gap as executives move up the corporate ladder.

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<sup>13</sup> The seniority of executives whose corporate levels are unspecified is unclear. As the promotion rate generally decreases with seniority, and the promotion rate of executives whose corporate titles are unspecified lies between the promotion rates of SVP and EVP, I can reasonably assume that the seniority of these executives is between SVP and EVP. In this case, the results still suggest an inverted U-shaped relationship between the gender promotion gap and seniority.

*⟨Insert Table 7⟩*

Next, I study the relationship between the gender gap and competition at each corporate level and report the results in Table 7. The results suggest that the overall effect of competition on the gender gap is driven by promotions from EVP positions. EVPs are candidates for the most senior jobs, i.e., president or CEO positions. It is likely that a senior executive contributes more to the overall firm performance than a junior executive; thus, as competition intensifies, it is more critical to choose the right senior executive.

## 6 Effect of a gender diverse board

Even though there is little evidence to date on the importance of discrimination in explaining why so few women are in leadership positions, my evidence is consistent with the intuition of board gender quota advocates that discrimination may be important. Board gender quotas are a popular policy response to the dearth of female business leaders, because they give firms less discretion in exercising discrimination (for a summary of countries that have implemented board gender quotas, see [Adams and Kirchmaier \(2015\)](#)). However, the merits of quotas have been hotly debated. To examine whether these policies are likely to be effective, I examine whether the gender promotion gap is smaller in firms with more female directors.

Female directors may improve management gender diversity through various channels. For instance, they can help build networks among female managers; they can assist in overcoming discrimination; they can entice women to compete ([Niederle et al., 2013](#)); they can serve as role models for other aspiring women ([Pande and Ford, 2012](#)). However, there are reasons to be skeptical of the positive effects of a diverse board. Female directors may also have gender stereotypes and associate certain leadership traits with men. In addition, as [Bagues et al. \(2017\)](#) suggest, the presence of more female directors can induce male directors to be less favorable towards female candidates.

To test whether female directors improve the gender diversity of the top management

team, I analyze the association between the gender promotion gap and board gender diversity. Because an executive can be promoted to an executive position and become a new director in the same year, using contemporaneous measures of board diversity and promotion introduces a bias. Hence, I measure board diversity measured in year  $t$  and promotion measured in year  $t+1$ .

Table 8 presents the estimates of the linear probability model. In column (1), I use the percentage of female directors to measure board diversity. The interaction term of the female dummy and board diversity is insignificant, showing no evidence that board diversity and the gender promotion gap are materially correlated.

*⟨Insert Table 8⟩*

Columns (2) and (3) use the female outside director ratio and the female inside director ratio to measure board diversity. I find that the higher female outside director ratio is associated with a smaller gender gap, though it is not statistically significant, and that that the higher female inside director ratio is significantly associated with a larger gender gap. The results suggest that the negative effect of the inside director diversity counterbalances the positive effect of the outside director diversity. This can explain the inconsistency between my study and [Matsa and Miller \(2011\)](#). To address the issue that some executives are directors, [Matsa and Miller \(2011\)](#) exclude “the individuals who are ever top executive at the same company” when calculating the proportion of female directors. Their key independent variable, female share of board, essentially measures the proportion of female outside directors, and they show it is positively correlated with management diversity.<sup>1415</sup>

[Kanter \(1977\)](#) suggest that reaching a critical mass is important in group dynamics, and [Kramer et al. \(2006\)](#) find having three or more women on a board can create a critical mass. Therefore, in columns (4) – (6), I use a dummy variable indicating the presence of

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<sup>14</sup>My data are at the individual level, and I address the overlapping issue by controlling for the inside director status.

<sup>15</sup>[Matsa and Miller \(2011\)](#) also use the proportion of female directors as an alternative measure of board diversity and find stronger positive association between board gender diversity and management gender diversity (Columns (5) and (6) in Table 2). However, they do not include firm fixed effects in this setting. A female executive director is counted as both executive and director, which is likely to introduce positive biases.

at least one (two or three) female director(s) to measure board diversity. Again, I observe no material association between board gender diversity and the gender promotion gap.

Furthermore, the disciplinary effect of product market competition may be supplementary to the potential positive effect of board diversity on management diversity. [Tate and Yang \(2015\)](#), for instance, find that women hired by firms with female leaders have smaller gender wage gaps, especially in concentrated industries. Thus, I restrict my sample to firms where the competitive threat is low. I still observe no evidence that the gender promotion gap is smaller in firms where the board is more diverse (see [Table A9](#)).

## 7 Robustness

### 7.1 Other market disciplinary force

The competition measures based on text analysis of annual reports do not capture competition from private or foreign rivals. To address this limitation, this subsection examines how the gender promotion gap responds to a takeover threat. The market for corporate control has a disciplinary effect on inefficient management behaviors. Considering discrimination as a particular form of inefficient management behavior, I expect that the takeover threat can reduce it. Moreover, a takeover may indicate the entrance of a rival and thus increased competition. For example, Amazon's acquisition of Whole Foods in 2017 put competitive pressure on other grocery companies such as Trader Joe's and Target. [Heyman et al. \(2013\)](#) document a substitutional effect of takeover and product market competition on gender discrimination in the general workforce.

Unlike [Heyman et al. \(2013\)](#) who study the gender composition of employees in takeover target firms, I exploit the spillover effect of a takeover event. It is well documented that takeovers are sometimes clustered at the industry level ([Betton et al., 2008](#)); a takeover event may indicate that a firm in the same industry is more likely to become a target; the alleviated threat may have disciplinary effect on the firm. I use the log transformation of the number of takeovers in an industry to measure the takeover threat. Firms that are takeover targets are excluded from this analysis.

Table 9 displays the results of the linear probability model estimates of the effect of takeover threat on the gender promotion gap. Since a large industry is likely to have more takeover events and may also have a different promotion rate, I control for industry size in this set of regressions.<sup>16</sup> Column (1) studies the gender promotion gap in the pooled sample. The coefficient on the interaction term between the female dummy and the number of takeovers is significantly positive, which suggests that the gap is smaller in firms facing a higher takeover threat. In columns (2)–(6), I study the gender gap in promotions from each corporate level. The results show that promotions from EVP positions drive the overall results, consistent with the results in Table 7. The results are similar when I use an alternative measure of takeover threat, a dummy variable indicating that the industry has at least one takeover event in a given year (see Table A10).

*⟨Insert Table 9⟩*

## 7.2 Willingness to increase professional responsibilities

In the baseline specification, one omitted variable is the willingness to increase professional responsibilities. It is plausible that some female executives refrain from supplying more labor because they bear a disproportionately heavy load of domestic duties. Though this argument can explain the gender promotion gap, it cannot explain the narrowing gap as competition goes up. It may even predict that the gender gap is larger in firms facing a higher competitive threat, because a position in a competitive firm entails a higher level of responsibility than a similar position in a firm where competition is chilled.

To address this concern, I study the promotions of executives who are less restricted by family duties. Executives who are over 50 years old are less likely to have young children, and female executives in this age group are usually beyond childbearing age; thus both male and female executives can focus more on their careers. Therefore, I study the promotion gap of executives who are over 50 years old.

*⟨Insert Table 10⟩*

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<sup>16</sup>The results are similar without controlling for industry size.

I first examine whether the gender gap is smaller for executives who are over 50 years old. If age is a valid proxy for time constraints, I expect that the executives who are constrained by family duties are less likely to get promoted. Column (1) in Table 10 shows that the coefficient of the age-over-50 dummy is insignificant, suggesting a similar promotion rate for male executives who are over 50 and who are under 50. However, the coefficient on the interaction term between the female dummy and the age-over-50 dummy is significant positive, suggesting that the gender promotion gap is lower in executives who are over 50 years old.

I then restrict the sample to executives who are over 50 years old and examine the association between the gender gap and the competitive threat and report the results in columns (2) to (4). The coefficients on the interaction terms between the female dummy and each competition measure are all positive, and two are statistically significant, consistent with the results of the baseline test.

### 7.3 Promotions in the C-suites

Although I have highlighted the advantages of BoardEx data over ExecuComp data for studying the gender promotion gap, the BoardEx dataset has its own limitation: It may include some lower-level managers who voluntarily disclosed their information. This self-reporting issue is less of a concern for the ExecuComp data. To alleviate the self-reporting concern, I restrict the sample to C-suite executives. A C-Suite executive is an executive whose job title contains the word “Chief”. The “Chief” positions are evidently senior; thus this sub-sample has fewer junior managers who are not valid candidates for senior executive positions. The results, reported in Table 11, show similar patterns to the baseline tests.

*⟨Insert Table 11⟩*

Furthermore, the self-reporting issue may be more severe among executives whose corporate titles are not specified. In Tables 6 and 7, the regressions in each corporate subsample show that my results are not driven by these executives.

## 7.4 Turnover

Another unobserved variable that may lead to biases is competency. If on average female executives underperformed relative to male executives, their promotion rate would naturally be lower. But this argument cannot explain the lower gender promotion gap in firms facing a higher competitive threat.

I examine the possibility that female executives systematically underperform by analyzing the sensitivity of executive turnover to firm performance. [Fee and Hadlock \(2004\)](#) document that badly performing firms weed out incompetent executives. If female managers are generally of lower quality, I expect to observe that their turnover is more sensitive to performance.

*⟨Insert Table 12⟩*

The evidence, displayed in [Table 12](#), does not support this argument. The variable of interest is the interaction term between the female dummy and the performance measure, ROA or stock return. The coefficients on these interaction terms are either statistically insignificant or significantly positive; therefore they do not support the argument that female executives are more likely to be dismissed when firms underperform.

## 7.5 The glass cliff phenomenon

One concern about my interpretation of the competition results is that certain attributes or skills may become more desirable when competition goes up. Women may have such attributes and skills; in that case, they would be well suited to highly competitive situations. For example, a strand of literature on the glass cliff phenomenon finds that women tend to be appointed to leadership positions that are risky. So far, it is unclear what drives the glass cliff phenomenon. It may be because women are perceived as communal, and communality is in demand when a firm is dealing with a crisis ([Ryan et al., 2016](#)). On the other hand, [Ryan et al. \(2016\)](#) also suggest that it may be because women have fewer opportunities to become leaders. This argument implies that discrimination may underlie the glass cliff phenomenon.

Intensifying competition does not necessarily mean crisis. But to ensure that my results are not driven by women who advanced in poorly performing firms, I re-run the regressions with extra controls for accounting-based and stock-based firm performance measures (ROA, Tobin-q, or stock return), and the results are robust.

Although these additional analyses suggest that the poor firm performance is unlikely to drive my results, I acknowledge that I cannot completely rule out the alternative argument that the improvement in women's promotions as competition increases occurs because certain of their traits and skills are in demand in competitive situations.

## 8 Conclusion

Despite women's advancement in education and labor force participation, there are a few female corporate leaders. Understanding the scarcity of female executives helps shape the policies that promote gender diversity. I find a large gender promotion gap. Women who are in the pipeline to CEO positions are clustered in staff positions, which do not prepare managers well for the role of president or CEO. The effect of functional expertise becomes increasingly important when a manager moves up the corporate ladder. Furthermore, I find that the promotion gap is smaller in firms where product market competition is higher. These results are consistent with the theory in [Becker \(1957\)](#), and they suggest that discrimination may still play a role in executive promotions.



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Table 1: Summary statistics of sample size and female representation

My sample includes managers who are at corporate level vice president or above, and Observations are at the manager-year level over the period 2000-2015.

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Total
<i>Panel A: sample size</i>																	
No. of firms	1,230	1,379	1,436	2,873	3,267	3,424	3,437	3,561	3,415	3,226	3,152	3,152	3,195	3,253	3,336	3,165	5,886
No. of obs	10,664	12,487	13,361	22,480	25,968	28,742	29,785	29,927	29,341	27,596	27,133	26,999	26,808	26,451	25,793	23,208	386,743
<i>Panel B: female representation in each functional area (pp)</i>																	
Accounting	11.7	11.9	12.7	12.0	12.0	13.0	12.9	13.5	14.0	14.3	15.1	15.7	16.5	16.5	16.8	17.2	14.4
Admin	11.9	15.7	15.9	19.0	19.3	19.2	19.6	20.0	20.4	21.1	20.6	23.9	24.9	25.8	26.9	24.9	21.2
Finance	9.8	10.1	10.4	9.9	11.2	11.7	12.3	13.3	13.8	14.0	13.5	14.0	13.5	13.7	13.7	14.5	12.7
Gen Mgr	7.3	7.6	7.7	7.4	7.6	7.7	8.1	8.5	8.7	8.8	9.3	9.1	9.2	9.6	9.6	9.8	8.6
HR	30.7	34.0	32.4	37.4	41.1	42.4	43.3	42.8	42.2	44.9	45.2	45.3	45.1	47.3	49.8	53.7	43.5
IT	8.6	8.7	8.9	8.7	9.1	9.6	10.0	10.5	9.9	9.9	9.6	10.1	9.3	8.8	9.8	9.3	9.6
Legal	15.2	17.0	17.3	18.8	19.7	19.7	20.1	21.0	20.7	20.6	22.7	23.0	23.9	23.8	24.6	24.9	21.4
Marketing	13.3	16.1	16.4	13.3	15.4	15.6	16.4	16.6	16.9	18.3	19.2	20.7	20.1	21.1	23.0	23.4	18.0
Operations	5.9	5.2	5.4	5.2	6.2	6.1	5.9	6.0	6.4	6.7	6.7	7.0	7.2	7.6	8.0	8.5	6.6
PR	38.1	39.5	37.9	36.4	36.4	35.5	35.3	34.7	34.0	35.0	33.6	35.3	35.1	37.7	35.6	35.8	35.6
RD	5.8	6.2	5.5	6.9	7.8	8.5	7.8	8.2	8.9	9.3	9.3	8.4	8.2	9.2	10.2	10.0	8.5
Sales	5.0	5.9	8.8	6.6	6.0	4.6	5.5	5.6	5.1	7.0	6.7	6.8	7.2	8.1	9.0	9.6	6.7
Secretary	20.4	20.7	21.4	23.9	26.0	26.6	28.0	29.8	28.0	26.5	26.7	29.7	30.3	30.1	28.4	25.3	27.0
Strategy	8.8	8.2	10.9	11.1	9.5	10.3	9.3	8.9	8.5	8.0	7.2	8.1	8.2	8.3	10.3	10.5	9.0
<i>Panel C: female representation in each corporate level (pp)</i>																	
VP	13.0	13.5	14.0	13.7	14.4	14.7	14.5	14.9	15.1	15.5	15.8	16.3	16.6	17.0	17.9	18.6	15.4
SVP	11.0	11.8	12.3	11.8	12.7	13.3	14.0	15.0	15.4	15.7	16.2	16.1	15.7	16.2	16.8	17.3	14.8
EVP	8.8	9.6	9.8	9.5	10.0	10.5	10.7	11.2	11.1	11.8	12.5	13.3	14.0	14.2	14.3	14.9	11.9
President	4.5	4.9	4.8	4.2	4.6	4.9	5.4	5.9	6.0	6.1	6.1	6.4	6.6	6.8	7.2	7.6	5.9
CEO	1.9	2.3	2.4	2.7	2.9	3.1	3.4	3.6	3.6	4.1	4.4	4.0	4.3	4.3	4.8	5.6	3.8
CorpLevel	11.4	11.6	12.5	12.5	13.5	13.3	13.9	14.3	14.4	14.6	14.9	15.5	15.4	16.1	16.2	16.1	14.5
unspecified																	

Table 2: Summary statistics of female representation in each industry

This table represents the female representation in industries that have more than 3,000 observation in my sample. My sample includes managers who are at corporate level vice president or above, and Observations are at the manager-year level over the period 2000-2015.

Industry	N	% women
Primary Metal Industries	4,655	7.5
Electronic & Other Electric Equipment	32,475	8.0
Oil & Gas Extraction	17,277	8.4
Fabricated Metal Products	5,002	9.3
Petroleum & Coal Products	3,114	9.3
Wholesale Trade – Nondurable Goods	5,851	9.5
Industrial Machinery & Equipment	24,982	9.6
Wholesale Trade – Durable Goods	8,698	10.2
Transportation Equipment	12,661	11.2
Instruments & Related Products	25,975	11.3
Rubber & Miscellaneous Plastics Products	3,631	12.1
Furniture & Fixtures	3,023	12.3
Transportation by Air	3,698	12.7
Business Services	53,497	12.8
Amusement & Recreation Services	4,000	13.6
Paper & Allied Products	4,192	13.7
Food & Kindred Products	11,874	13.8
Engineering & Management Services	8,576	14.5
Chemical & Allied Products	46,584	14.9
Communications	15,090	15.5
Health Services	8,042	15.8
Eating & Drinking Places	6,732	16.9
Miscellaneous Retail	8,118	17.7
Apparel & Other Textile Products	3,536	18.8
General Merchandise Stores	4,297	18.9
Printing & Publishing	4,453	19.7
Apparel & Accessory Stores	6,467	27.5

Table 3: Summary statistics of individual characteristics and promotions

My sample includes managers who are at corporate level vice president or above, and Observations are at the manager-year level over the period 2000-2015.

	Female	Male
Age	48.7	50.5
MBA (in pp)	24.8	29.5
Ivy league (in pp)	12.5	13.5
Firm tenure (in years)	8.9	9.7
CEO experience (in years)	0.4	1.6
Industry experience (in years)	8.8	9.5
Turnover (in pp)	12.0	11.8
CEO turnover (in pp)	13.6	12.5
Total assets (in \$million)	12,675.9	9,197.3
Promotions (in pp)	4.9	5.8
Promotions from (in pp)		
VP	6.7	7.3
SVP	4.9	6.3
EVP	2.6	3.9
President	3.0	4.4
CorpLevel unspecified	3.0	5.0
No of executives	9,114	62,414

Table 4: The gender promotion gap - baseline

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. The omitted group for the corporate level consists of vice presidents. The omitted group for the functional expertise consists of general managers. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level.

	Promotions				
	(1)	(2)	(3)	(4)	(5)
Female	-1.24*** (-8.87)	-1.36*** (-10.06)	-1.83*** (-12.76)	-1.18*** (-8.83)	-0.71*** (-2.85)
MBA	0.65*** (6.11)	0.76*** (7.33)	0.90*** (8.31)	0.72*** (6.40)	0.73*** (6.42)
Ivy league	0.52*** (2.99)	0.61*** (3.65)	0.86*** (4.98)	0.89*** (5.03)	0.89*** (5.01)
Inside dir	4.50*** (11.99)	5.80*** (13.13)	7.10*** (14.89)	6.58*** (14.50)	6.57*** (14.45)
Age (10 yrs)	6.17*** (8.12)	6.71*** (7.90)	9.39*** (11.02)	8.43*** (10.10)	8.45*** (10.10)
Age squared	-0.81*** (-10.70)	-0.86*** (-10.31)	-1.09*** (-12.92)	-0.99*** (-11.91)	-0.99*** (-11.90)
CEO exp (10 yrs)	0.26 (1.02)	0.22 (0.87)	0.43 (1.64)	0.12 (0.44)	0.11 (0.43)
Industry exp (10 yrs)	0.20 (1.25)	0.05 (0.33)	0.12 (0.83)	-0.03 (-0.23)	-0.03 (-0.21)
Firm tenure (10 yrs)	-0.33** (-2.14)	0.05 (0.33)	0.07 (0.45)	0.12 (0.78)	0.12 (0.78)
Log assets	0.15*** (4.39)	0.37** (2.45)	0.50*** (3.29)	0.52*** (3.35)	0.52*** (3.36)
SVP			-3.65*** (-13.10)	-3.83*** (-14.02)	-3.69*** (-13.15)
EVP			-7.09*** (-20.18)	-7.71*** (-21.79)	-7.61*** (-22.04)
President			-5.58*** (-20.15)	-7.23*** (-24.57)	-7.11*** (-23.64)
CorpTitle unspecified			-3.72*** (-14.86)	-3.67*** (-14.87)	-3.60*** (-14.12)
Female * SVP					-0.93** (-2.42)
Female * EVP					-0.73* (-1.71)
Female * President					-1.03*

*Continued on next page*

Table 4 – Continued from previous page

	Promotions				
	(1)	(2)	(3)	(4)	(5)
					(-1.75)
Female * CorpLevel unspecified					-0.42
					(-1.08)
Accounting				-2.75***	-2.76***
				(-11.71)	(-11.72)
Administration				-1.37***	-1.38***
				(-2.95)	(-2.97)
Finance				-0.36*	-0.37*
				(-1.77)	(-1.82)
HR				-2.60***	-2.61***
				(-11.74)	(-11.66)
IT				-2.97***	-2.97***
				(-11.46)	(-11.49)
Legal				-1.58***	-1.58***
				(-7.78)	(-7.80)
Marketing				0.26	0.27
				(0.94)	(0.96)
Operations				4.87***	4.87***
				(14.61)	(14.59)
PR				-4.45***	-4.49***
				(-12.15)	(-12.19)
R&D				-1.44***	-1.43***
				(-5.44)	(-5.41)
Sales				0.87*	0.87*
				(1.80)	(1.80)
Secretary				-3.41***	-3.44***
				(-7.28)	(-7.32)
Strategy				-0.77**	-0.77**
				(-2.47)	(-2.48)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Observations	229,565	229,406	229,406	229,406	229,406
R <sup>2</sup>	0.01	0.02	0.03	0.03	0.03
Distinct female	6,799	6,799	6,799	6,799	6,799
Distinct male	42,093	42,093	42,093	42,093	42,093
No. female obs	32,136	32,136	32,136	32,136	32,136
No. male obs	197,429	197,429	197,429	197,429	197,429



Table 5: Gender promotion gap and product market competition

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. *High competition* indicates that industry concentration is lower than median, or that product similarity is higher than median, or that product market fluidity is higher than median. The omitted group for the corporate level consists of vice presidents. The omitted group for the functional expertise consists of general managers. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level.

High competition measures	Dependent variable: Promotions		
	HHI (1)	Similarity (2)	Fluidity (3)
Female	-1.49*** (-8.00)	-1.41*** (-7.53)	-1.49*** (-6.88)
High competition	0.30 (1.25)	0.05 (0.16)	0.03 (0.15)
Female * High competition	0.66** (2.29)	0.53* (1.93)	0.66** (2.27)
MBA	0.73*** (6.12)	0.73*** (6.13)	0.76*** (6.31)
Ivy league	0.92*** (4.96)	0.92*** (4.96)	0.98*** (5.29)
Inside dir	6.83*** (13.19)	6.83*** (13.20)	6.75*** (12.61)
Age (10 yrs)	9.25*** (10.41)	9.25*** (10.41)	9.19*** (10.22)
Age squared	-1.08*** (-12.17)	-1.08*** (-12.16)	-1.07*** (-11.96)
CEO exp (10 yrs)	0.30 (1.00)	0.30 (1.00)	0.35 (1.16)
Industry exp (10 yrs)	-0.04 (-0.25)	-0.04 (-0.26)	-0.01 (-0.06)
Firm tenure (10 yrs)	0.15 (0.96)	0.15 (0.96)	0.14 (0.82)
Log assets	0.54*** (3.15)	0.56*** (3.25)	0.54*** (2.99)
SVP	-3.91*** (-14.66)	-3.91*** (-14.65)	-3.89*** (-14.36)
EVP	-7.81*** (-22.20)	-7.81*** (-22.17)	-7.81*** (-22.46)
President	-7.38*** (-23.72)	-7.38*** (-23.74)	-7.33*** (-23.54)

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Table 5 – *Continued from previous page*

High competition measures	Dependent variable: Promotions		
	HHI (1)	Similarity (2)	Fluidity (3)
CorpTitle unspecified	-3.76*** (-14.35)	-3.76*** (-14.33)	-3.75*** (-14.13)
Accounting	-2.79*** (-11.72)	-2.79*** (-11.72)	-2.75*** (-11.29)
Administration	-1.33*** (-2.65)	-1.34*** (-2.66)	-1.31** (-2.55)
Finance	-0.32 (-1.58)	-0.32 (-1.57)	-0.27 (-1.27)
HR	-2.60*** (-11.14)	-2.60*** (-11.13)	-2.63*** (-10.83)
IT	-3.00*** (-11.01)	-3.00*** (-11.01)	-2.99*** (-10.57)
Legal	-1.51*** (-6.83)	-1.51*** (-6.82)	-1.43*** (-6.40)
Marketing	0.37 (1.29)	0.37 (1.29)	0.34 (1.16)
Operations	5.01*** (14.40)	5.01*** (14.40)	4.98*** (14.21)
PR	-4.44*** (-12.19)	-4.44*** (-12.15)	-4.39*** (-12.06)
R&D	-1.52*** (-5.65)	-1.52*** (-5.67)	-1.48*** (-5.27)
Sales	1.01* (1.94)	1.01* (1.94)	1.02* (1.84)
Secretary	-3.47*** (-7.02)	-3.47*** (-7.03)	-3.34*** (-6.77)
Strategy	-0.61* (-1.78)	-0.61* (-1.78)	-0.64* (-1.81)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	210,156	210,156	203,108
R <sup>2</sup>	0.03	0.03	0.03

Table 6: Promotions from a corporate level

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. The omitted group for the functional expertise consists of general managers. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level.

Sample	Dependent variable: Promotions				
	Corptitle unspecified	VP	SVP	EVP	President
	(1)	(2)	(3)	(4)	(5)
Female	-1.42*** (-3.47)	-1.53*** (-5.45)	-1.71*** (-5.15)	-0.84** (-2.16)	-0.11 (-0.24)
MBA	1.26*** (3.26)	0.47** (2.03)	0.98*** (3.49)	0.57* (1.71)	-0.20 (-0.57)
Ivy league	0.57 (1.13)	1.15*** (3.11)	0.48 (1.53)	0.87** (2.30)	1.13** (2.13)
Inside dir	3.80*** (4.46)	2.74** (2.46)	5.92*** (3.98)	5.59*** (6.07)	13.91*** (11.07)
Age (10 yrs)	9.63*** (5.38)	13.22*** (7.27)	7.98*** (3.72)	8.09*** (3.64)	11.00*** (4.04)
Age squared	-1.03*** (-5.48)	-1.45*** (-8.01)	-0.98*** (-4.63)	-0.92*** (-4.24)	-1.13*** (-4.24)
CEO exp (10 yrs)	-0.79 (-1.48)	2.81*** (3.11)	1.44* (1.81)	1.22 (1.53)	1.90*** (2.67)
Industry exp (10 yrs)	0.01 (0.01)	0.03 (0.10)	-0.26 (-0.72)	-0.00 (-0.00)	0.60* (1.92)
Firm tenure (10 yrs)	0.42 (0.91)	0.71*** (2.61)	0.45 (1.21)	0.11 (0.31)	-0.29 (-0.95)
Log assets	0.22 (0.75)	0.51 (1.29)	1.43*** (4.34)	0.12 (0.38)	0.44 (0.95)
Accounting	-2.83*** (-4.92)	-3.94*** (-9.12)	-3.90*** (-6.82)	-4.82*** (-7.48)	-4.97 (-0.95)
Administration	-0.06 (-0.04)	-0.20 (-0.17)	-1.47 (-1.35)	-3.39*** (-4.44)	10.86 (0.83)
Finance	-1.09** (-2.12)	-1.02** (-2.28)	0.93* (1.82)	-3.55*** (-8.04)	5.97*** (2.92)
HR	-1.11 (-0.91)	-2.02*** (-4.34)	-3.89*** (-8.25)	-4.69*** (-9.99)	5.24** (2.01)
IT	-2.10*** (-3.21)	-4.85*** (-9.91)	-2.98*** (-5.36)	-3.81*** (-7.09)	0.09 (0.04)
Legal	-1.44** (-2.32)	-1.09** (-2.43)	-2.72*** (-5.81)	-4.73*** (-10.40)	3.26 (0.49)

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Table 6 – *Continued from previous page*

Sample	Dependent variable: Promotions				
	Corptitle unspecified	VP	SVP	EVP	President
	(1)	(2)	(3)	(4)	(5)
Marketing	1.11 (1.27)	-0.20 (-0.39)	-0.40 (-0.64)	-0.26 (-0.38)	1.31 (0.47)
Operations	7.70*** (10.50)	0.82 (1.48)	1.57** (2.15)	4.20*** (7.17)	11.76*** (11.87)
PR	-4.80*** (-4.47)	-5.94*** (-10.05)	-5.00*** (-6.00)	-4.60*** (-5.63)	
R&D	-1.90** (-2.48)	-1.76*** (-3.30)	-1.67** (-2.32)	-3.13*** (-3.55)	-7.76** (-2.37)
Sales	1.93 (1.32)	0.87 (1.07)	-0.43 (-0.49)	0.64 (0.61)	0.44 (0.35)
Secretary	-3.64*** (-4.48)	-4.36*** (-4.47)	-3.49*** (-2.61)	-3.82** (-2.37)	5.53 (1.28)
Strategy	-0.56 (-0.65)	-1.46** (-2.27)	-1.19** (-2.25)	-2.83*** (-5.15)	2.49 (1.64)
Firm FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Obs	36,067	78,708	54,652	33,747	24,138
R <sup>2</sup>	0.07	0.06	0.05	0.06	0.16
Promotion Prob (women)	2.96	6.74	4.89	2.59	3.02
Promotion Prob (men)	4.96	7.27	6.26	3.95	4.38
Coeff. (female) W/O FuncArea	-1.81	-2.03	-2.42	-1.43	-0.34

Table 7: Promotions from each corporate level and product market competition

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. *High competition* indicates that industry concentration is lower than median, or that product similarity is higher than median, or that product market fluidity is higher than median. All regressions include year FE, firm FE, and functional expertise FE. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level.

Sample	Dependent variable: Promotions				
	CorpLevel unspecified (1)	VP (2)	SVP (3)	EVP (4)	President (5)
Panel A					
Female	-1.60*** (-2.86)	-1.78*** (-4.72)	-2.20*** (-5.42)	-1.42*** (-3.47)	-0.54 (-0.85)
High competition (HHI)	-0.08 (-0.20)	0.86* (1.92)	-0.09 (-0.23)	0.07 (0.19)	-0.49 (-1.26)
Female * High competition (HHI)	0.09 (0.14)	0.47 (0.81)	0.88 (1.49)	1.37** (2.14)	1.00 (0.93)
Obs	31,712	72,973	50,324	30,970	22,177
R <sup>2</sup>	0.07	0.07	0.05	0.07	0.17
Panel B					
Female	-1.83*** (-3.45)	-1.72*** (-4.66)	-1.97*** (-4.60)	-1.38*** (-2.85)	-0.65 (-1.12)
High competition (Similarity)	-0.52 (-0.80)	0.25 (0.43)	-0.49 (-0.96)	0.56 (1.09)	-1.04* (-1.86)
Female * High competition (Similarity)	0.72 (1.01)	0.39 (0.73)	0.42 (0.65)	1.31** (2.00)	1.65 (1.57)
Obs	31,712	72,973	50,324	30,970	22,177
R <sup>2</sup>	0.07	0.07	0.05	0.07	0.17
Panel C					
Female	-1.93*** (-2.87)	-1.86*** (-4.44)	-1.99*** (-4.44)	-0.97* (-1.73)	-0.56 (-0.82)
High competition (Fluidity)	-0.01 (-0.03)	-0.17 (-0.38)	0.42 (0.99)	0.09 (0.20)	-0.17 (-0.38)
Female * High competition (Fluidity)	0.93 (1.12)	0.55 (1.02)	0.44 (0.75)	0.27 (0.32)	0.92 (1.04)
Obs	30,609	70,756	48,517	29,918	21,295
R <sup>2</sup>	0.07	0.07	0.05	0.07	0.17

Table 8: Gender promotion gap and board gender diversity

This table presents the estimates linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. The omitted group for the corporate level consists of vice presidents. The omitted group for the functional expertise consists of general managers. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level

Board diversity var	Promotions						
	Female dir ratio	Female outside dir ratio	Female inside dir ratio	Female dir >=1	Female dir >=2	Female dir >=3	Female CEO
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female	-1.17*** (-6.62)	-1.30*** (-7.22)	-1.09*** (-7.95)	-0.97*** (-4.34)	-1.25*** (-7.95)	-1.24*** (-8.79)	-1.15*** (-8.31)
Board diversity	-0.26 (-0.21)	-0.28 (-0.22)	0.16 (0.04)	-0.14 (-0.56)	0.36 (1.47)	-0.31 (-0.76)	-0.80 (-1.62)
Female * Board diversity	-0.13 (-0.11)	1.02 (0.81)	-8.50** (-2.12)	-0.30 (-1.06)	0.16 (0.56)	0.40 (0.94)	-0.49 (-0.89)
MBA	0.72*** (6.41)	0.72*** (6.40)	0.73*** (6.42)	0.72*** (6.42)	0.72*** (6.40)	0.72*** (6.41)	0.73*** (6.42)
Ivy league	0.89*** (5.01)	0.89*** (5.01)	0.89*** (5.01)	0.89*** (5.01)	0.89*** (5.00)	0.89*** (5.00)	0.90*** (5.05)
Inside dir	6.58*** (14.49)	6.58*** (14.49)	6.64*** (14.64)	6.59*** (14.53)	6.57*** (14.46)	6.58*** (14.48)	6.58*** (14.49)
Age (10 yrs)	8.45*** (10.15)	8.44*** (10.14)	8.46*** (10.15)	8.46*** (10.16)	8.44*** (10.14)	8.44*** (10.15)	8.42*** (10.09)
Age squared	-0.99*** (-11.97)	-0.99*** (-11.95)	-0.99*** (-11.96)	-0.99*** (-11.97)	-0.99*** (-11.95)	-0.99*** (-11.96)	-0.99*** (-11.90)
CEO exp (10 yrs)	0.12 (0.46)	0.12 (0.46)	0.11 (0.43)	0.12 (0.45)	0.12 (0.46)	0.12 (0.46)	0.11 (0.43)
Industry exp (10 yrs)	-0.03 (-0.23)	-0.03 (-0.23)	-0.03 (-0.22)	-0.03 (-0.23)	-0.04 (-0.23)	-0.04 (-0.24)	-0.04 (-0.24)
Firm tenure (10 yrs)	0.12 (0.78)	0.12 (0.79)	0.12 (0.78)	0.12 (0.78)	0.12 (0.80)	0.12 (0.79)	0.12 (0.78)
Log assets	0.52*** (3.34)	0.52*** (3.33)	0.52*** (3.32)	0.53*** (3.39)	0.51*** (3.27)	0.52*** (3.35)	0.51*** (3.30)
CorpTitle unspecified	-3.67*** (-14.91)	-3.66*** (-14.91)	-3.67*** (-14.92)	-3.67*** (-14.93)	-3.66*** (-14.90)	-3.66*** (-14.89)	-3.67*** (-14.86)
SVP	-3.83*** (-14.01)	-3.83*** (-14.02)	-3.83*** (-14.02)	-3.83*** (-14.02)	-3.83*** (-14.02)	-3.83*** (-14.03)	-3.83*** (-14.03)
EVP	-7.71*** (-21.77)	-7.72*** (-21.77)	-7.71*** (-21.78)	-7.71*** (-21.79)	-7.71*** (-21.79)	-7.72*** (-21.81)	-7.72*** (-21.81)
President	-7.23*** (-24.59)	-7.23*** (-24.59)	-7.23*** (-24.57)	-7.23*** (-24.60)	-7.23*** (-24.57)	-7.23*** (-24.60)	-7.23*** (-24.62)
Accounting	-2.75***	-2.75***	-2.75***	-2.75***	-2.75***	-2.75***	-2.75***

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Table 8 – *Continued from previous page*

Board diversity var	Promotions						
	Female dir ratio	Female outside dir ratio	Female inside ratio	Female dir >=1	Female dir >=2	Female dir >=3	Female CEO
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	(-11.72)	(-11.72)	(-11.70)	(-11.72)	(-11.72)	(-11.72)	(-11.73)
Administration	-1.37***	-1.37***	-1.38***	-1.38***	-1.37***	-1.37***	-1.38***
	(-2.95)	(-2.94)	(-2.95)	(-2.96)	(-2.93)	(-2.94)	(-2.96)
Finance	-0.36*	-0.36*	-0.36*	-0.36*	-0.36*	-0.36*	-0.36*
	(-1.79)	(-1.78)	(-1.80)	(-1.80)	(-1.78)	(-1.79)	(-1.79)
HR	-2.60***	-2.60***	-2.61***	-2.60***	-2.60***	-2.60***	-2.60***
	(-11.75)	(-11.73)	(-11.80)	(-11.75)	(-11.71)	(-11.72)	(-11.77)
IT	-2.97***	-2.97***	-2.97***	-2.97***	-2.97***	-2.97***	-2.97***
	(-11.47)	(-11.47)	(-11.46)	(-11.47)	(-11.48)	(-11.47)	(-11.45)
Legal	-1.58***	-1.57***	-1.58***	-1.58***	-1.57***	-1.57***	-1.58***
	(-7.78)	(-7.77)	(-7.80)	(-7.78)	(-7.77)	(-7.79)	(-7.79)
Marketing	0.26	0.26	0.26	0.26	0.26	0.26	0.26
	(0.94)	(0.94)	(0.95)	(0.95)	(0.94)	(0.94)	(0.93)
Operations	4.87***	4.87***	4.87***	4.87***	4.87***	4.87***	4.87***
	(14.61)	(14.59)	(14.62)	(14.61)	(14.61)	(14.59)	(14.62)
PR	-4.45***	-4.46***	-4.45***	-4.45***	-4.46***	-4.45***	-4.45***
	(-12.12)	(-12.13)	(-12.15)	(-12.10)	(-12.13)	(-12.13)	(-12.15)
R&D	-1.44***	-1.44***	-1.44***	-1.44***	-1.44***	-1.44***	-1.44***
	(-5.44)	(-5.44)	(-5.43)	(-5.43)	(-5.44)	(-5.44)	(-5.44)
Sales	0.87*	0.87*	0.87*	0.87*	0.87*	0.87*	0.87*
	(1.80)	(1.79)	(1.79)	(1.80)	(1.79)	(1.79)	(1.80)
Secretary	-3.42***	-3.41***	-3.40***	-3.42***	-3.42***	-3.41***	-3.42***
	(-7.28)	(-7.27)	(-7.24)	(-7.30)	(-7.29)	(-7.28)	(-7.30)
Strategy	-0.77**	-0.77**	-0.77**	-0.77**	-0.77**	-0.77**	-0.77**
	(-2.47)	(-2.48)	(-2.47)	(-2.47)	(-2.47)	(-2.47)	(-2.47)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs	229,403	229,403	229,403	229,403	229,403	229,403	229,406
R <sup>2</sup>	0.03	0.03	0.03	0.03	0.03	0.03	0.03

Table 9: Promotions and takeover threat

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. *Log N<sup>o</sup>takeovers* measures the number of takeover events in an industry. The value is set to missing if a company is the takeover target. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level.

Sample	Dependent variable: Promotions					
	All	CorpLevel unspecified	VP	SVP	EVP	President
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-1.49*** (-7.04)	-1.49** (-2.41)	-1.51*** (-3.63)	-1.56*** (-3.12)	-1.98*** (-4.50)	-0.43 (-0.61)
Log N <sup>o</sup> takeovers	-0.17 (-1.03)	0.19 (0.44)	-0.10 (-0.33)	0.15 (0.46)	-0.32 (-0.89)	-0.14 (-0.42)
Female * Log N <sup>o</sup> takeovers	0.18** (2.47)	0.00 (0.02)	-0.00 (-0.02)	0.45** (2.24)	0.14 (0.78)	0.22 (0.76)
MBA	0.74*** (6.16)	1.16*** (3.00)	0.52** (2.12)	0.59* (1.70)	0.98*** (3.45)	-0.19 (-0.55)
Ivy league	0.95*** (5.35)	0.84 (1.63)	1.21*** (3.30)	0.83** (2.14)	0.54 (1.58)	1.16** (2.12)
Inside dir	6.69*** (13.99)	3.64*** (4.18)	2.67** (2.35)	5.54*** (5.92)	6.33*** (4.08)	14.18*** (11.07)
Age (10 yrs)	8.99*** (10.29)	11.03*** (5.91)	13.58*** (7.12)	7.73*** (3.30)	8.63*** (3.83)	11.01*** (3.96)
Age squared	-1.05*** (-12.06)	-1.17*** (-6.04)	-1.49*** (-7.81)	-0.89*** (-3.86)	-1.05*** (-4.69)	-1.14*** (-4.14)
CEO exp (10 yrs)	0.25 (0.91)	-0.62 (-1.14)	2.94*** (3.07)	1.23 (1.48)	1.60* (1.92)	1.84** (2.54)
Industry exp (10 yrs)	-0.04 (-0.24)	-0.07 (-0.13)	0.02 (0.08)	-0.07 (-0.20)	-0.30 (-0.80)	0.53 (1.65)
Firm tenure (10 yrs)	0.14 (0.90)	0.48 (0.97)	0.73*** (2.65)	0.15 (0.43)	0.47 (1.22)	-0.22 (-0.72)
Log assets	0.51*** (3.11)	0.20 (0.68)	0.52 (1.28)	0.12 (0.37)	1.48*** (4.09)	0.40 (0.86)
SVP	-3.85*** (-14.47)					
EVP	-7.79*** (-22.38)					
President	-7.35*** (-24.28)					
CorpTitle unspecified	-3.73*** (-14.48)					

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Table 9 – Continued from previous page

Sample	Dependent variable: Promotions					
	All	CorpLevel unspecified	VP	SVP	EVP	President
	(1)	(2)	(3)	(4)	(5)	(6)
Accounting	-2.78*** (-11.48)	-2.73*** (-4.57)	-4.02*** (-8.96)	-4.86*** (-7.31)	-3.97*** (-6.78)	-7.42 (-1.45)
Administration	-1.41*** (-2.95)	0.09 (0.05)	-0.20 (-0.17)	-3.50*** (-4.42)	-1.68 (-1.54)	10.48 (0.82)
Finance	-0.36* (-1.74)	-1.09** (-2.06)	-1.08** (-2.39)	-3.65*** (-8.06)	1.00* (1.95)	6.02*** (2.86)
HR	-2.58*** (-11.34)	-1.05 (-0.85)	-2.01*** (-4.28)	-4.74*** (-9.94)	-3.94*** (-8.12)	6.59** (2.13)
IT	-2.98*** (-10.95)	-2.07*** (-3.06)	-4.95*** (-9.81)	-3.87*** (-6.92)	-3.10*** (-5.49)	-0.08 (-0.03)
Legal	-1.57*** (-7.38)	-1.52** (-2.34)	-1.09** (-2.36)	-4.85*** (-10.52)	-2.78*** (-5.72)	1.66 (0.28)
Marketing	0.30 (1.08)	1.13 (1.24)	-0.15 (-0.28)	-0.24 (-0.33)	-0.50 (-0.78)	1.15 (0.41)
Operations	4.98*** (14.61)	7.71*** (9.89)	0.77 (1.32)	4.28*** (7.17)	1.62** (2.25)	11.78*** (11.52)
PR	-4.44*** (-11.85)	-4.81*** (-4.49)	-6.01*** (-10.03)	-4.85*** (-5.75)	-5.04*** (-5.97)	
R&D	-1.42*** (-5.11)	-1.77** (-2.35)	-1.74*** (-3.14)	-3.19*** (-3.40)	-1.67** (-2.16)	-9.57*** (-2.97)
Sales	0.92* (1.81)	1.87 (1.23)	0.78 (0.92)	0.83 (0.77)	-0.30 (-0.34)	0.34 (0.37)
Secretary	-3.49*** (-7.22)	-3.66*** (-4.31)	-4.46*** (-4.42)	-3.84** (-2.23)	-3.65*** (-2.65)	5.35 (1.17)
Strategy	-0.71** (-2.22)	-0.50 (-0.59)	-1.41** (-2.16)	-2.88*** (-5.05)	-1.22** (-2.23)	2.42 (1.56)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	220,941	34,355	76,233	32,398	52,441	23,401
R <sup>2</sup>	0.03	0.07	0.06	0.07	0.05	0.16

Table 10: Promotions in executives who are over 50 years old

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. *Age over 50* is a dummy variable indicating that the manager is over 50 years old. Column (1) includes all executives; columns (2)-(4) include executives who are over 50 years old. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level.

High competition measure	Dependent variable: Promotions			
	(1)	HHI (2)	Similarity (3)	Fluidity (4)
Female	-1.43*** (-8.32)	-1.38*** (-4.55)	-1.08*** (-3.69)	-0.95*** (-2.82)
Age over 50	-0.20 (-0.90)			
Female * Age over 50	0.64** (2.44)			
High competition		0.34 (1.22)	-0.08 (-0.25)	0.12 (0.47)
Female * High competition		1.43*** (3.03)	0.86* (1.94)	0.53 (1.18)
MBA	0.72*** (6.38)	0.76*** (4.08)	0.76*** (4.07)	0.78*** (4.03)
Ivy league	0.89*** (5.04)	0.29 (1.10)	0.29 (1.11)	0.29 (1.06)
Inside dir	6.58*** (14.49)	6.01*** (11.07)	6.02*** (11.08)	5.89*** (10.76)
Age (10 yrs)	8.31*** (10.00)	9.28 (1.35)	9.33 (1.36)	9.82 (1.39)
Age squared	-0.97*** (-11.53)	-1.03* (-1.72)	-1.03* (-1.72)	-1.08* (-1.75)
CEO exp (10 yrs)	0.12 (0.46)	0.07 (0.19)	0.08 (0.21)	0.18 (0.51)
Industry exp (10 yrs)	-0.03 (-0.22)	-0.18 (-0.88)	-0.19 (-0.90)	-0.10 (-0.48)
Firm tenure (10 yrs)	0.12 (0.79)	0.01 (0.05)	0.01 (0.06)	-0.03 (-0.15)
Log assets	0.52*** (3.37)	0.87*** (3.66)	0.90*** (3.79)	0.79*** (3.35)
CorpTitle unspecified	-3.67*** (-14.84)	-2.69*** (-9.10)	-2.69*** (-9.10)	-2.71*** (-8.88)
SVP	-3.83*** (-14.01)	-3.47*** (-11.05)	-3.47*** (-11.04)	-3.48*** (-10.80)

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Table 10 – *Continued from previous page*

High competition measure	Dependent variable: Promotions			
	(1)	(2)	(3)	(4)
EVP	-7.72*** (-21.81)	-6.70*** (-17.63)	-6.71*** (-17.61)	-6.74*** (-17.12)
President	-7.23*** (-24.56)	-5.84*** (-14.98)	-5.84*** (-14.96)	-5.78*** (-14.68)
Accounting	-2.75*** (-11.71)	-2.19*** (-6.01)	-2.18*** (-6.00)	-2.02*** (-5.58)
Administration	-1.37*** (-2.93)	-0.44 (-0.66)	-0.45 (-0.67)	-0.27 (-0.41)
Finance	-0.36* (-1.76)	0.47 (1.31)	0.47 (1.33)	0.59 (1.62)
HR	-2.61*** (-11.73)	-1.52*** (-4.48)	-1.52*** (-4.47)	-1.58*** (-4.45)
IT	-2.97*** (-11.46)	-2.21*** (-5.11)	-2.20*** (-5.10)	-2.08*** (-4.59)
Legal	-1.58*** (-7.77)	-1.12*** (-3.59)	-1.11*** (-3.58)	-0.95*** (-3.04)
Marketing	0.27 (0.95)	0.88* (1.83)	0.89* (1.86)	0.84* (1.71)
Operations	4.87*** (14.65)	5.38*** (11.27)	5.38*** (11.28)	5.51*** (11.33)
PR	-4.46*** (-12.16)	-3.83*** (-7.15)	-3.81*** (-7.06)	-3.60*** (-6.50)
R&D	-1.44*** (-5.41)	-1.56*** (-3.61)	-1.56*** (-3.62)	-1.51*** (-3.44)
Sales	0.87* (1.80)	1.51* (1.77)	1.52* (1.77)	1.64* (1.84)
Secretary	-3.44*** (-7.34)	-3.21*** (-4.97)	-3.22*** (-5.02)	-3.03*** (-4.81)
Strategy	-0.77** (-2.48)	-0.89** (-2.26)	-0.89** (-2.27)	-0.84** (-2.14)
Obs	229,406	91,625	91,625	88,173
R <sup>2</sup>	0.03	0.03	0.03	0.03
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Table 11: Gender promotion gap and product market competition - C-suites executives

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. It includes executives whose job title contains “Chief” except CEO because by definition a CEO cannot be internally promoted. The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. *High competition* indicates that industry concentration is lower than median, or that product similarity is higher than median, or that product market fluidity is higher than median. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level

High competition measures	Dependent variable: Promotions			
	(1)	(2)	(3)	(4)
Female	-1.31*** (-3.56)	-2.66*** (-5.54)	-2.21*** (-4.45)	-1.51*** (-2.65)
High competition		-0.25 (-0.59)	-0.25 (-0.46)	-0.10 (-0.24)
Female * High competition		2.89*** (4.15)	1.99*** (2.92)	0.19 (0.26)
MBA	0.81*** (3.09)	0.75*** (2.65)	0.75*** (2.64)	0.83*** (2.80)
Ivy league	1.62*** (4.06)	1.67*** (3.94)	1.68*** (3.94)	1.77*** (4.04)
Inside dir	6.66*** (8.24)	6.69*** (7.44)	6.69*** (7.45)	6.59*** (7.20)
Age (10 yrs)	11.06*** (6.05)	12.59*** (6.10)	12.57*** (6.09)	12.60*** (6.12)
Age squared	-1.24*** (-6.78)	-1.39*** (-6.72)	-1.39*** (-6.71)	-1.39*** (-6.72)
CEO exp (10 yrs)	1.34 (1.45)	1.68 (1.62)	1.68 (1.61)	1.68 (1.60)
Industry exp (10 yrs)	0.03 (0.08)	0.03 (0.09)	0.03 (0.08)	0.06 (0.17)
Firm tenure (10 yrs)	0.08 (0.25)	0.05 (0.15)	0.06 (0.17)	0.01 (0.03)
Log assets	0.67*** (3.10)	0.76*** (3.24)	0.77*** (3.31)	0.79*** (3.26)
CorpTitle unspecified	-3.31*** (-6.32)	-3.27*** (-5.76)	-3.28*** (-5.76)	-3.16*** (-5.46)
SVP	-5.10*** (-10.90)	-5.29*** (-10.80)	-5.30*** (-10.83)	-5.22*** (-10.36)
EVP	-11.39***	-11.76***	-11.77***	-11.63***

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Table 11 – *Continued from previous page*

High competition measures	Dependent variable: Promotions			
	(1)	(2)	(3)	(4)
	(-22.06)	(-21.33)	(-21.35)	(-20.75)
President	-7.56*** (-7.97)	-7.68*** (-7.46)	-7.68*** (-7.47)	-7.47*** (-7.28)
Accounting	-2.66***	-2.82***	-2.78***	-2.43***
Administration	(-3.82) -0.63	(-3.77) -0.80	(-3.69) -0.79	(-3.22) -0.58
Finance	(-0.68) 0.70	(-0.80) 0.68	(-0.78) 0.72	(-0.57) 1.08
	(1.00)	(0.92)	(0.95)	(1.43)
HR	-2.75*** (-3.10)	-2.82*** (-2.94)	-2.83*** (-2.93)	-2.56*** (-2.61)
IT	-3.62*** (-5.38)	-3.79*** (-5.26)	-3.76*** (-5.16)	-3.44*** (-4.67)
Legal	-3.50*** (-4.61)	-3.71*** (-4.62)	-3.68*** (-4.57)	-3.29*** (-4.05)
Marketing	0.84 (0.99)	0.81 (0.90)	0.86 (0.95)	1.24 (1.33)
Operations	10.26*** (11.95)	10.41*** (11.17)	10.43*** (11.16)	10.63*** (11.68)
PR	-4.99*** (-3.14)	-5.65*** (-3.60)	-5.48*** (-3.50)	-5.01*** (-3.16)
R&D	-2.58*** (-3.71)	-2.74*** (-3.84)	-2.72*** (-3.80)	-2.49*** (-3.46)
Sales	0.47 (0.17)	0.78 (0.27)	0.62 (0.21)	1.08 (0.37)
Secretary	-6.04*** (-2.68)	-7.19*** (-3.02)	-7.12*** (-2.94)	-5.19** (-2.16)
Strategy	0.23 (0.20)	0.66 (0.54)	0.71 (0.58)	0.81 (0.66)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	66,188	59,557	59,557	57,518
R <sup>2</sup>	0.05	0.06	0.05	0.05

Table 12: Executive turnover

This table presents the estimates of linear probability models of manager turnover. Observations are at the manager-year level over the period 2000-2015. The dependent variable, *Turnover*, is a dummy variable that equals to one hundred if a manager departs from the firm in the following year. *ROA* measures operating income before depreciation over total assets. *Stock return* measures the buy and hold stock return over 12 months before the fiscal year end. t-statistics, reported in the parentheses, are calculated with standard errors clustered at industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level

	Executive turnover			
	(1)	(2)	(3)	(4)
Female	0.60*** (2.63)	0.50** (2.25)	0.58*** (2.73)	0.65*** (3.00)
ROA	-8.33*** (-4.89)		-9.70*** (-4.91)	
Female * ROA	-0.32 (-0.38)		0.84 (1.29)	
Stock return		-2.80*** (-15.76)		-4.10*** (-20.41)
Female * Stock return		0.78** (2.27)		0.76** (2.11)
MBA	1.28*** (8.38)	1.26*** (8.38)	1.37*** (9.62)	1.33*** (8.85)
Ivy league	0.66*** (3.60)	0.54*** (2.70)	0.66*** (3.23)	0.63*** (2.92)
Inside dir	-3.08*** (-13.07)	-3.14*** (-12.25)	-2.35*** (-10.27)	-2.38*** (-9.92)
Age (10 yrs)	-12.21*** (-6.43)	-13.24*** (-6.69)	-12.21*** (-6.88)	-13.23*** (-7.16)
Age squared	1.63*** (8.21)	1.74*** (8.38)	1.56*** (8.41)	1.67*** (8.62)
CEO exp (10 yrs)	-0.11 (-0.52)	-0.04 (-0.19)	-0.25 (-1.24)	-0.17 (-0.79)
Industry exp (10 yrs)	0.80*** (5.25)	0.87*** (5.15)	0.70*** (3.86)	0.81*** (4.23)
Firm tenure (10 yrs)	-1.40*** (-8.01)	-1.49*** (-8.01)	-2.53*** (-11.91)	-2.72*** (-11.44)
Log assets	1.20*** (5.33)	0.42* (1.86)	0.30*** (3.99)	-0.10 (-1.44)
CorpTitle unspecified	2.97*** (13.35)	2.98*** (12.43)	3.22*** (14.21)	3.15*** (13.21)
SVP	0.25 (1.25)	0.25 (1.19)	1.00*** (4.68)	1.02*** (4.33)
EVP	1.63*** (6.72)	1.56*** (6.08)	2.18*** (9.57)	2.04*** (8.17)

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Table 12 – *Continued from previous page*

	Executive turnover			
	(1)	(2)	(3)	(4)
President	-1.30*** (-5.76)	-1.26*** (-5.42)	-0.81*** (-3.68)	-0.78*** (-3.51)
Accounting	-2.89*** (-11.26)	-3.07*** (-11.52)	-3.21*** (-12.36)	-3.40*** (-12.79)
Administration	-3.80*** (-6.05)	-3.61*** (-5.70)	-3.05*** (-5.00)	-2.84*** (-4.50)
Finance	-1.90*** (-7.65)	-2.13*** (-7.98)	-1.74*** (-6.81)	-1.90*** (-6.79)
HR	-2.41*** (-6.42)	-2.57*** (-6.77)	-1.99*** (-5.43)	-2.23*** (-5.98)
IT	-2.45*** (-7.58)	-2.52*** (-7.06)	-2.19*** (-6.51)	-2.20*** (-6.17)
Legal	-5.77*** (-22.49)	-5.89*** (-22.66)	-5.64*** (-23.35)	-5.71*** (-23.11)
Marketing	1.31*** (3.34)	1.31*** (3.26)	0.94** (2.43)	1.01** (2.51)
Operations	-0.66** (-2.32)	-0.79*** (-2.59)	-0.93*** (-3.21)	-1.04*** (-3.31)
PR	-3.94*** (-8.16)	-4.32*** (-9.03)	-4.06*** (-9.00)	-4.28*** (-9.12)
R&D	-2.84*** (-6.38)	-2.74*** (-5.67)	-3.29*** (-7.17)	-2.85*** (-6.05)
Sales	1.51*** (3.09)	1.56*** (2.97)	1.63*** (3.26)	1.71*** (2.91)
Secretary	-3.05*** (-5.50)	-3.20*** (-5.44)	-3.58*** (-6.47)	-3.82*** (-6.59)
Strategy	-0.65* (-1.84)	-0.91** (-2.36)	-0.85** (-2.20)	-0.97** (-2.32)
Firm FE	Yes	Yes	No	No
Year FE	Yes	Yes	No	No
Industry-year FE	No	No	Yes	Yes
Obs	296,619	273,080	296,636	273,043
R <sup>2</sup>	0.05	0.05	0.02	0.02

# Appendix 1 Variable definitions

## Appendix 2: Variable definitions

Variable	Definition	Source
Female	Dummy variable: 1 if an executive is female. 0 otherwise.	BoardEx
Functional expertise	A set of dummy variables including accounting, administration, finance, general manager, HR, IT, legal, marketing, operations, PR, R&D, sales, secretary, and strategy.	BoardEx
Corporate level	A set of dummy variables including VP, SVP, EVP, president, CEO and corporate level unspecified	BoardEx
Vice president (VP)	Dummy variable: 1 if an executive is a vice president. 0 otherwise.	BoardEx
Senior vice president (SVP)	Dummy variable: 1 if an executive is a senior vice president, including the divisional or regional senior vice president. 0 otherwise.	BoardEx
Executive vice president (EVP)	Dummy variable: 1 if an executive is an executive vice president, including the divisional or regional executive vice president. 0 otherwise.	BoardEx
President	Dummy variable: 1 if an executive is a president, including the divisional or regional president. 0 otherwise.	BoardEx
CEO	Dummy variable: 1 if an executive is a chief executive officer. 0 otherwise.	BoardEx
Promotion_to_SVP	Dummy variable: 1 if an executive is promoted internally to senior vice president position in the following year. 0 otherwise.	BoardEx
Promotion_to_EVP	Dummy variable: 1 if an executive is promoted internally to executive vice president position in the following year. 0 otherwise.	BoardEx
Promotion_to_president	Dummy variable: 1 if an executive is promoted internally to president position in the following year. 0 otherwise.	BoardEx
Promotion_to_CEO	Dummy variable: 1 if an executive is promoted internally to CEO position in the following year. 0 otherwise.	BoardEx
Promotion	Dummy variable: 1 if an executive is promoted internally in the following year. 0 otherwise.	BoardEx
Age	Age	BoardEx
Age squared	Age squared	BoardEx
Ivy league	Dummy variable: 1 if an executive graduated from an Ivy League university. 0 otherwise.	BoardEx
MBA	Dummy variable: 1 if an executive has an MBA degree. 0 otherwise.	BoardEx
Inside director	Dummy variable: 1 if an executive is an insider director. 0 otherwise.	BoardEx
CEO experience	The number of years that an executive worked in CEO positions.	BoardEx



Appendix 2: Variable definitions (Continue)

Variable	Definition	Source
Industry experience	The number of years that an executive worked on full time positions in an industry, including experience in private firms. Industry is defined as FTSE international industry classification, the classification in BoardEx.	BoardEx
Firm tenure	The number of years that an executive worked in a firm	BoardEx
Log assets	Total assets (ln)	Compustat
Stock return	Buy and hold return over 12 months before the fiscal year end	CRSP monthly
ROA	Operating income before depreciation over total assets	Compustat
Turnover	Dummy variable: 1 if an executive departs from the firm in the following year. 0 otherwise.	BoardEx
High competition (HHI)	Dummy variable: 1 if a firm's HHI is below median in a year. 0 otherwise.	Hoberg-Phillips Data Library
High competition (similarity)	Dummy variable: 1 if a firm's product similarity score is above median in a year. 0 otherwise.	Hoberg-Phillips Data Library
High competition (fluidity)	Dummy variable: 1 if a firm's product market fluidity is above median in a year. 0 otherwise.	Hoberg-Phillips Data Library
HHI	Industry concentration	Hoberg-Phillips Data Library
Similarity	Total product similarity	Hoberg-Phillips Data Library
Fluidity	Product market fluidity	Hoberg-Phillips Data Library
Log No takeovers	No takeovers measures the number of takeover events in an industry (ln)	SDC
Industry size	The number of firms in an industry (four digit SIC) in a given year	BoardEx
Female director ratio	The number of female directors / the number of directors	BoardEx
Female outside director ratio	The number of female outside directors / the number of outside directors	BoardEx
Female inside director ratio	The number of female inside directors / the number of inside directors	BoardEx

## Appendix 2 Robustness

Table A1: Gender promotion gap and product market competition

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. In columns (1)-(3), *Competition* variables are continuous variables from Hoberg-Philips data library.(Hoberg and Phillips, 2016, Hoberg et al., 2014) In columns (4)-(6), *Competition* variables are quartiles of each corresponding competition measure. The omitted group for the corporate level consists of vice presidents. The omitted group for the functional expertise consists of General Managers. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level.

Competition measures	Dependent variable: Promotions					
	HHI (1)	Similarity (2)	Fluidity (3)	HHI4 (4)	Similarity4 (5)	Fluidity4 (6)
Female	-0.76*** (-3.41)	-1.35*** (-7.97)	-1.60*** (-4.65)	-1.76*** (-5.07)	-2.00*** (-5.82)	-1.91*** (-5.28)
Competition	-0.49 (-0.87)	8.90*** (3.81)	-0.01 (-0.17)	0.11 (0.85)	0.05 (0.28)	-0.01 (-0.12)
Female * Competition	1.87** (2.42)	3.66*** (3.21)	0.06 (1.49)	0.24* (1.81)	0.35*** (2.68)	0.30** (2.40)
MBA	0.73*** (6.13)	0.73*** (6.13)	0.76*** (6.31)	0.73*** (6.13)	0.73*** (6.13)	0.76*** (6.31)
Ivy league	0.92*** (4.96)	0.92*** (4.98)	0.98*** (5.29)	0.92*** (4.96)	0.92*** (4.96)	0.98*** (5.29)
Inside dir	6.83*** (13.20)	6.83*** (13.20)	6.75*** (12.61)	6.83*** (13.20)	6.83*** (13.21)	6.75*** (12.61)
Age (10 yrs)	9.25*** (10.41)	9.26*** (10.43)	9.19*** (10.18)	9.24*** (10.39)	9.25*** (10.43)	9.19*** (10.20)
Age squared	-1.08*** (-12.16)	-1.08*** (-12.18)	-1.07*** (-11.92)	-1.08*** (-12.14)	-1.08*** (-12.18)	-1.07*** (-11.94)
CEO exp (10 yrs)	0.30 (0.99)	0.30 (1.01)	0.35 (1.16)	0.30 (1.00)	0.30 (0.99)	0.35 (1.15)
Industry exp (10 yrs)	-0.04 (-0.26)	-0.05 (-0.32)	-0.01 (-0.06)	-0.04 (-0.26)	-0.04 (-0.25)	-0.01 (-0.06)
Firm tenure (10 yrs)	0.15 (0.96)	0.16 (1.00)	0.14 (0.83)	0.15 (0.96)	0.15 (0.95)	0.13 (0.82)
Log assets	0.56*** (3.27)	0.52*** (2.91)	0.54*** (2.97)	0.54*** (3.13)	0.55*** (3.19)	0.54*** (2.98)
CorpTitle unspecified	-3.76*** (-14.35)	-3.75*** (-14.29)	-3.75*** (-14.10)	-3.76*** (-14.34)	-3.76*** (-14.32)	-3.75*** (-14.11)
SVP	-3.91*** (-14.66)	-3.92*** (-14.69)	-3.89*** (-14.35)	-3.91*** (-14.66)	-3.91*** (-14.64)	-3.89*** (-14.35)

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Table A1 – *Continued from previous page*

Competition measures	Dependent variable: Promotions					
	HHI	Similarity	Fluidity	HHI4	Similarity4	Fluidity4
	(1)	(2)	(3)	(4)	(5)	(6)
	(1)	(2)	(3)			
EVP	-7.81*** (-22.19)	-7.81*** (-22.27)	-7.81*** (-22.45)	-7.81*** (-22.19)	-7.81*** (-22.20)	-7.81*** (-22.45)
President	-7.38*** (-23.74)	-7.38*** (-23.75)	-7.33*** (-23.53)	-7.37*** (-23.72)	-7.38*** (-23.74)	-7.33*** (-23.54)
Accounting	-2.80*** (-11.70)	-2.79*** (-11.73)	-2.75*** (-11.30)	-2.79*** (-11.72)	-2.79*** (-11.72)	-2.75*** (-11.29)
Administration	-1.33*** (-2.64)	-1.34*** (-2.65)	-1.31** (-2.56)	-1.34*** (-2.65)	-1.34*** (-2.65)	-1.31** (-2.56)
Finance	-0.32 (-1.58)	-0.33 (-1.59)	-0.27 (-1.28)	-0.32 (-1.58)	-0.32 (-1.58)	-0.27 (-1.27)
HR	-2.60*** (-11.15)	-2.60*** (-11.15)	-2.64*** (-10.86)	-2.60*** (-11.14)	-2.60*** (-11.10)	-2.63*** (-10.84)
IT	-3.00*** (-11.02)	-3.00*** (-11.02)	-2.99*** (-10.57)	-3.00*** (-11.01)	-3.00*** (-11.01)	-2.99*** (-10.56)
Legal	-1.51*** (-6.83)	-1.52*** (-6.86)	-1.43*** (-6.40)	-1.51*** (-6.82)	-1.51*** (-6.83)	-1.43*** (-6.41)
Marketing	0.37 (1.27)	0.37 (1.30)	0.34 (1.17)	0.37 (1.28)	0.37 (1.29)	0.34 (1.17)
Operations	5.01*** (14.40)	5.00*** (14.35)	4.98*** (14.20)	5.01*** (14.39)	5.01*** (14.41)	4.98*** (14.21)
PR	-4.45*** (-12.17)	-4.45*** (-12.17)	-4.40*** (-12.06)	-4.44*** (-12.16)	-4.44*** (-12.16)	-4.40*** (-12.06)
R&D	-1.53*** (-5.66)	-1.52*** (-5.66)	-1.48*** (-5.29)	-1.53*** (-5.67)	-1.51*** (-5.63)	-1.48*** (-5.26)
Sales	1.01* (1.94)	1.01* (1.94)	1.01* (1.84)	1.01* (1.94)	1.02* (1.95)	1.01* (1.84)
Secretary	-3.47*** (-7.00)	-3.47*** (-7.02)	-3.34*** (-6.77)	-3.47*** (-7.03)	-3.46*** (-7.04)	-3.34*** (-6.76)
Strategy	-0.61* (-1.78)	-0.61* (-1.78)	-0.64* (-1.82)	-0.61* (-1.78)	-0.60* (-1.77)	-0.64* (-1.81)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	210,156	210,156	203,108	210,156	210,156	203,108
R <sup>2</sup>	0.03	0.03	0.03	0.03	0.03	0.03

Table A2: Gender promotion gap and product market competition

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. *High competition* indicates that industry concentration is lower than median, or that product similarity is higher than median, or that product market fluidity is higher than median. t-statistics are calculated with standard errors clustered at the industry level (icode300). \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level

High competition measures	Dependent variable: Promotions			
	(1)	(2)	(3)	(4)
Female	-1.20*** (-7.94)	-1.50*** (-6.98)	-1.41*** (-7.05)	-1.51*** (-7.20)
High competition		0.26 (1.16)	0.06 (0.18)	0.03 (0.14)
Female * High competition		0.64** (2.26)	0.48 (1.63)	0.65** (2.11)
SVP	-3.85*** (-14.90)	-3.92*** (-15.17)	-3.92*** (-15.15)	-3.90*** (-15.10)
EVP	-7.69*** (-23.30)	-7.78*** (-23.15)	-7.78*** (-23.13)	-7.78*** (-23.43)
President	-7.27*** (-26.92)	-7.37*** (-26.01)	-7.37*** (-26.04)	-7.32*** (-25.43)
Corportitle unidentified	-3.74*** (-16.94)	-3.77*** (-16.02)	-3.77*** (-16.01)	-3.76*** (-16.05)
MBA	0.72*** (4.91)	0.73*** (5.12)	0.73*** (5.13)	0.76*** (5.31)
Ivy league	0.87*** (4.63)	0.89*** (4.56)	0.89*** (4.56)	0.95*** (4.86)
Inside dir	6.79*** (16.13)	6.89*** (15.70)	6.89*** (15.69)	6.82*** (15.30)
Age (10 yrs)	8.61*** (9.66)	9.25*** (9.88)	9.26*** (9.86)	9.21*** (9.63)
Age squared	-1.01*** (-11.22)	-1.08*** (-11.30)	-1.08*** (-11.28)	-1.08*** (-11.02)
CEO exp (10 yrs)	0.11 (0.35)	0.27 (0.80)	0.27 (0.81)	0.32 (0.96)
Industry exp (10 yrs)	-0.03 (-0.17)	-0.02 (-0.09)	-0.02 (-0.10)	0.01 (0.06)
Firm tenure (10 yrs)	0.13 (0.74)	0.12 (0.67)	0.12 (0.68)	0.11 (0.57)
Log assets	0.57*** (3.03)	0.51** (2.53)	0.52*** (2.61)	0.49** (2.49)

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Table A2 – Continued from previous page

High competition measures	Dependent variable: Promotions			
	(1)	HHI (2)	Similarity (3)	Fluidity (4)
Accounting	-2.73*** (-10.80)	-2.78*** (-11.01)	-2.78*** (-11.00)	-2.74*** (-10.67)
Administration	-1.40*** (-2.91)	-1.36*** (-2.65)	-1.36*** (-2.66)	-1.33** (-2.53)
Finance	-0.32 (-1.51)	-0.33 (-1.55)	-0.33 (-1.54)	-0.28 (-1.28)
HR	-2.59*** (-10.17)	-2.59*** (-9.86)	-2.59*** (-9.82)	-2.62*** (-9.64)
IT	-3.01*** (-8.82)	-3.00*** (-8.80)	-3.00*** (-8.79)	-2.99*** (-8.59)
Legal	-1.58*** (-7.45)	-1.51*** (-6.71)	-1.51*** (-6.69)	-1.42*** (-6.30)
Marketing	0.30 (1.04)	0.37 (1.25)	0.37 (1.25)	0.33 (1.07)
Operations	4.95*** (14.20)	5.05*** (13.97)	5.05*** (13.97)	5.03*** (13.80)
PR	-4.52*** (-13.67)	-4.46*** (-13.72)	-4.46*** (-13.66)	-4.42*** (-13.42)
R&D	-1.57*** (-6.62)	-1.54*** (-6.43)	-1.54*** (-6.43)	-1.49*** (-6.15)
Sales	0.87* (1.75)	1.00** (2.03)	1.00** (2.04)	1.00** (1.99)
Secretary	-3.36*** (-7.68)	-3.45*** (-7.36)	-3.44*** (-7.39)	-3.31*** (-7.04)
Strategy	-0.75*** (-2.72)	-0.62** (-2.09)	-0.62** (-2.08)	-0.65** (-2.13)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	219,066	207,752	207,752	200,823
R <sup>2</sup>	0.03	0.03	0.03	0.03

Table A3: Gender promotion gap and product market competition - control for advertising expense

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. It includes executives whose job title contains “Chief” except CEO because by definition a CEO cannot be internally promoted. The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. *High competition* indicates that industry concentration is lower than median, or that product similarity is higher than median, or that product market fluidity is higher than median. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level

High competition measures	Dependent variable: Promotions			
	(1)	(2)	(3)	(4)
Female	-1.18*** (-8.82)	-1.49*** (-8.00)	-1.41*** (-7.53)	-1.49*** (-6.88)
High competition		0.31 (1.27)	0.05 (0.18)	0.03 (0.15)
Female * High competition		0.66** (2.29)	0.53* (1.94)	0.66** (2.27)
MBA	0.73*** (6.40)	0.73*** (6.12)	0.73*** (6.14)	0.76*** (6.31)
Ivy league	0.89*** (5.02)	0.92*** (4.96)	0.92*** (4.96)	0.98*** (5.29)
Inside dir	6.58*** (14.50)	6.83*** (13.19)	6.83*** (13.20)	6.75*** (12.61)
Age (10 yrs)	8.42*** (10.08)	9.24*** (10.40)	9.24*** (10.39)	9.18*** (10.21)
Age squared	-0.99*** (-11.89)	-1.08*** (-12.15)	-1.08*** (-12.14)	-1.07*** (-11.94)
CEO exp (10 yrs)	0.12 (0.44)	0.30 (1.00)	0.30 (1.00)	0.35 (1.15)
Industry exp (10 yrs)	-0.03 (-0.22)	-0.04 (-0.25)	-0.04 (-0.26)	-0.01 (-0.06)
Firm tenure (10 yrs)	0.12 (0.78)	0.15 (0.95)	0.15 (0.96)	0.14 (0.82)
Log assets	0.48*** (3.24)	0.50*** (3.03)	0.52*** (3.14)	0.50*** (2.91)
Log advertising expense	0.14 (1.10)	0.15 (1.11)	0.14 (1.09)	0.14 (1.06)
CorpTitle unspecified	-3.67*** (-14.87)	-3.76*** (-14.35)	-3.76*** (-14.33)	-3.75*** (-14.13)
SVP	-3.83***	-3.91***	-3.91***	-3.89***

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Table A3 – Continued from previous page

High competition measures	Dependent variable: Promotions			
	(1)	(2)	(3)	(4)
	(-14.02)	(-14.65)	(-14.65)	(-14.35)
EVP	-7.71***	-7.81***	-7.81***	-7.81***
	(-21.79)	(-22.20)	(-22.17)	(-22.46)
President	-7.23***	-7.38***	-7.38***	-7.33***
	(-24.54)	(-23.70)	(-23.71)	(-23.51)
Accounting	-2.75***	-2.79***	-2.79***	-2.75***
	(-11.71)	(-11.72)	(-11.72)	(-11.29)
Administration	-1.37***	-1.34***	-1.34***	-1.31**
	(-2.96)	(-2.65)	(-2.66)	(-2.56)
Finance	-0.36*	-0.32	-0.32	-0.27
	(-1.77)	(-1.58)	(-1.57)	(-1.27)
HR	-2.60***	-2.60***	-2.60***	-2.63***
	(-11.72)	(-11.13)	(-11.11)	(-10.81)
IT	-2.97***	-3.00***	-3.00***	-2.99***
	(-11.45)	(-11.00)	(-11.00)	(-10.55)
Legal	-1.57***	-1.51***	-1.51***	-1.42***
	(-7.78)	(-6.83)	(-6.82)	(-6.40)
Marketing	0.26	0.37	0.37	0.34
	(0.94)	(1.29)	(1.29)	(1.16)
Operations	4.87***	5.01***	5.01***	4.98***
	(14.59)	(14.39)	(14.39)	(14.20)
PR	-4.45***	-4.44***	-4.44***	-4.39***
	(-12.17)	(-12.19)	(-12.16)	(-12.06)
R&D	-1.44***	-1.52***	-1.52***	-1.48***
	(-5.44)	(-5.65)	(-5.67)	(-5.28)
Sales	0.87*	1.01*	1.01*	1.01*
	(1.79)	(1.93)	(1.94)	(1.84)
Secretary	-3.41***	-3.47***	-3.47***	-3.34***
	(-7.28)	(-7.02)	(-7.03)	(-6.77)
Strategy	-0.77**	-0.61*	-0.61*	-0.64*
	(-2.48)	(-1.78)	(-1.78)	(-1.82)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	229,406	210,156	210,156	203,108
R <sup>2</sup>	0.03	0.03	0.03	0.03

Table A4: Gender promotion gap in non-family firms

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. The sample only includes firms that are identified as non-family firms by [Anderson et al. \(2009\)](#) and [Anderson et al. \(2012\)](#). The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. *High competition* indicates that industry concentration is lower than median, or that product similarity is higher than median, or that product market fluidity is higher than median. The omitted group for the corporate level consists of vice presidents. The omitted group for the functional expertise consists of general managers. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level.

High competition measures	Dependent variable: Promotions		
	HHI (1)	Similarity (2)	Fluidity (3)
Female	-1.87*** (-5.14)	-1.70*** (-5.42)	-1.76*** (-5.13)
High competition	0.39 (1.01)	-0.21 (-0.44)	0.01 (0.02)
Female * High competition	0.85 (1.65)	0.61 (1.40)	0.74 (1.58)
MBA	0.51** (2.33)	0.51** (2.34)	0.53** (2.37)
Ivy league	0.74*** (2.59)	0.74*** (2.60)	0.82*** (2.85)
Inside dir	11.02*** (11.97)	11.03*** (11.97)	10.75*** (11.95)
Age (10 yrs)	15.99*** (9.10)	16.01*** (9.10)	16.18*** (9.28)
Age squared	-1.78*** (-10.01)	-1.78*** (-10.02)	-1.80*** (-10.24)
CEO exp (10 yrs)	0.09 (0.17)	0.09 (0.16)	0.16 (0.28)
Industry exp (10 yrs)	-0.21 (-0.94)	-0.22 (-0.97)	-0.13 (-0.57)
Firm tenure (10 yrs)	0.55** (2.24)	0.56** (2.27)	0.48* (1.92)
Log assets	0.55 (1.43)	0.57 (1.48)	0.44 (1.15)
CorpTitle unspecified	-4.01*** (-9.23)	-4.02*** (-9.24)	-4.10*** (-9.34)
SVP	-3.49*** (-8.91)	-3.50*** (-8.93)	-3.52*** (-8.69)
EVP	-7.60*** (-16.81)	-7.61*** (-16.81)	-7.64*** (-16.81)

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Table A4 – *Continued from previous page*

High competition measures	Dependent variable: Promotions		
	HHI (1)	Similarity (2)	Fluidity (3)
	(-14.65)	(-14.65)	(-14.68)
President	-8.48*** (-15.09)	-8.49*** (-15.09)	-8.54*** (-15.13)
Accounting	-4.19*** (-10.21)	-4.19*** (-10.21)	-4.21*** (-9.83)
Administration	-2.17*** (-2.71)	-2.17*** (-2.72)	-2.18*** (-2.70)
Finance	-0.94** (-2.55)	-0.95** (-2.56)	-0.89** (-2.33)
HR	-3.55*** (-8.12)	-3.56*** (-8.12)	-3.60*** (-8.03)
IT	-3.81*** (-7.77)	-3.82*** (-7.78)	-3.88*** (-7.71)
Legal	-2.46*** (-6.59)	-2.46*** (-6.60)	-2.37*** (-6.25)
Marketing	-0.41 (-0.74)	-0.42 (-0.76)	-0.45 (-0.78)
Operations	4.98*** (10.77)	4.98*** (10.77)	4.95*** (10.73)
PR	-5.44*** (-9.06)	-5.45*** (-9.06)	-5.52*** (-9.32)
R&D	-1.52*** (-2.99)	-1.52*** (-3.01)	-1.48*** (-2.78)
Sales	-0.67 (-0.80)	-0.67 (-0.80)	-0.74 (-0.92)
Secretary	-3.51*** (-3.48)	-3.52*** (-3.50)	-3.27*** (-3.23)
Strategy	-1.15* (-1.83)	-1.14* (-1.83)	-1.15* (-1.79)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Obs	66,105	66,105	63,975
R <sup>2</sup>	0.04	0.04	0.04

Table A5: Promotions in executives: Remove position and age filters

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. The sample does not have restrictions on position and age. The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level.

High competition measure	Dependent variable: Promotions			
	(1)	(2)	(3)	(4)
Female	-1.18*** (-8.77)	-1.47*** (-8.03)	-1.39*** (-7.46)	-1.49*** (-7.00)
High competition		0.30 (1.27)	0.05 (0.19)	-0.01 (-0.05)
Female * High competition		0.64** (2.32)	0.48* (1.88)	0.65** (2.28)
MBA	0.71*** (6.40)	0.72*** (6.21)	0.72*** (6.22)	0.75*** (6.38)
Ivy league	0.86*** (5.15)	0.87*** (5.01)	0.87*** (5.01)	0.94*** (5.38)
Inside dir	6.11*** (14.57)	6.26*** (13.35)	6.27*** (13.36)	6.20*** (12.72)
Age (10 yrs)	5.49*** (9.70)	5.99*** (9.89)	5.99*** (9.88)	6.00*** (9.89)
Age squared	-0.68*** (-12.74)	-0.73*** (-12.81)	-0.73*** (-12.80)	-0.74*** (-12.86)
CEO exp (10 yrs)	-0.21 (-1.00)	-0.14 (-0.60)	-0.14 (-0.60)	-0.09 (-0.38)
Industry exp (10 yrs)	-0.06 (-0.38)	-0.07 (-0.45)	-0.07 (-0.46)	-0.03 (-0.22)
Firm tenure (10 yrs)	0.08 (0.55)	0.11 (0.75)	0.11 (0.76)	0.09 (0.60)
Log assets	0.53*** (3.52)	0.54*** (3.25)	0.55*** (3.36)	0.53*** (3.08)
CorpTitle unspecified	-3.67*** (-15.46)	-3.75*** (-14.95)	-3.75*** (-14.94)	-3.73*** (-14.75)
SVP	-3.72*** (-13.70)	-3.78*** (-14.31)	-3.78*** (-14.30)	-3.77*** (-13.96)
EVP	-7.51*** (-21.20)	-7.59*** (-21.68)	-7.59*** (-21.65)	-7.59*** (-21.94)
President	-6.96*** (-23.61)	-7.09*** (-22.95)	-7.09*** (-22.96)	-7.05*** (-22.81)
Accounting	-2.66***	-2.72***	-2.72***	-2.69***

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Table A5 – *Continued from previous page*

High competition measure	Dependent variable: Promotions			
	(1)	(2)	(3)	(4)
	(-11.75)	(-11.68)	(-11.68)	(-11.32)
Administration	-1.31*** (-2.87)	-1.29*** (-2.61)	-1.29*** (-2.62)	-1.27** (-2.53)
Finance	-0.30 (-1.51)	-0.27 (-1.32)	-0.27 (-1.31)	-0.21 (-1.01)
HR	-2.55*** (-11.63)	-2.55*** (-11.12)	-2.55*** (-11.11)	-2.59*** (-10.81)
IT	-2.87*** (-11.39)	-2.92*** (-11.09)	-2.92*** (-11.09)	-2.91*** (-10.62)
Legal	-1.57*** (-7.82)	-1.52*** (-6.97)	-1.51*** (-6.96)	-1.43*** (-6.49)
Marketing	0.30 (1.08)	0.40 (1.41)	0.40 (1.41)	0.37 (1.29)
Operations	4.90*** (14.87)	5.01*** (14.66)	5.01*** (14.66)	4.98*** (14.39)
PR	-4.32*** (-12.11)	-4.32*** (-12.40)	-4.32*** (-12.36)	-4.28*** (-12.28)
R&D	-1.30*** (-4.79)	-1.40*** (-5.06)	-1.40*** (-5.08)	-1.37*** (-4.73)
Sales	0.91* (1.90)	1.01** (1.97)	1.01** (1.98)	1.01* (1.86)
Secretary	-3.23*** (-7.41)	-3.28*** (-7.14)	-3.27*** (-7.15)	-3.17*** (-6.92)
Strategy	-0.74** (-2.43)	-0.61* (-1.82)	-0.61* (-1.82)	-0.64* (-1.86)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	236,280	217,497	217,497	210,161
Adjusted R-squared	0.03	0.03	0.03	0.03

Table A6: Promotions in executives - Include external promotions

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. The sample does not have restrictions on position and age. *Promotion* is a dummy variable that equals to one hundred if a manager is promoted to the position in the following year, or if the manager works at the same level but moves to a firm which size is at least twice as big as the current firm. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level.

High competition measure	Dependent variable: Promotions			
	(1)	(2)	(3)	(4)
Female	-0.83*** (-8.41)	-1.25*** (-6.70)	-1.11*** (-6.45)	-1.25*** (-6.44)
High competition		0.26 (1.15)	0.06 (0.18)	0.12 (0.50)
Female * High competition		0.63** (2.04)	0.35 (1.26)	0.63** (2.32)
MBA	0.59*** (6.56)	0.83*** (7.21)	0.83*** (7.21)	0.86*** (7.25)
Ivy league	0.56*** (4.53)	0.77*** (5.00)	0.77*** (5.00)	0.82*** (5.24)
Inside dir	-0.28 (-1.34)	-0.41 (-1.43)	-0.41 (-1.42)	-0.45 (-1.52)
Age (10 yrs)	5.36*** (8.42)	7.83*** (9.35)	7.83*** (9.35)	7.86*** (9.40)
Age squared	-0.68*** (-10.91)	-0.93*** (-11.20)	-0.93*** (-11.21)	-0.94*** (-11.30)
CEO exp (10 yrs)	-0.93*** (-9.28)	-1.25*** (-9.01)	-1.25*** (-8.99)	-1.21*** (-8.65)
Industry exp (10 yrs)	-0.03 (-0.26)	0.01 (0.10)	0.01 (0.09)	0.04 (0.26)
Firm tenure (10 yrs)	-0.01 (-0.13)	-0.01 (-0.10)	-0.01 (-0.09)	-0.03 (-0.20)
Log assets	0.52*** (5.08)	0.60*** (3.97)	0.61*** (4.03)	0.59*** (3.86)
CorpTitle unspecified	-1.53*** (-8.13)	-1.70*** (-7.02)	-1.70*** (-7.02)	-1.69*** (-6.98)
SVP	-2.09*** (-9.61)	-2.50*** (-10.02)	-2.50*** (-10.02)	-2.47*** (-9.66)
EVP	-4.89*** (-19.73)	-5.90*** (-19.19)	-5.90*** (-19.16)	-5.88*** (-19.28)
President	-4.55*** (-25.48)	-5.68*** (-25.77)	-5.68*** (-25.79)	-5.64*** (-25.43)

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Table A6 – *Continued from previous page*

High competition measure	Dependent variable: Promotions			
	(1)	(2)	(3)	(4)
Accounting	-1.33*** (-6.92)	-1.87*** (-7.94)	-1.87*** (-7.93)	-1.86*** (-7.64)
Administration	-0.25 (-0.62)	-0.47 (-0.88)	-0.47 (-0.89)	-0.46 (-0.85)
Finance	0.60*** (3.74)	0.56*** (2.72)	0.56*** (2.73)	0.60*** (2.84)
HR	-1.20*** (-6.51)	-1.62*** (-6.96)	-1.62*** (-6.94)	-1.71*** (-7.09)
IT	-1.55*** (-7.24)	-2.17*** (-7.90)	-2.17*** (-7.90)	-2.17*** (-7.69)
Legal	-0.49*** (-2.99)	-0.84*** (-3.91)	-0.84*** (-3.90)	-0.78*** (-3.55)
Marketing	0.99*** (4.59)	1.42*** (4.89)	1.42*** (4.89)	1.38*** (4.72)
Operations	4.99*** (16.45)	6.28*** (16.25)	6.28*** (16.25)	6.25*** (15.93)
PR	-2.87*** (-9.24)	-3.64*** (-9.74)	-3.64*** (-9.71)	-3.60*** (-9.64)
R&D	-0.29 (-1.42)	-0.51** (-1.99)	-0.51** (-2.00)	-0.49* (-1.87)
Sales	1.52*** (3.97)	1.91*** (3.79)	1.91*** (3.79)	1.90*** (3.59)
Secretary	-1.73*** (-5.06)	-2.34*** (-5.12)	-2.34*** (-5.12)	-2.20*** (-4.82)
Strategy	0.11 (0.41)	0.26 (0.73)	0.26 (0.73)	0.21 (0.59)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	327,053	244,159	244,159	236,017
Adjusted R-squared	0.03	0.03	0.03	0.03

Table A7: Promotions to a corporate level - baseline

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. The dependent variable, *Promotion to [CorpLevel]*, is a dummy variable that equals to one hundred if a manager is internally promoted to [CorpLevel] in the following year. The omitted group for the corporate level consists of vice presidents. The omitted group for the functional expertise consists of general managers. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level.

Dependent variable	Promo to SVP (1)	Promo to EVP (2)	Promo to President (3)	Promo to CEO (4)
Female	-0.34** (-2.28)	-0.44*** (-4.32)	-0.48*** (-6.86)	-0.17*** (-3.74)
MBA	-0.04 (-0.29)	0.21*** (2.85)	0.30*** (4.41)	0.21*** (4.64)
Ivy league	0.37* (1.93)	0.18 (1.50)	0.29*** (3.01)	0.19*** (3.08)
Inside dir	-1.08*** (-4.47)	0.12 (0.46)	2.02*** (7.62)	4.82*** (20.15)
Age (10 yrs)	4.36*** (5.74)	3.08*** (6.61)	3.08*** (7.47)	2.08*** (7.33)
Age squared	-0.50*** (-6.66)	-0.35*** (-7.31)	-0.38*** (-8.96)	-0.24*** (-8.15)
CEO exp (10 yrs)	-0.43** (-2.51)	-0.07 (-0.54)	-0.07 (-0.52)	0.30* (1.91)
Industry exp (10 yrs)	-0.07 (-0.53)	-0.05 (-0.54)	-0.11 (-1.38)	0.03 (0.67)
Firm tenure (10 yrs)	0.29** (2.14)	0.15 (1.52)	0.15* (1.92)	-0.09 (-1.65)
Log assets	0.19 (1.20)	0.35*** (3.70)	0.12** (2.02)	0.08 (1.43)
CorpTitle unspecified	-3.61*** (-20.48)	-0.22** (-1.97)	0.85*** (7.42)	0.30*** (4.51)
SVP		3.06*** (22.26)	0.58*** (7.41)	0.19*** (4.64)
EVP			2.50*** (16.71)	0.57*** (8.11)
President				3.59*** (23.21)
Accounting	-0.45** (-2.30)	-0.36*** (-2.88)	-2.02*** (-14.07)	0.40*** (6.52)
Administration	-0.00 (-0.00)	0.61 (1.49)	-1.82*** (-7.42)	0.38*** (2.80)

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Table A7 – *Continued from previous page*

Dependent variable	Promo to SVP (1)	Promo to EVP (2)	Promo to President (3)	Promo to CEO (4)
Finance	0.24 (1.06)	0.90*** (6.10)	-1.67*** (-12.38)	0.65*** (9.29)
HR	0.37 (1.15)	-0.64*** (-4.56)	-2.03*** (-13.76)	0.36*** (6.87)
IT	-0.83*** (-2.84)	-0.34** (-2.03)	-1.84*** (-11.49)	0.25*** (3.70)
Legal	1.17*** (5.06)	0.13 (0.94)	-2.13*** (-14.70)	0.42*** (7.08)
Marketing	-0.01 (-0.04)	0.11 (0.63)	-0.23 (-1.53)	0.51*** (5.93)
Operations	0.24 (0.90)	0.50** (2.47)	1.98*** (10.49)	3.05*** (15.21)
PR	-2.12*** (-6.05)	-1.17*** (-5.88)	-1.65*** (-9.64)	0.46*** (6.65)
R&D	0.17 (0.56)	-0.15 (-0.64)	-1.26*** (-9.65)	0.26*** (3.10)
Sales	0.87* (1.91)	0.14 (0.57)	-0.33 (-1.60)	0.52*** (5.35)
Secretary	-0.72* (-1.79)	-0.55** (-2.52)	-2.00*** (-9.34)	-0.16 (-1.12)
Strategy	0.41 (1.13)	-0.27 (-1.53)	-1.00*** (-7.90)	0.38*** (4.95)
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Obs	135,088	199,534	239,990	268,952
R <sup>2</sup>	0.05	0.04	0.02	0.05

Table A8: Promotions to each corporate level and product market competition  
This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. The dependent variable, *Promotion to [CorpLevel]*, is a dummy variable that equals to one hundred if a manager is internally promoted to [CorpLevel] in the following year. *High competition* indicates that industry concentration is lower than median, or that product similarity is higher than median, or that product market fluidity is higher than median. All regressions include year FE, firm FE, corporate level FE, and functional expertise FE, and other controls. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level.

Dependent variable	Promo to SVP (1)	Promo to EVP (2)	Promo to President (3)	Promo to CEO (4)
Panel A				
Female	-0.51** (-2.20)	-0.46*** (-3.27)	-0.78*** (-7.18)	-0.27*** (-3.86)
High competition	0.46* (1.76)	0.03 (0.20)	0.03 (0.26)	-0.02 (-0.26)
Female * High competition	0.32 (0.87)	-0.07 (-0.35)	0.50*** (3.51)	0.20* (1.93)
Observations	107,479	159,276	191,298	214,437
R <sup>2</sup>	0.06	0.05	0.03	0.06
Panel B				
Female	-0.40* (-1.83)	-0.49*** (-3.47)	-0.80*** (-7.10)	-0.25*** (-3.89)
High competition	0.18 (0.57)	0.02 (0.12)	-0.12 (-0.82)	-0.06 (-0.70)
Female * High competition	0.08 (0.24)	-0.01 (-0.05)	0.60*** (3.72)	0.18* (1.77)
Observations	107,479	159,276	191,298	214,437
R <sup>2</sup>	0.06	0.05	0.03	0.06
Panel C				
Female	-0.39* (-1.67)	-0.55*** (-3.83)	-0.82*** (-6.56)	-0.20*** (-2.65)
High competition	-0.19 (-0.66)	0.17 (1.02)	-0.12 (-1.03)	0.01 (0.18)
Female * High competition	0.15 (0.47)	0.10 (0.51)	0.55*** (3.21)	0.05 (0.44)
Obs	104,119	154,096	185,056	207,302
R <sup>2</sup>	0.06	0.05	0.03	0.06



Table A9: Gender promotion gap and board gender diversity in firms where competitive threat is low

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. Column(1)-(3) include observations where the competition, measured by HHI, Similarity, and Fluidity respectively, is low. The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level

	Dependent variable: Promotions		
	(1)	(2)	(3)
Female	-1.52*** (-5.02)	-1.18*** (-4.08)	-1.28*** (-4.03)
Female director ratio	-0.54 (-0.30)	-1.24 (-0.69)	0.96 (0.52)
Female * Female director ratio	1.12 (0.58)	-0.21 (-0.13)	-0.19 (-0.10)
SVP	-3.58*** (-10.42)	-3.47*** (-11.47)	-3.47*** (-9.98)
EVP	-7.52*** (-15.92)	-7.18*** (-15.59)	-7.23*** (-15.91)
President	-7.48*** (-18.44)	-7.47*** (-18.98)	-7.24*** (-17.88)
Corportitle unidentified	-3.45*** (-10.85)	-3.51*** (-11.86)	-3.62*** (-11.49)
MBA	0.78*** (4.71)	0.81*** (5.22)	0.90*** (5.50)
Ivy league	0.65*** (2.84)	0.78*** (3.32)	0.80*** (3.37)
Inside dir	6.72*** (10.93)	7.07*** (12.21)	7.03*** (12.04)
Age (10 yrs)	8.64*** (7.14)	8.92*** (7.18)	10.91*** (8.76)
Age squared	-1.00*** (-8.31)	-1.03*** (-8.36)	-1.22*** (-9.87)
CEO exp (10 yrs)	0.20 (0.71)	0.01 (0.03)	-0.08 (-0.21)
Industry exp (10 yrs)	-0.09 (-0.43)	0.14 (0.68)	-0.15 (-0.72)
Firm tenure (10 yrs)	0.14 (0.70)	-0.08 (-0.38)	0.11 (0.49)
Log assets	0.38 (1.63)	0.57** (2.47)	0.41 (1.63)
Accounting	-3.15*** (-10.33)	-3.10*** (-10.44)	-3.25*** (-10.76)

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Table A9 – *Continued from previous page*

	Dependent variable: Promotions		
	(1)	(2)	(3)
Administration	-0.92 (-1.40)	-1.59*** (-2.72)	-1.60** (-2.58)
Finance	-0.58** (-2.37)	-0.53** (-2.01)	-0.24 (-0.80)
HR	-2.71*** (-8.44)	-2.70*** (-9.08)	-3.00*** (-9.01)
IT	-3.57*** (-10.61)	-3.66*** (-10.81)	-3.64*** (-9.49)
Legal	-1.99*** (-7.58)	-2.11*** (-8.03)	-2.04*** (-7.14)
Marketing	0.50 (1.31)	0.44 (1.14)	0.15 (0.36)
Operations	5.27*** (13.56)	5.62*** (13.54)	5.57*** (13.16)
PR	-4.35*** (-8.49)	-4.33*** (-8.66)	-4.89*** (-10.16)
R&D	-1.88*** (-4.86)	-1.63*** (-3.73)	-1.34*** (-2.89)
Sales	0.91 (1.45)	1.16* (1.72)	0.83 (1.13)
Secretary	-3.42*** (-5.74)	-3.32*** (-5.11)	-3.53*** (-5.84)
Strategy	-0.56 (-1.28)	-0.66 (-1.59)	-0.54 (-1.21)
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Observations	120,099	129,349	113,090
Adjusted R-squared	0.04	0.03	0.03

Table A10: Promotions and takeover threat

This table presents the estimates of linear probability models of promotions. Observations are at the manager-year level over the period 2000-2015. The sample excludes any executive who leaves the firm or the sample in the following year. The dependent variable, *Promotion*, is a dummy variable that equals to one hundred if a manager is internally promoted in the following year. *Takeover indicator* equals to one when there is at least one takeover event in the industry. The value is set to missing if a company is the takeover target. t-statistics are calculated with standard errors clustered at the industry level. \*, \*\* and \*\*\* denote significant at the 10%, 5% and 1% level.

Sample	Dependent variable: Promotions					
	All	CorpLevel unspecified	VP	SVP	EVP	President
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-1.28*** (-8.01)	-1.36*** (-2.78)	-1.49*** (-4.54)	-0.94** (-2.17)	-1.83*** (-5.12)	-0.28 (-0.54)
Takeover threat (dummy)	-0.01 (-1.39)	-0.01 (-1.32)	-0.03*** (-4.24)	0.01 (1.25)	0.01 (0.81)	-0.01 (-0.61)
Female * Takeover threat (dummy)	0.01*** (2.80)	-0.01 (-0.84)	-0.00 (-0.29)	0.01 (1.15)	0.00 (0.90)	0.01* (1.83)
MBA	0.74*** (6.15)	1.16*** (3.01)	0.52** (2.12)	0.58* (1.68)	0.98*** (3.45)	-0.19 (-0.54)
Ivy league	0.95*** (5.35)	0.84 (1.61)	1.20*** (3.28)	0.83** (2.14)	0.54 (1.59)	1.15** (2.11)
Inside dir	6.69*** (13.97)	3.65*** (4.18)	2.68** (2.34)	5.54*** (5.93)	6.33*** (4.08)	14.18*** (11.07)
Age (10 yrs)	8.97*** (10.27)	11.01*** (5.89)	13.52*** (7.08)	7.71*** (3.29)	8.68*** (3.84)	11.00*** (3.95)
Age squared	-1.05*** (-12.04)	-1.17*** (-6.03)	-1.48*** (-7.76)	-0.89*** (-3.85)	-1.05*** (-4.69)	-1.13*** (-4.13)
CEO exp (10 yrs)	0.25 (0.91)	-0.62 (-1.15)	2.95*** (3.08)	1.25 (1.50)	1.61* (1.92)	1.85** (2.54)
Industry exp (10 yrs)	-0.04 (-0.26)	-0.07 (-0.15)	0.02 (0.07)	-0.06 (-0.17)	-0.30 (-0.80)	0.53* (1.65)
Firm tenure (10 yrs)	0.14 (0.91)	0.48 (0.97)	0.73*** (2.66)	0.15 (0.42)	0.47 (1.23)	-0.22 (-0.72)
Log assets	0.51*** (3.14)	0.21 (0.70)	0.53 (1.34)	0.13 (0.39)	1.48*** (4.12)	0.40 (0.85)
CorpTitle unspecified	-3.73*** (-14.50)					
SVP	-3.86*** (-14.47)					
EVP	-7.79*** (-22.37)					
President	-7.35***					

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Table A10 – *Continued from previous page*

Sample	Dependent variable: Promotions					
	All	CorpLevel unspecified	VP	SVP	EVP	President
	(1)	(2)	(3)	(4)	(5)	(6)
	(-24.30)					
Accounting	-2.79*** (-11.49)	-2.73*** (-4.57)	-4.02*** (-9.00)	-4.86*** (-7.29)	-3.98*** (-6.77)	-7.41 (-1.45)
Administration	-1.41*** (-2.94)	0.10 (0.06)	-0.19 (-0.17)	-3.51*** (-4.46)	-1.68 (-1.54)	10.45 (0.81)
Finance	-0.36* (-1.74)	-1.10** (-2.07)	-1.08** (-2.40)	-3.64*** (-8.02)	0.99* (1.94)	5.99*** (2.84)
HR	-2.59*** (-11.37)	-1.06 (-0.86)	-2.01*** (-4.28)	-4.77*** (-9.94)	-3.95*** (-8.09)	6.50** (2.12)
IT	-2.98*** (-10.95)	-2.08*** (-3.06)	-4.94*** (-9.81)	-3.86*** (-6.93)	-3.10*** (-5.50)	-0.07 (-0.03)
Legal	-1.57*** (-7.36)	-1.52** (-2.35)	-1.08** (-2.35)	-4.84*** (-10.48)	-2.78*** (-5.71)	1.70 (0.28)
Marketing	0.30 (1.06)	1.13 (1.23)	-0.15 (-0.27)	-0.24 (-0.33)	-0.49 (-0.78)	1.13 (0.40)
Operations	4.98*** (14.58)	7.70*** (9.88)	0.77 (1.34)	4.28*** (7.19)	1.62** (2.24)	11.78*** (11.53)
PR	-4.44*** (-11.85)	-4.80*** (-4.47)	-6.01*** (-9.99)	-4.75*** (-5.73)	-5.05*** (-5.96)	
R&D	-1.43*** (-5.16)	-1.78** (-2.36)	-1.73*** (-3.13)	-3.21*** (-3.44)	-1.67** (-2.17)	-9.56*** (-2.97)
Sales	0.91* (1.81)	1.85 (1.23)	0.79 (0.93)	0.83 (0.78)	-0.30 (-0.34)	0.24 (0.27)
Secretary	-3.48*** (-7.19)	-3.63*** (-4.27)	-4.44*** (-4.39)	-3.80** (-2.21)	-3.61*** (-2.61)	5.34 (1.17)
Strategy	-0.72** (-2.23)	-0.50 (-0.59)	-1.41** (-2.16)	-2.88*** (-5.04)	-1.22** (-2.24)	2.46 (1.59)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs	220,941	34,355	76,233	32,398	52,441	23,401
R2	0.03	0.07	0.06	0.07	0.05	0.16