



# The gender gap in executive promotions<sup>☆</sup>

Jing Xu

University of Technology Sydney, NSW, Australia

## ARTICLE INFO

Editor: E Lyandres

*JEL classification:*

J16

J20

G34

G38

*Keywords:*

Executive

Promotion

Gender gap

Diversity

## ABSTRACT

This paper examines whether there is a gender promotion gap among executives. Using a comprehensive dataset of executives, I find that women's promotion probability is 16% lower than men's after controlling for educational and employment background, age, function, rank, and firm characteristics. The gap occurs partially because women are clustered in positions that support the business rather than positions with profit-and-loss responsibilities. Additionally, my analysis shows that product market competition, public attention on gender diversity, a respectful corporate culture, and board gender diversity alleviate the gender promotion gap. These findings support the notion that demand-side factors continue to hinder women's advancement to leadership positions.

## 1. Introduction

Over the past few years, the world has seen encouraging developments in the fight for gender equality. However, the top income distribution remains a stubborn bastion of inequality (Blau and Kahn, 2017). To address the gender disparity in business leadership, several countries have adopted board gender quotas. While such policies have increased gender diversity in boardrooms, their impact on executives is not discernible (Bertrand et al., 2019). This paper investigates the probability of career advancement for women and men in executive positions, identifies reasons for existing gaps, and suggests factors enhancing gender representation in leadership roles.

Exploring executive promotions not only offers insights into the advancement of women in the leadership positions but also enhances our understanding of how well executives are motivated. Promotion-based incentives have a positive impact on firm performance, often outweighing short-term compensation-based incentives (Graham et al., 2005; Kale et al., 2009). Unequal promotion practices could undermine the effect of promotion-based incentives.

Additionally, studying promotions sheds light on what drives the gender pay gap. The pay gap exists due to the gender disparity in pay for equivalent jobs and the absence of women in highly paid positions. Research on the gender pay gap frequently focuses on the first explanation (for example, Bertrand and Hallock, 2001). As Bertrand and Hallock (2001) point out, studying the pay gap in equivalent jobs alone does not rule out the possibility of unequal promotion, which would drive up the overall gender pay gap.

<sup>☆</sup> This article is based on my dissertation. I am deeply grateful to my advisors Renée Adams and Rik Sen for their guidance. For comments and discussions, I also thank an anonymous referee, Attila Balogh, Marianne Bertrand (discussant), Seungho Choi, Victoria Clout (discussant), Claire Liu, Ron Masulis, Dave Michayluk, Sandra Mortal, Marco Navone, Yuka Nishikawa (discussant), Peter Pham, Kenny Phua, Talis Putnins, Elvira Sojli, Baolian Wang (discussant), Jian Zhang (discussant) and seminar participants at AisanFA Annual Meeting, China International Conference in Finance, FMA Annual Meeting, FIRN Annual Meeting, Showcasing Women in Finance Meeting, Macquarie University, University of Adelaide and University of New South Wales. I thank Anita Ren for research assistance.

E-mail address: [jing.xu@uts.edu.au](mailto:jing.xu@uts.edu.au).

<https://doi.org/10.1016/j.jcorpfin.2024.102680>

Received 25 April 2023; Received in revised form 1 August 2024; Accepted 6 October 2024

Available online 16 October 2024

0929-1199/© 2024 The Author. Published by Elsevier B.V. This is an open access article under the CC BY license (<http://creativecommons.org/licenses/by/4.0/>).

A recent study reveals that gender disparity in seniority accounts for approximately 70% of the overall gender pay gap in a retail chain [Benson et al. \(2023\)](#).

While theories have been developed to explain the gender gap among rank-and-file employees in the labor market (e.g., [Altonji and Blank, 1999](#); [Blau and Kahn, 2017](#)), the reasons for the gender gap among executives are less clear. Tokenism and role congruity theories suggest that female leaders face visibility challenges, gender stereotypes, and incongruity with masculine leadership roles ([Kanter, 1977a,b](#); [Eagly and Karau, 2002](#)). Thus, women could be promoted at a slower pace. Subtle discrimination, biases present only in tie-break scenarios, discourages disadvantaged individuals from investing in human capital when the rewards from promotion, like those associated with executive positions, are significant ([Pikulina and Ferreira, 2023](#)). However, some other studies suggest that the gender gap in executive labor markets can shrink and, in some cases, even reverse. Women who have overcome barriers to reach leadership positions may be perceived as higher-quality executives and thus enjoy a female premium ([Fryer, 2007](#)). Moreover, executives have different attributes from average employees, and the preference-based arguments for the gender gap may not easily extend to executives ([Adams and Funk, 2012](#)). Whether a gender gap exists in executive promotion is an empirical question.

Although studying promotions naturally complements studying pay, few papers have analyzed promotions. Studying promotions requires panel data on executives and the firms in which they work, detailed job titles indicating corporate ranks, and information on executives' educational and employment backgrounds. The most common dataset of U.S. executives, ExecuComp, generally includes only five executive positions. Its criterion for inclusion is pay rather than rank. While rank often correlates with pay, some studies show that this correlation is weaker for women.<sup>1</sup>

This means women are likely to be underrepresented in ExecuComp even if they have a high rank. For example, in S&P 1500 firms, a proportion of male COOs included in ExecuComp data is higher than the proportion of female COOs included. As a result, the promotion patterns of both men and women may be mismeasured.

I collect the data from BoardEx, which uses rank as the inclusion criterion. Since the entry-level rank in BoardEx is vice president (VP), I study internal promotions to four ranks above VP: SVP, EVP, President, and CEO.<sup>2</sup>

The results show a significant gender promotion gap among corporate executives. After accounting for educational and employment background, function, rank, and firm characteristics, I find that the probability of women being promoted is 0.9 percentage points lower than that of men, resulting in a 16% gender promotion gap. Additionally, the gender gap in promotions tends to widen as executives climb up the corporate ladder.

The unexplained gap may result from supply- and demand-side factors. Next, 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. However, if promotion decisions are grounded in valid business reasons, then the promotion gap should remain unchanged when competition goes up.

Motivated by this theory, I examine whether the gender promotion gap reflects discrimination by studying how it responds to changes in product market competition. I use industry concentration, product similarity, and product market fluidity from [Hoberg et al. \(2014\)](#), [Hoberg and Phillips \(2016\)](#) to measure industry-level competition. The results show that the gender promotion gap is smaller in firms that face higher competition. For example, the gender promotion gap is 21% in firms that have high market power, whereas it is 14% in firms that have low market power.

Last, I explore what other factors that could affect the gender promotion gap, including public attention on gender equality, respectful corporate culture, and board gender diversity. [Giannetti and Wang \(2023\)](#) document that public attention on gender equality is positively associated with board gender diversity. Corporate culture is pivotal to a diverse array of business decisions ([Guiso et al., 2015](#); [Li et al., 2021](#)). Additionally, some regulators respond to the shortage of female business leaders by implementing board gender quotas, hoping that the benefits of increased female board representation will extend to other parts of the companies. However, the merits of quotas have been hotly debated. My analysis reveals that heightened public attention on gender diversity, respectful corporate culture and board gender diversity are associated with lower gender promotion gap. These findings are consistent with the conjecture that discrimination still plays a role in holding women back from leadership positions.

Job allocations are endogenous. To address these identification challenges, I estimate a linear probability model for predicting promotions with four sets of fixed effects: corporate rank, function, firm, and year fixed effects. Corporate rank 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. [Blau and Kahn \(2017\)](#) find that function explains 33% of the gender pay gap in the general workforce in 2010. Function segregation is also common among executives, and I use function fixed effects to account for it. Men and women have different attributes and preferences, which lead them into different industries and companies. Firm fixed effects account for differential sorting by gender into industries and firms.

One might challenge my interpretation by pointing out alternative explanations. The gender gap may be lower in highly competitive settings because female leadership is in demand when competition goes up. Another possibility is that competition

<sup>1</sup> Research on the gender pay gap among executives is vast. The findings largely point to a gender pay gap among non-CEO executives, yet the relationship for CEOs remains unclear ([Bertrand and Hallock, 2001](#); [Bell, 2005](#); [Elkinawy and Stater, 2011](#); [Gayle et al., 2012](#); [Bugeja et al., 2012](#); [Vieito and Khan, 2012](#); [Newton and Simutin, 2015](#); [Hill et al., 2015](#); [Geiler and Renneboog, 2015](#); [Gupta et al., 2018](#); [Burns et al., 2022](#); [Francis et al., 2023](#)).

<sup>2</sup> The results are similar if I use both internal and external promotions, as reported in [Table 9](#).

affects men's and women's turnover decisions differently. If men who are not quickly promoted tend to leave to pursue external promotions in competitive times while women are more willing to stay, this gender difference will lead to a smaller gender promotion gap when competition increases. Another explanation is that women with more family responsibilities move to firms that face less competition and thus offer a better work-life balance. This self-selection leads to a higher gender promotion gap in less competitive industries. I conduct additional tests to show that these alternative explanations are unlikely to explain my results.

My paper adds to the literature on gender differences in the U.S. executive labor market. [Smith et al. \(2013\)](#) and [Keloharju et al. \(2022\)](#) find a gender gap in executives in Scandinavian countries. As [La Porta et al. \(1999\)](#) suggest, there are significant differences in ownership structure across countries, and family firms are more prevalent in Scandinavian countries. Scandinavian countries are also known for their gender equality in social norms and policies. Thus, it is not clear that the results from Scandinavian countries can easily be extended to the U.S.

Using a comprehensive sample of executives in U.S. firms, I find a gender promotion gap at 16%. An earlier study on U.S. firms, [Gayle et al. \(2012\)](#), finds that female executives are promoted at a faster pace. This discrepancy can be attributed to differences in the samples. [Gayle et al. \(2012\)](#) analyze a select group of executives who appear in both ExecuComp and Marquis Who's Who, representing some of the most distinguished executives. In [Gayle et al. \(2012\)](#), the average number of executives per firm is fewer than two, in contrast to the average of 7.3 executives per firm in my sample.<sup>34</sup> Therefore, I interpret their findings as indicating a "superstar effect": Female superstars are promoted more rapidly than male superstars.

Furthermore, my paper contributes to the understanding of barriers in women's careers, emphasizing the role of functional expertise in promotion and building upon the work of [Helfat et al. \(2006\)](#) and [Smith et al. \(2013\)](#). [Helfat et al. \(2006\)](#) reveal that women's representation among executives tasked with profit-and-loss responsibilities is lower than their representation among executives tasked with supporting the businesses. [Smith et al. \(2013\)](#) demonstrate that functional expertise partially accounts for the gender disparity observed in CEO promotions in Denmark.

The paper also sheds light on demand-side factors influencing women's career trajectories. [Black and Strahan \(2001\)](#), [Black and Brainerd \(2004\)](#), [Heyman et al. \(2013\)](#), and [Huang et al. \(2023\)](#) document evidence of ongoing discrimination among rank-and-file employees. However, as [Blau and Kahn \(2017\)](#) and [Pikulina and Ferreira \(2023\)](#) point out, the labor market for highly compensated employees does not necessarily follow the same pattern as the labor market for lower-level employees. Thus these findings may not readily extend to top executives. My study focuses on executives and partially attributes the gender promotion gap to a demand-side explanation: discrimination. It adds to the recent studies that document demand-side explanations of gender differences in capital allocation and punishment for misconduct ([Duchin et al., 2020](#); [Niessen-Ruenzi and Ruenzi, 2019](#); [Ewens and Townsend, 2020](#); [Egan et al., 2022](#)). A contemporary paper, [Guo et al. \(2023\)](#), presents evidence consistent with demand-side explanations for executive mobility in U.S., using a shock to labor supply. Unlike [Guo et al. \(2023\)](#), who focus on external labor markets, I examine internal labor markets, in which positions are relatively more comparable than those across different firms. Additionally, my study highlights the importance of functional expertise in the gender promotion gap among executives.

## 2. Data and summary statistics

I start with the BoardEx Senior Manager and Disclosed Earner Summary dataset, an unbalanced panel of manager-firm-year level data. It includes executives, their employers, their positions, and the start and end dates of these positions. To check the quality of the data, I manually checked 331 managers from 26 randomly selected companies. BoardEx claims that they build their data based on publicly available information, such as corporate websites, SEC filings, and press releases. 182 managers were listed as executives or leaders on company websites.<sup>5</sup> 135 appeared in either SEC filings or press releases.<sup>6</sup> I find the remaining 14 managers on other non-self-disclosed webpages, such as Federal Election Commissions.

I take the following steps to construct my sample.

- (1) The original data extend from 1999 to 2022. Since the data for 1999 cover only 84 firms and I require the following year's observations to identify promotion, my sample period ranges from 2000 to 2021.
- (2) Though BoardEx tracks managers who are at the corporate rank of VP or above, it sometimes backfills the career history and includes some junior positions. I infer the rank from the job title and exclude positions that are below the rank of VP.
- (3) 65 is a common full retirement age in companies' retirement plans; therefore I restrict the sample to executives whose age is between 30 and 65.<sup>7</sup>
- (4) If a manager holds more than one full-time position in a year, perhaps because he or she changed jobs, I keep the position in the larger firm. This step essentially converts manager-firm-year data to manager-year data.
- (5) I merge this dataset with other datasets. Education and experience variables are from two other BoardEx datasets, education and employment. Measures for product market competition are from the Hoberg-Phillips data library. The financial data are from Compustat. Takeover data are from the SDC Platinum.<sup>8</sup>

<sup>3</sup> The average number of executives in a firm is calculated based on the sample in [Table 6](#), where [Gayle et al. \(2012\)](#) report the results of promotions.

<sup>4</sup> Executives in both ExecuComp and Marquis Who's Who receive an average annual total compensation of USD 2.7 million, whereas those only in ExecuComp earn about USD 1.4 million.

<sup>5</sup> I use Way Back Machine to access company website archives.

<sup>6</sup> I checked 10-K, Def 14 A and 8-K filings. Seven managers are mentioned in SEC filings or press releases, but they are not in the capacity of an executive. For example, one individual appeared in the press release as the contact person.

<sup>7</sup> The results remain robust if I do not filter the data by position and age.

**Table 1**  
**Summary statistics of female representation.**

The table reports female representation across functions and ranks. The sample consists of executives at the corporate rank of vice president or above in listed U.S. firms from 2000 to 2021. Variable definitions are in Appendix 1. Panel A reports the female representation in each functional area; Panel B reports the female representation at each corporate rank.

Rank	N	% Female
Panel A		
Accounting	38,024	15%
Admin	4,922	22%
Finance	53,007	13%
General Managers	187,741	9%
HR	13,058	47%
IT	13,993	10%
Legal	37,289	21%
Marketing	13,618	20%
Operations	37,072	7%
PR	6,449	36%
RD	11,631	9%
Sales	6,216	7%
Secretary	6,336	29%
Strategy	15,316	9%
Panel B		
VP	111,133	17%
SVP	91,444	16%
EVP	72,562	13%
President	40,099	8%
CEO	56,143	4%
Rank unspecified	73,291	14%

I use the BoardEx variable Individual Role to categorize corporate rank and functional expertise. Since the entry position of the sample is VP, executives are grouped into five ranks from VP to CEO. Executives whose job titles don't clearly indicate ranks are in the residual group, Rank Unspecified. All executives in the C-suites are ranked according to their job descriptions. For example, if an executive's job title includes the term "Vice President" (or its abbreviations), the executive's rank is VP. Using this method, I can assign ranks to approximately 80% of executives. The results remain similar if I classify COOs with unspecified ranks as Presidents, the most common rank for COOs in the sample, and CFOs with unspecified ranks as EVPs, the most common rank for CFOs in the sample, as shown in Table A8. The results are also similar if I exclude executives with unspecified ranks from the sample, as shown in Table A9. The weaker statistical significance could be due to more inaccurate rank classifications in Table A8 and a smaller sample size in Table A9.

The ranking system is generally consistent with that of [Bertrand and Hallock \(2001\)](#).<sup>9</sup> Executives are internally promoted when they stay with the firm and move up to higher ranks in the following year. CEOs cannot be promoted internally; 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 categorize functions into 14 categories: Accounting, Administration, Finance, IT, General Manager, Human Resources (HR), Legal, Marketing, Operations, Public Relations (PR), Research and Development (R&D), Sales, Corporate Secretary (Secretary).<sup>10</sup> Executives whose job titles don't indicate their functions are in the residual group, General Manager.<sup>11</sup>

I construct the experience and education variables from the BoardEx employment and education datasets. A position that misses either the start date or the end date is excluded because I cannot calculate the duration of the position; an outside directorship position is also excluded because it is a not full-time position. While calculating industry experience, I use the FTSE international industry classification, the classification used in BoardEx. Private firms in BoardEx are not in Compustat. Thus, using SIC from

<sup>8</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.

<sup>9</sup> I do not distinguish between divisional and regional titles because few executives are divisional or regional managers. The results are similar if I use a granular classification including divisional or regional ranks.

<sup>10</sup> These categories are not exactly the same as those of [Helfat et al. \(2006\)](#) and [Guadalupe et al. \(2014\)](#) because some categories in my sample have few observations. For example, [Helfat et al. \(2006\)](#) include real estate as a functional area category, but in my sample, only 0.3% of managers specialize in real estate.

<sup>11</sup> The next section shows that general managers have a high probability of promotion. Since general managers are usually well equipped for top positions, the high promotion rate supports my classification method.

**Table 2**  
**Summary statistics of executive and firm characteristics.**

The table reports the summary statistics. The sample consists of executives at the corporate rank of vice president or above in listed U.S. firms from 2000 to 2021. Variable definitions are in Appendix 1. Panel A reports the executives characteristics and promotion rates for female and male executives; Panel B reports the firm characteristics; Panel C reports the promotion rates in high competition and low competition firms.

Panel A: Executive characteristics and promotion rates							
Variable	Female			Male			t
	N	Mean	SD	N	Mean	SD	
Age (in years)	104,145	48.6	7.28	526,783	50.24	7.49	64.76
MBA (in pct)	104,145	26.19	43.97	526,783	31.42	46.42	33.5
Ivy League (in pct)	104,145	13.28	33.94	526,783	13.95	34.64	5.65
Inside director (in pct)	104,145	3.91	19.39	526,783	14.1	34.8	91.68
Firm tenure (in years)	104,145	8.28	7.65	526,783	8.88	8.16	21.83
CEO experience (in years)	104,145	0.36	2.07	526,783	1.58	4.8	80.28
Industry experience (in years)	104,145	8.64	7.78	526,783	9.17	8.24	19
CFO (in pct)	104,145	7.86	26.92	526,783	11.68	32.12	35.9
COO (in pct)	104,145	2.09	14.3	526,783	4.55	20.85	36.48
Turnover (in pct)	92,023	8.49	27.88	481,419	9.07	28.72	5.65
CEO Turnover (in pct)	2,275	11.47	31.88	53,813	11.03	31.33	-0.65
Promotion (in pct)	87,042	5.06	21.91	403,480	5.66	23.11	7.1
Promotion from a rank (in pct)							
VP	29,629	7.49	26.32	115,813	7.97	27.08	2.73
SVP	21,324	5.84	23.45	90,534	6.63	24.88	4.23
EVP	13,351	1.83	13.4	72,872	3.34	17.96	9.25
President	4,418	2.51	15.65	43,828	3.89	19.33	4.58
Rank unspecified	18,320	3.17	17.52	80,433	4.33	20.35	7.13

Panel B: Firm characteristics						
Variable	N	Mean	SD	P25	P50	P75
HHI (inverse)	76,819	0.74	0.26	0.66	0.86	0.93
Similarity	78,948	0.11	0.20	0.01	0.02	0.08
Fluidity	78,495	7.11	3.81	4.24	6.34	9.33
Total assets	85,756	6.49	2.30	5.00	5.59	7.99
SVI	76,809	0.40	0.17	0.24	0.33	0.62
Respect	52,358	3.13	2.16	1.65	2.59	3.98
Pct female dirs	85,748	0.11	0.12	0	0.11	0.18
Pct female outside dirs	85,748	0.10	0.11	0	0.10	0.17
Pct female (industry)	85,756	0.18	0.14	0.08	0.17	0.26
3 female dirs	85,756	0.10	0.30	0	0	0

Panel C: Promotion and competition						
	HHI (inverse)		Competition		Fluidity	
	Low	High	Similarity		Low	High
			Low	High		
Female	4.97	5.18	5.04	5.11	5.02	5.14
Male	5.79	5.59	5.80	5.57	5.79	5.60

Compustat would understate some executives' industry experience. In the rest of the study, I use four-digit SIC to classify the industry.

Panel A in Table 1 reports the female representation in each functional area. In six functions, more than 20% of managers are women: human resources, public relations, secretary, legal, administrative positions and marketing. In contrast, the proportion of female managers is only 7% in sales and operations.

Panel B presents the female representation at each corporate rank. It shows that women's representation decreases with rank. For example, 17% of VPs are female, while only 4% of CEOs are female.

Table 2 presents the executive and firm characteristics. In Panel A, I compare individual characteristics of men and women. The sample has 14,941 unique female executives and 69,776 unique male executives.<sup>12</sup> The average age of male and female executives is 50 and 49, respectively. The average tenure for female executives is 8.3 years, while for male executives, it is 8.9 years.<sup>13</sup>

### 3. Results

#### 3.1. The gender promotion gap

Table 2 presents the descriptive statistics of promotion rates for men and women. On average, women's promotion rate in any given year stands at 5.1 percentage points, compared to 5.7 percentage points for men. The promotion rate for women is also lower across different ranks. Moreover, as executives move up the corporate ladder, the rate of promotion decreases.

In Table 3, I compare the promotion rates for men and women in a multivariate analysis. Since I use firm fixed effects in most regressions, I use the linear probability model for my analysis (Greene, 2003). The dependent variable, Promotion, is a dummy variable that indicates an internal promotion in the next year. I control for a set of characteristics that are measured in the current year. They include age, education, industry experience, CEO experience, firm tenure, and firm size, as well as insider director, CFO, and COO status. Women tend to work in larger firms, as noted by Adams (2016). To exclude the possibility that my results are driven by firm size only, I also include the interaction term between the female dummy and firm size in a regression where the main variable of interest is the interaction term between the female dummy and another variable.<sup>14</sup>

I start with a regression that includes only the female dummy in Column (1), and then I sequentially add controls, firm and year fixed effects, rank fixed effects, and function fixed effects in Columns (2)-(5). The coefficient on the female dummy is significantly negative in all five columns. In Column (5), the coefficient is  $-0.009$  and implies a 16% ( $-0.9/5.7$ , where 0.057 is the unconditional promotion probability of men, as shown in Table 2) gender promotion gap.

The gender promotion gap could stem from gender differences in personal characteristics omitted in the analysis. Typically, when more personal characteristics are accounted for, the gender gap declines. However, it does not always decrease. In fact, the gap increases by about 70% when I add the rank fixed effects. Women are clustered in relatively junior positions, with 56% of female executives holding VP or SVP roles, compared to 45% of their male counterparts. Executives in these positions generally have a higher promotion rate, which is also evident from the coefficients on the rank indicators. The omitted group for the rank consists of VPs. The coefficients on all rank indicators are significantly negative, which indicates that VPs, who are in the lowest rank in my sample, are promoted more frequently than other executives.

The coefficients on the other control variables are generally in line with intuition and prior work. They indicate that an executive is on a fast track if the executive is a director or has an MBA or a degree from an Ivy League university (Masulis and Mobbs, 2011).

In Column (5), I examine the effect of functional expertise on the gender promotion gap. In recent years, functional expertise has become an important factor contributing to the gender wage gap in the general workforce (Goldin, 2014; Blau and Kahn, 2017). Function segregation is also common among executives. Keloharju et al. (2022) demonstrate that functional expertise ranks as the second most significant factor contributing to the gender disparity in CEO appointments in Sweden, following career disruption. Experience in line positions, which are roles with profit-and-loss responsibilities, plays a crucial role in the career progression of executives (Galinsky et al., 2003). However, female executives are less likely to be in such positions (Catalyst, 2004; Helfat et al., 2006; Smith et al., 2013; McKinsey, 2017). This is evident in my data too. Similar to Helfat et al. (2006), I define line positions as positions in Operations, Marketing, Sales and General Management. While 40% of women occupy line positions, this figure rises to 56% for men.

I find that the gender gap declines by 17% from the gap in Column (4) after adding the function fixed effects in Column (5). The coefficients for each function indicator corroborate the important role of experience in line positions. The baseline group for functions is General Management. Among the 13 functions, coefficients for nine are significantly negative, indicating that executives in these roles have a lower probability of promotion than General Managers. The exceptions — Administration, Marketing, Sales, and Operations — are roughly aligned with line positions, in which executives have similar promotion chances to General Managers.

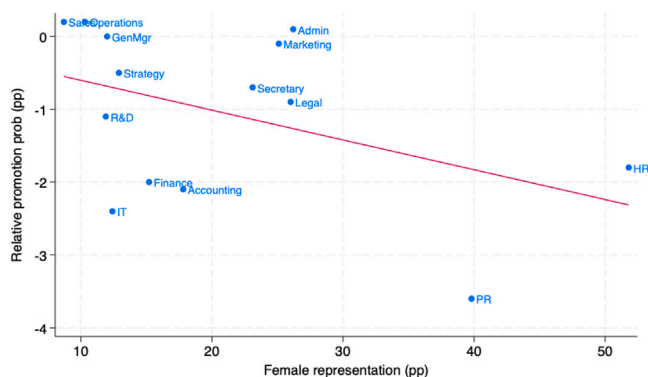
I next document that executives in functions with higher women's representation experience lower promotion probability, regardless of their gender. In Fig. 1, I plot the coefficients on function indicators in Column (5) against women's representation. Each coefficient represents the promotion probability of executives within a particular functional area compared to those in General Management. Fig. 1 shows that executives, regardless of their gender, are promoted more quickly in functions where women's representation is lower. For instance, women constitute about half of the executives in HR and 40% executives in PR, and executives in these roles are 1.8 and 3.6 percentage points less likely to be promoted than General Managers. In contrast, women represent about 10% of executives in Sales and Operations, where executives have the highest chance of promotion.

These results imply line positions prepare managers well for career advancement, however, women are less likely to be on these positions than men. Thus, their upward mobility of women is naturally lower.

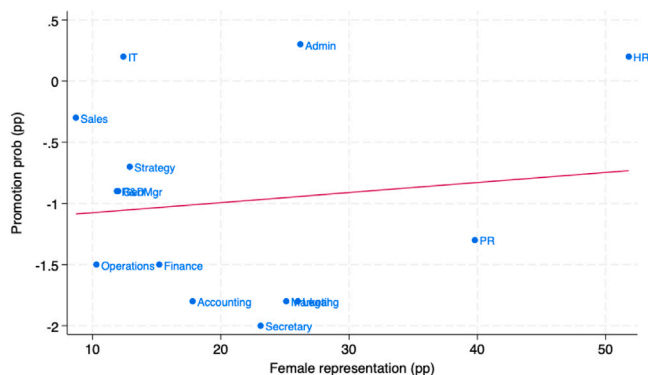
<sup>12</sup> These figures include CEOs who are not in the multivariate analysis of internal promotions because they cannot be internally promoted. But the observations of CEOs help identify promotions to CEO positions.

<sup>13</sup> Although BoardEx covers employment history, it does not allow me to measure career interruptions accurately. BoardEx doesn't capture legitimate leaves, such as maternity leaves. If a female executive takes a maternity leave for 12 months and returns to the executive labor market afterward, the gap is not captured by BoardEx.

<sup>14</sup> The results remain similar if I do not include the interaction term between the female dummy and firm size. See Table A7.



**Fig. 1. Relative promotion probability and female representation across functions** Relative promotion probability is the coefficients on function indicators from Column (5) of Table 3. It measures the likelihood of promotion within a specific function compared to that of General Managers after accounting for age, education, experience, and rank. Female representation is the share of female executives within a function.



**Fig. 2. The gender promotion gap and female representation across functions** The gender promotion gap is the coefficients on the female indicators in Table A4; a negative value indicates that women’s promotion probability is lower than men’s within the same function. Female representation is the share of female executives within a function.

Although I find that the promotion probability within a function is negatively correlated with women’s representation in such function, the gender gap in promotion is not necessarily different between functions with higher and lower female representation. In Fig. 2, I plot the gender promotion gap within different functions, estimated in Table A4, against women’s representation. The relationship between the gender promotion gap within a function and women’s representation is not clear. There is no significant gender promotion gap in IT and Sales, where women’s representation is low. In contrast, while women hold a reasonable representation in Accounting and Corporate Secretary roles, there is a significant gender gap in promotions within these areas. Specifically, the promotion gap is 1.8 percentage points in Accounting and 2 percentage points in Corporate Secretary.<sup>15</sup>

After including rank, function, firm and year fixed effects and controls, I find a gender promotion gap of 16%. The result aligns with the findings of Guo et al. (2023), who observe that career disruption resulting from takeovers has a greater impact on female executives’ labor market outcomes than male executives’. However, it diverges from the results of Gayle et al. (2012), who find a gender premium in promotion. This disparity in findings may be attributed to differences in the samples. Gayle et al. (2012) focus on a specific cohort of executives in both ExecuComp and Marquis Who’s Who, who are highly distinguished, and show women are promoted more frequently. I interpret their findings as indicative of a “superstar effect”.

In the last two columns of Table 3, I explore the gender promotion gap in different corporate ranks and sample period. Theoretically, it is unclear how the gender gap will change with rank. Fryer (2007) predicts that the gender gap will be lower at more senior positions because female executives – who have overcome the statistical discrimination to reach the top – are of higher quality. Eagly and Karau (2002) propose that the perceived incongruity between leadership roles and female gender roles leads to prejudice. The incongruity may be larger when the position is more senior, which would suggest that the gender gap increases as seniority rises. Pikulina and Ferreira (2023) propose that subtle discrimination causes disadvantaged individuals to refrain from investing in human capital in high-stakes careers. On the empirical side, Blau and Kahn (2017) document that in 1980, women at

<sup>15</sup> In Table A5, I compare the gender promotion gap in male-dominated functions with that in gender-integrated functions and find no statistically significant difference.

the top had a slightly lower gender wage gap than those in the middle and a slightly higher wage gap than those at the bottom. By 2010, the wage gap of women at the top was higher than that of women at the middle and bottom of the distribution. [Smith et al. \(2013\)](#) show that the gender gap in promotion to CEO positions is higher than the gender gap in promotion to VP positions in Danish firms.

Column (6) presents the relative gender promotion gap across ranks. In comparison to the gender gap among VPs, the gender gap among EVPs is about 0.6 percentage point higher, and the difference is statistically significant at the 10% level. The gender gap among presidents is also 0.4 percentage point higher, but it is statistically insignificant. The results suggest that the gender gap tends to widen among executives at more senior ranks.

In Column (7), I investigate how the gender promotion gap changes over time. The coefficient on the interaction term between the female indicator and the indicator for years 2011 to 2021 is positive. This implies that the gender promotion gap declines over time. In the first half of the sample, a woman is 24% less likely to be promoted than a man, whereas the gap declines to 14% in the second half of the sample.

### 3.2. The gender promotion gap and product market competition

Even after I account for the potential sorting of executives into firms, ranks, and functions, the unexplained promotion gap remains large. This leads to the question of what underlies this gap. It might stem from supply-side factors such as gender differences in attitudes and preferences ([Bertrand et al., 2010](#); [Pande and Ford, 2012](#)). Alternatively, the gap could be indicative of demand-side factors, such as discrimination. Both anecdotal evidence and academic studies highlight ongoing discrimination against women in the workplace ([Altonji and Blank, 1999](#); [Blau and Kahn, 2017](#); [Huang et al., 2023](#)). My focus is on discrimination, by examining how the gender gap responds to product market competition.

The relationship between product market competition and the gender promotion gap is uncertain ex ante. On the one hand, longer working hours, which are common in a highly competitive environment, may not be in line with women's preference for flexible working arrangements ([Goldin, 2014](#)). Gender differences in competitiveness and confidence could diminish women's engagement in promotion competitions ([Niederle and Vesterlund, 2007](#); [Buser et al., 2014](#)). On the other hand, aversion to competition is not necessarily an inherent trait among women ([Gneezy et al., 2009](#)). Moreover, executives possess distinct attributes compared to the average employee ([Adams and Funk, 2012](#)), suggesting that preference-based arguments, typically grounded in population-wide evidence, may not accurately reflect the unique characteristics of executives.

On the other hand, product market competition could reduce the gender promotion gap. [Becker \(1957\)](#) shows that discrimination is hard to sustain in a competitive market because the cost of discrimination increases with competition. Additionally, product market competition can serve as an important channel for corporate governance ([Giroud and Mueller, 2010, 2011](#)). A well-governed firm is more likely to foster a culture and practices that support the success of all talent, including women, and to mitigate discriminatory behavior.

It might be challenging to believe in such outright discrimination in the 21st century. However, such bias could be implicit ([Bertrand et al., 2005](#)). Moreover, [Pikulina and Ferreira \(2023\)](#) demonstrate that even a small bias can lead to noticeable differences in promotion, especially in high-stakes careers.

Other studies have used Becker's 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 employees in banks receive a disproportionate share of rents. [Black and Brainerd \(2004\)](#) document that competitive pressure from globalization increases the relative wage of women in manufacturing industries. [Heyman et al. \(2013\)](#) see takeovers as a disciplinary force similar to competition and find that the share of female employees rises after takeovers. [Huang et al. \(2023\)](#) explore the patterns of promotion among rank-and-file employees in the finance industry and uncover evidence of discrimination. Unlike [Black and Strahan \(2001\)](#), [Black and Brainerd \(2004\)](#), [Heyman et al. \(2013\)](#) and [Huang et al. \(2023\)](#), who focus on employees, I focus on senior executives and test whether product market competition could affect the gender promotion gap. If promotion decisions are well grounded, the gender promotion gap should remain unchanged as competition intensifies. However, 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 easily be 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.

[Table 4](#) reports two sets of results of the linear probability model estimates of the effect of competition on the gender promotion gap. The dependent variables are the indicators for promotions. Columns (1)–(3) include only the female dummies, the high competition dummies, and their interaction terms. Columns (4)–(6) include additional controls and firm, year, function and rank fixed effects. As shown in [Table 3](#), functions and ranks play significant roles in determining promotions. Employing this set of fixed effects, I compare executives with similar seniority and expertise who work within the same firm.



Table 3

## The gender promotion gap.

This table reports the linear probability model estimates of the promotion indicator regressed on the female indicator. The sample consists of executives at the corporate rank of vice president or above in listed U.S. firms from 2000 to 2021. *Promotion* is a dummy variable that equals one if an executive moves to a higher rank position within the same firm. *Female* is a dummy variable that equals one if an executive is female. The omitted group for the corporate rank consists of VPs. The omitted group for the functional area consists of General Managers. Variable definitions are in Appendix 1. t-statistics are calculated with standard errors clustered at the industry level.

	Dependent variable = Promotion						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Female	-0.006** (-7.102)	-0.005*** (-4.894)	-0.007*** (-6.998)	-0.012*** (-11.560)	-0.010*** (-10.716)	-0.019*** (-3.913)	-0.022*** (-5.011)
MBA		0.003*** (4.271)	0.004*** (5.610)	0.004*** (5.116)	0.003*** (3.851)	0.003*** (3.841)	0.003*** (3.857)
Ivy League		0.002 (0.828)	0.006*** (5.453)	0.009*** (7.866)	0.009*** (7.237)	0.009*** (7.200)	0.009*** (7.217)
Inside dir		0.028*** (8.299)	0.043*** (10.627)	0.055*** (14.795)	0.055*** (14.944)	0.055*** (14.908)	0.055*** (14.936)
Age		0.069*** (7.889)	0.058*** (6.637)	0.089*** (12.005)	0.087*** (12.217)	0.087*** (12.235)	0.086*** (12.141)
Age squared		-0.008*** (-10.182)	-0.008*** (-8.936)	-0.010*** (-13.856)	-0.010*** (-14.094)	-0.010*** (-14.114)	-0.010*** (-14.015)
CEO exp		-0.001 (-0.699)	0.001 (0.842)	0.007** (3.201)	0.003* (1.795)	0.003* (1.797)	0.003* (1.828)
Industry exp		0.002 (1.565)	-0.001 (-1.128)	-0.000 (-0.391)	-0.001 (-1.183)	-0.001 (-1.191)	-0.001 (-1.181)
Firm tenure		-0.000 (-0.188)	0.004*** (3.724)	0.004*** (4.133)	0.005*** (4.385)	0.005*** (4.424)	0.005*** (4.426)
CFO		0.000 (0.157)	0.001 (0.472)	0.014*** (8.660)	0.032*** (8.986)	0.032*** (8.873)	0.032*** (8.870)
COO		0.067*** (17.173)	0.070*** (16.471)	0.091*** (20.861)	0.084*** (18.122)	0.083*** (18.047)	0.084*** (18.124)
Total assets		-0.000 (-0.665)	0.002* (1.930)	0.003** (3.038)	0.003** (2.886)	0.003** (2.605)	0.003** (2.675)
Rank unspec				-0.043*** (-21.116)	-0.043*** (-22.747)	-0.043*** (-21.528)	-0.043*** (-21.528)
SVP				-0.034*** (-15.451)	-0.036*** (-15.329)	-0.035*** (-15.765)	-0.036*** (-15.390)
EVP				-0.088*** (-23.079)	-0.092*** (-27.247)	-0.091*** (-29.121)	-0.092*** (-27.165)
President				-0.076*** (-40.184)	-0.085*** (-42.917)	-0.084*** (-41.135)	-0.085*** (-42.876)
Female * Rank unspec						0.001 (0.237)	
Female * SVP						-0.002 (-0.698)	
Female * EVP						-0.006* (-1.710)	
Female * President						-0.004 (-1.266)	
Accounting					-0.021*** (-8.338)	-0.021*** (-8.344)	-0.021*** (-8.334)
Admin					0.001 (0.200)	0.001 (0.226)	0.001 (0.179)
Finance					-0.020*** (-6.603)	-0.020*** (-6.588)	-0.020*** (-6.524)
HR					-0.018*** (-9.192)	-0.018*** (-9.093)	-0.018*** (-9.191)
IT					-0.024*** (-12.277)	-0.024*** (-12.319)	-0.024*** (-12.317)
Legal					-0.009*** (-5.567)	-0.009*** (-5.530)	-0.009*** (-5.574)
Marketing					-0.001 (-0.364)	-0.001 (-0.356)	-0.001 (-0.376)
Operations					0.002 (1.391)	0.002 (1.372)	0.002 (1.372)
PR					-0.036*** (-15.090)	-0.036*** (-15.174)	-0.036*** (-15.121)
RD					-0.011*** (-3.773)	-0.011*** (-3.797)	-0.011*** (-3.774)
Sales					0.002 (0.625)	0.002 (0.566)	0.002 (0.573)
Secretary					-0.007*** (-4.566)	-0.007*** (-4.483)	-0.007*** (-4.513)
Strategy					-0.005*** (-3.288)	-0.005*** (-3.306)	-0.005*** (-3.309)
Female * 2011–2021							0.005*** (3.398)
Female * Total assets						0.001** (2.353)	0.001* (1.957)
Observations	490,522	490,522	490,257	490,257	490,257	490,257	490,257
Adjusted R-squared	0.000	0.007	0.020	0.033	0.035	0.035	0.035
Firm FE	No	No	Yes	Yes	Yes	Yes	Yes
Year FE	No	No	Yes	Yes	Yes	Yes	Yes
Rank FE	No	No	No	Yes	Yes	Yes	Yes
Function FE	No	No	No	No	Yes	Yes	Yes

\* Denote statistical significance at the 10%.

\*\* Denote statistical significance at the 5%.

\*\*\* Denote statistical significance at the 1%.

Table 4

**The gender promotion gap and product market competition.**

This table reports the linear probability model estimates of the promotion indicator regressed on the interaction terms between the female indicator and high competition indicators. The sample consists of executives at the corporate rank of vice president or above in listed U.S. firms from 2000 to 2021. *Promotion* is a dummy variable that equals one if an executive moves to a higher rank position within the same firm. *Female* is a dummy variable that equals one if an executive is female. In Columns (1) and (4), *High competition* is a dummy variable that equals one if a firm's HHI is below median. In Columns (2) and (5), *High competition* is a dummy variable that equals one if a firm's product similarity score is above median. In Columns (3) and (6), *High competition* is a dummy variable that equals one if a firm's product market fluidity is above median. Variable definitions are in Appendix 1. Columns (1)-(3) do not include any fixed effects; Columns (4) to (6) include firm, year, function, and rank fixed effects. t-statistics are calculated with standard errors clustered at the industry level.

High competition	Dependent variable = Promotion					
	HHI (1)	Similarity (2)	Fluidity (3)	HHI (4)	Similarity (5)	Fluidity (6)
Female	-0.008*** (-6.275)	-0.008*** (-5.961)	-0.008*** (-6.147)	-0.021*** (-4.681)	-0.021*** (-4.759)	-0.020*** (-4.507)
High competition	-0.002*** (-2.701)	-0.002*** (-3.058)	-0.002** (-2.572)	-0.001 (-0.755)	0.000 (0.016)	0.001 (0.486)
Female * High competition	0.004** (2.270)	0.003* (1.664)	0.003* (1.784)	0.004** (2.106)	0.004** (2.425)	0.003** (2.017)
MBA				0.003*** (3.703)	0.003*** (3.783)	0.003*** (3.822)
Ivy League				0.008*** (6.796)	0.008*** (6.724)	0.008*** (6.699)
Inside dir				0.056*** (14.638)	0.055*** (14.598)	0.055*** (14.539)
Age				0.087*** (11.486)	0.087*** (11.594)	0.087*** (11.480)
Age squared				-0.010*** (-13.173)	-0.010*** (-13.292)	-0.010*** (-13.146)
CEO exp				0.003 (1.647)	0.003* (1.705)	0.003 (1.500)
Industry exp				-0.001 (-1.169)	-0.001 (-1.102)	-0.001 (-1.164)
Firm tenure				0.005*** (4.289)	0.004*** (4.287)	0.004*** (4.326)
CFO				0.033*** (8.901)	0.033*** (8.970)	0.033*** (8.892)
COO				0.086*** (16.889)	0.086*** (17.146)	0.085*** (17.134)
Total assets				0.003** (2.453)	0.003** (2.273)	0.003** (2.295)
Female * Total assets				0.001** (2.288)	0.001** (2.168)	0.001** (2.087)
Observations	463,848	470,056	467,025	463,675	469,862	466,830
Adjusted R-squared	0.000	0.000	0.000	0.036	0.035	0.035

\* Denote statistical significance at the 10%.

\*\* Denote statistical significance at the 5%.

\*\*\* Denote statistical significance at the 1%.

The key variable of interest is the interaction term between the female dummy and the high competition dummy. It is positive and statistically significant in all six columns, which suggests that higher competition in the product markets is associated with a lower gender promotion gap. The economic magnitude is meaningful too. For instance, in Column (4), the high competition dummy indicates firms that are not in concentrated industries. The gender promotion gap is 21% in firms that have high market power; the gap is 14% in firms that have low market power.

In Columns (5) and (6), I 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 to the one observed in Column (4).

The findings support the conjecture that discrimination, a demand-side factor, continues to hinder women's advancement into leadership roles, though it is unlikely to be the sole or primary factor. Over time, unfair promotion opportunity deters women from acquiring the human capital necessary for such positions. The effect of discrimination on women's career advancement is observed among women already holding senior management roles. Thus, the impact of discrimination on female executive promotion could be more significant than what is documented here.

The results are consistent with recent findings that provide demand-side explanations for challenges that women encounter in capital allocation, punishment for misconduct and mobility (Duchin et al., 2020; Niessen-Ruenzi and Ruenzi, 2019; Ewens and Townsend, 2020; Egan et al., 2022; Guo et al., 2023).

### 3.3. Other factors influencing the gender promotion gap

The results in the last subsection suggest that discrimination might still be in play in women's career advancement. In this subsection, I further examine other factors affecting the gender promotion gap. In particular, I focus on public attention to gender equality, firm culture, and board gender diversity. All these factors might indicate demand-side reasons for the scarcity of female executives (Tate and Yang, 2015; Giannetti and Wang, 2023; Guo et al., 2023), which complement to the results based on competition.

The first factor is the public attention on gender diversity. Giannetti and Wang (2023) demonstrate that companies are more inclined to appoint women to their boards during times when there is heightened public focus on gender equality. This suggests that firms may respond to public scrutiny by taking actions to address specific social issues.

The second factor is culture, a fundamental determinant of behavior at individual and organizational levels. Societal culture plays a crucial role in shaping the outcomes of women in the labor force (Fernández, 2007). The culture within firms can also influence a wide range of business decisions (Guiso et al., 2015; Li et al., 2021). Culture encompasses multiple dimensions, such as innovation, integrity, quality, and respect. In the context of gender diversity, a culture of respect is particularly pertinent (Li et al., 2021). A firm that cultivates a respectful culture can create an inclusive environment that empowers both men and women to reach their full potential.

The last aspect is board gender diversity. In response to the lack of female business leaders, some regulators have adopted board gender quota policies. One objective of these policies is to promote the trickle-down effect and increase women's representation at various corporate levels. Female directors may enhance management gender diversity through several mechanisms, such as building networks among female managers, helping to overcome discrimination, serving as role models for aspiring women (Niederle et al., 2013; Pande and Ford, 2012). However, there are reasons to be skeptical of the positive effects of a diverse board. Female leaders might not support or even hinder the progress of their female subordinates, which is known as "Queen Bee" effect. They 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 leaders can induce male leaders to respond less favorably to female candidates.

Following Giannetti and Wang (2023), I use Google search volume index (SVI) for the term "gender equality" to measure public attention to gender equality. I use respect culture score from Li et al. (2021) to measure the respectful firm culture. For board gender diversity, I use three measures. The first measure is the percentage of female directors, which is commonly used as a measure of board diversity (for example, Adams and Ferreira, 2009). Kanter (1977a) suggests that reaching a critical mass is important in group dynamics, and Kramer et al. (2006) and Schwartz-Ziv (2017) find that having three or more women on a board can create a critical mass. Thus, the second measure is an indicator set to one if a board has three or more female directors. An executive can be promoted to a higher rank and become a new director at the same time, which leads to spurious correlation. Thus, I also use the share of female outside directors as a proxy for board gender diversity. This measure remains unchanged when an executive is newly appointed as a director.

Table 5 presents the estimates of the linear probability model. The variables of interest are the interaction terms between *Female* and proxies for public attention, respectful firm culture, board gender diversity. In all four columns, the interaction terms are positive and statistically significant at 5% level. They indicate that heightened public attention, respectful firm culture, and diverse boards are associated with a smaller gender promotion gap. An increase of one standard deviation in public attention and respectful culture is associated with an 11% and 9% reduction in the gender promotion gap, respectively. The promotion gender gap in firms with at least three female directors is 30% lower than the gap in firms with fewer than three female directors.

These results are consistent with Giannetti and Wang (2023), who document that public attention is associated with more female representation on boards. They are also consistent with Tate and Yang (2015), Egan et al. (2022), Ewens and Townsend (2020), and Guo et al. (2023), who report smaller gender differences in wages, punishment for misconduct, fund raising, and job mobility when more decision makers are female. However, they are inconsistent with Smith et al. (2013) and Bertrand et al. (2019), who study firms in Denmark and Norway, and find no evidence that more female decision makers benefit female executives.

Taken together, the findings from both the previous and current subsections point to the possibility that discrimination still plays a role in executive promotions. Furthermore, they suggest that competitive product markets, good corporate culture, higher female representation on boards, and increased public attention on diversity could alleviate discrimination. However, the observed correlations could stem from spurious effects. For instance, firms might respond to heightened product market competition in specific ways, representing an omitted variable in the analysis of promotion and product market competition. In the following section, I explore alternative explanations to reduce the endogeneity concerns.

## 4. Robustness

In this section, I address three potential alternative explanations. They relate to the gender differences in leadership style, turnover decisions, and family responsibilities. Additionally, I use an alternative measure of market disciplinary force to demonstrate the robustness of the results.

### 4.1. Leadership style in demand

Thus far, I have demonstrated that the gender promotion gap narrows as product market competition intensifies. This narrowing gap could be attributed to decreased discrimination. However, it could also be argued that in highly competitive situations, women's skills become more valuable.

Table 5

**Gender promotion gap and public attention to gender equality, firm culture and board diversity.**

This table presents the estimates of the linear probability model estimates of the promotion indicator regressed on the interaction terms between the female indicator and measures of public attention, firm culture and board diversity. The sample consists of executives at the corporate rank of vice president or above in listed U.S. firms from 2000 to 2021. *Promotion* is a dummy variable that equals one if an executive moves to a higher rank position within the same firm. *Female* is a dummy variable that equals one if an executive is female. *SVI* is the Google search index on the term “gender equality”. *Respect* is the measure of respectful firm culture. *Pct female dirs* is the percentage of female directors. *3 female dirs* is an indicator set to one if a board has three or more female directors. *Pct female outside dirs* is the percentage of female outside directors. Variable definitions are in Appendix 1. All regressions include firm and year fixed effects. *t*-statistics are calculated with standard errors clustered at the industry level.

Variable	Dependent variable = Promotion				
	SVI (1)	Respect (2)	Pct female dirs (3)	3 female dirs (4)	Pct female outside dirs (5)
Female	-0.026*** (-5.788)	-0.026*** (-4.907)	-0.020*** (-4.476)	-0.018*** (-3.940)	-0.020*** (-4.379)
Var		0.001 (0.951)	0.006 (0.850)	-0.001 (-0.303)	0.010 (1.523)
Female * Var	0.017*** (3.728)	0.002*** (2.905)	0.016** (2.119)	0.005** (2.542)	0.019*** (2.845)
MBA	0.004*** (4.311)	0.003*** (3.141)	0.003*** (3.833)	0.003*** (3.861)	0.003*** (3.824)
Ivy League	0.009*** (6.776)	0.008*** (5.677)	0.009*** (7.216)	0.009*** (7.212)	0.009*** (7.192)
Inside dir	0.056*** (14.213)	0.058*** (13.200)	0.055*** (14.901)	0.055*** (14.932)	0.055*** (15.044)
Age	0.079*** (11.561)	0.091*** (12.520)	0.086*** (12.152)	0.086*** (12.186)	0.086*** (12.193)
Age squared	-0.009*** (-13.472)	-0.010*** (-14.180)	-0.010*** (-14.024)	-0.010*** (-14.064)	-0.010*** (-14.078)
CEO exp	0.004** (2.109)	0.003* (1.755)	0.003* (1.819)	0.003* (1.815)	0.003* (1.807)
Industry exp	-0.000 (-0.522)	-0.001 (-1.336)	-0.001 (-1.200)	-0.001 (-1.198)	-0.001 (-1.170)
Firm tenure	0.004*** (3.837)	0.005*** (4.062)	0.005*** (4.437)	0.005*** (4.445)	0.005*** (4.418)
CFO	0.031*** (8.426)	0.034*** (8.688)	0.032*** (8.878)	0.032*** (8.872)	0.032*** (8.883)
COO	0.082*** (17.193)	0.089*** (14.917)	0.084*** (18.123)	0.084*** (18.128)	0.084*** (18.078)
Total assets	0.003*** (2.857)	0.003** (1.987)	0.003*** (2.610)	0.003*** (2.680)	0.003** (2.400)
Female * Total assets	0.001** (2.254)	0.001*** (2.614)	0.001* (1.666)	0.001 (1.505)	0.001 (1.383)
Observations	439,470	364,547	490,237	490,257	489,413
Adjusted R-squared	0.036	0.036	0.035	0.035	0.035

\* Denote statistical significance at the 10%.

\*\* Denote statistical significance at the 5%.

\*\*\* Denote statistical significance at the 1%.

It is a common belief that women and men lead differently. If the female leadership style is particularly effective in a highly competitive environment, the correlation between the gender promotion gap and competition may indicate that the female leadership style is in demand when competition goes up.

However, the literature suggests that the gender difference in management style is small, casting doubt on its significance, particularly among senior executives. [Eagly and Carli \(2007\)](#) report that some gender differences in leadership style are present in middle-level management and absent in senior-level management. This may be because that some female leadership characteristics, such as being a caring and supportive leader, are typically considered to be less essential for promotion to the most senior positions than more charismatic leadership characteristics, such as inspiring and enthusing others.

Nevertheless, to address this concern, I re-run the tests in [Table 4](#) in a subsample of male-dominated industries/functions and a subsample of gender-integrated industries/functions. [Eagly and Carli \(2003, 2007\)](#) show that some female leadership characteristics are only present and more effective in gender-integrated environment. This is because when female leaders are rare, they may lose authority if they lead in a female style, and therefore they lead in a style that is typical of men. These findings suggest that if women are promoted for their leadership style in highly competitive environments, the effect should be stronger in gender-integrated areas.

[Table 6](#) reports the results when the sample is split by industry. In the first three columns, the subsample consists of executives in industries where the percentage of female executives is above median; in the last three columns, the subsample consists of executives in industries where the percentage of female executives is below median. The results show that high competition is associated with a low gender gap in male-dominated industries, whereas there is no evidence of significant correlation in gender-integrated industries.

[Table 7](#) reports the results when the sample is split by function. In the first three columns, the subsample consists of executives in functions where the female executive representation is above median; in the last three columns, the subsample consists of executives

**Table 6**  
**Promotions in male-dominated and gender-integrated industries.**

This table reports the linear probability model estimates of the promotion indicator regressed on the interaction terms between the female indicator and high competition indicators in male-dominated and gender-integrated industries. The sample consists of executives at the corporate rank of vice president or above in listed U.S. firms from 2000 to 2021. The sample is divided into two groups: executives working in industries where the percentage of female executives is above median (Columns 1-3), and those working in industries where the percentage of female executives is below median (Columns 4-6). *Promotion* is a dummy variable that equals one if an executive moves to a higher rank position within the same firm. *Female* is a dummy variable that equals one if an executive is female. In Columns (1) and (4), *High competition* is an indicator variable that equals one if a firm's HHI is below median. In Columns (2) and (5), *High competition* is an indicator variable that equals one if a firm's product similarity score is above median. In Columns (3) and (6), *High competition* is an indicator variable that equals one if a firm's product market fluidity is above median. Variable definitions are in Appendix 1. All regressions include firm, year, function, and rank fixed effects. t-statistics are calculated with standard errors clustered at the industry level.

Subsample	Dependent variable = Promotion					
	Gender-integrated industries			Male-dominated industries		
High competition	HHI (1)	Similarity (2)	Fluidity (3)	HHI (4)	Similarity (5)	Fluidity (6)
Female	-0.019*** (-3.450)	-0.018*** (-3.606)	-0.018*** (-3.435)	-0.021*** (-3.037)	-0.018*** (-2.643)	-0.019*** (-2.610)
High competition	0.000 (0.146)	0.001 (0.302)	0.000 (0.069)	-0.004 (-1.259)	-0.001 (-0.332)	0.002 (0.820)
Female * High competition	0.002 (1.002)	0.002 (1.294)	0.002 (1.146)	0.006** (1.986)	0.007* (1.800)	0.006* (1.739)
MBA	0.003** (2.540)	0.003*** (2.653)	0.003*** (2.641)	0.005*** (3.686)	0.005*** (3.650)	0.005*** (3.709)
Ivy League	0.006*** (4.574)	0.006*** (4.527)	0.006*** (4.523)	0.013*** (4.967)	0.013*** (4.986)	0.013*** (4.971)
Inside dir	0.053*** (11.046)	0.052*** (11.005)	0.052*** (10.938)	0.061*** (9.696)	0.060*** (9.665)	0.061*** (9.697)
Age	0.084*** (9.156)	0.083*** (9.249)	0.083*** (9.152)	0.092*** (8.208)	0.092*** (8.238)	0.092*** (8.270)
Age squared	-0.009*** (-10.548)	-0.009*** (-10.652)	-0.009*** (-10.520)	-0.010*** (-9.620)	-0.010*** (-9.637)	-0.011*** (-9.678)
CEO exp	0.002 (1.158)	0.002 (1.225)	0.002 (1.006)	0.002 (0.737)	0.002 (0.736)	0.002 (0.736)
Industry exp	-0.001 (-0.706)	-0.001 (-0.625)	-0.001 (-0.708)	-0.002 (-1.233)	-0.002 (-1.239)	-0.002 (-1.208)
Firm tenure	0.005*** (3.692)	0.005*** (3.717)	0.005*** (3.733)	0.004** (2.304)	0.004** (2.265)	0.004** (2.300)
CFO	0.027*** (5.701)	0.027*** (5.781)	0.027*** (5.700)	0.043*** (11.154)	0.043*** (11.224)	0.043*** (11.222)
COO	0.082*** (13.384)	0.082*** (13.737)	0.081*** (13.669)	0.092*** (12.378)	0.092*** (12.444)	0.092*** (12.446)
Total assets (ln)	0.002* (1.756)	0.002 (1.443)	0.002 (1.498)	0.004** (2.304)	0.004*** (2.651)	0.004** (2.576)
Female * Total assets (ln)	0.001* (1.894)	0.001* (1.888)	0.001* (1.811)	0.001 (0.761)	0.000 (0.454)	0.000 (0.487)
Constant	-0.154*** (-5.166)	-0.150*** (-5.118)	-0.149*** (-5.060)	-0.176*** (-5.604)	-0.180*** (-5.840)	-0.182*** (-5.872)
Observations	316,014	321,368	318,780	147,660	148,491	148,047
Adjusted R <sup>2</sup>	0.035	0.035	0.035	0.037	0.037	0.037

\* Denote statistical significance at the 10%.

\*\* Denote statistical significance at the 5%.

\*\*\* Denote statistical significance at the 1%.

in functions where the female executive representation is below median. The results are slightly stronger among executives on the gender-integrated functions.

Overall, the results do not show that the effect of competition on gender promotion gap is more pronounced in gender-integrated areas. They do not support the idea that women are promoted more frequently in a competitive setting because their leadership style is in demand.

#### 4.2. The gender turnover gap

Another concern is that competition affects the gender promotion gap due to gender differences in turnover decisions in response to increased competition. Men who are slow in climbing internal corporate ladders may incline towards seeking external opportunities, which become more abundant in a competitive environment, whereas women may tend to stay. This would result in a smaller internal gender promotion gap when competition rises, because men are more likely to seek opportunities elsewhere.

**Table 7**  
**Promotions in male-dominated and gender-integrated functions.**

This table reports the linear probability model estimates of the promotion indicator regressed on the interaction terms between the female indicator and high competition indicators in male-dominated and gender-integrated functions. The sample consists of executives at the corporate rank of vice president or above in listed U.S. firms from 2000 to 2021. The sample is divided into two groups: executives working in functions where the percentage of female executives is above median (Columns 1-3), and those working in functions where the percentage of female executives is below median (Columns 4-6). *Promotion* is a dummy variable that equals one if an executive moves to a higher rank position within the same firm. *Female* is a dummy variable that equals one if an executive is female. In Columns (1) and (4), *High competition* is an indicator variable that equals one if a firm's HHI is below median. In Columns (2) and (5), *High competition* is an indicator variable that equals one if a firm's product similarity score is above median. In Columns (3) and (6), *High competition* is an indicator variable that equals one if a firm's product market fluidity is above median. Variable definitions are in Appendix 1. All regressions include firm, year, function, and rank fixed effects. t-statistics are calculated with standard errors clustered at the industry level.

Subsample	Dependent variable = Promotion					
	Gender-integrated functions			Male-dominated functions		
High competition	HHI	Similarity	Fluidity	HHI	Similarity	Fluidity
	(1)	(2)	(3)	(4)	(5)	(6)
Female	-0.022*** (-4.528)	-0.021*** (-4.551)	-0.022*** (-4.778)	-0.016** (-2.268)	-0.015** (-2.200)	-0.013* (-1.831)
High competition	0.001 (0.316)	0.001 (0.282)	0.001 (0.631)	-0.001 (-0.794)	0.001 (0.272)	0.001 (0.422)
Female * High competition	0.001 (0.372)	0.002 (0.998)	0.005*** (2.615)	0.002 (0.886)	0.001 (0.484)	-0.002 (-0.677)
MBA	0.001 (0.753)	0.001 (0.697)	0.001 (0.743)	0.005*** (4.508)	0.005*** (4.625)	0.005*** (4.529)
Ivy League	0.008*** (4.080)	0.008*** (3.975)	0.008*** (4.015)	0.009*** (5.775)	0.009*** (5.865)	0.009*** (5.775)
Inside dir	0.036*** (7.453)	0.036*** (7.541)	0.036*** (7.571)	0.072*** (13.485)	0.071*** (13.392)	0.071*** (13.425)
Age	0.074*** (8.934)	0.073*** (8.902)	0.073*** (8.876)	0.109*** (10.676)	0.108*** (10.749)	0.108*** (10.531)
Age squared	-0.008*** (-10.037)	-0.008*** (-10.002)	-0.008*** (-9.972)	-0.012*** (-11.978)	-0.012*** (-12.070)	-0.012*** (-11.838)
CEO exp	0.021*** (4.714)	0.021*** (4.904)	0.020*** (4.959)	0.000 (0.067)	0.000 (0.126)	0.000 (0.064)
Industry exp	-0.002* (-1.801)	-0.002 (-1.582)	-0.002 (-1.570)	-0.001 (-0.610)	-0.001 (-0.729)	-0.001 (-0.775)
Firm tenure	0.007*** (4.697)	0.006*** (4.598)	0.007*** (4.628)	0.004*** (2.927)	0.004*** (3.021)	0.004*** (3.041)
CFO	0.044*** (9.312)	0.043*** (9.397)	0.043*** (9.298)			
COO	0.072*** (6.117)	0.069*** (5.724)	0.069*** (5.778)	0.091*** (17.013)	0.091*** (17.186)	0.090*** (17.286)
Total assets	0.004*** (3.198)	0.004*** (3.267)	0.004*** (3.263)	0.001 (1.132)	0.001 (0.766)	0.001 (0.800)
Female * Total assets	0.001** (2.306)	0.001** (2.092)	0.001** (2.048)	0.001 (0.973)	0.001 (0.914)	0.001 (0.838)
Observations	201,688	204,455	203,149	261,348	264,724	262,999
Adjusted R-squared	0.035	0.035	0.035	0.042	0.042	0.042

\* Denote statistical significance at the 10%.

\*\* Denote statistical significance at the 5%.

\*\*\* Denote statistical significance at the 1%.

I address this alternative explanation in two ways. First, this argument is based on the idea that men and women make different turnover decisions when facing heightened competition. Thus, I test this idea explicitly in [Table 8](#). It shows that though women have a higher turnover rate than men, the gap is not significantly associated with competition.

Second, I examine the impact of competition on the gender promotion gap, considering both internal and external promotion opportunities. The argument that men are more likely to pursue external promotion opportunities suggests that focusing solely on internal promotions does not fully represent career progression. Therefore, I examine both internal and external promotions in [Table 9](#).

The dependent variable, *Promotion (internal & external)*, is set to one if an executive is promoted to a higher-ranking position or to a position of the same rank but in a significantly larger company (at least twice the size of the executive's previous firm). Since CEO is the highest rank, CEOs cannot be promoted internally and are excluded from the sample when I examine only internal promotions. The sample in [Table 9](#) includes CEOs and the CEO indicator is subsumed by the rank fixed effects.

The coefficients on the interaction terms between the female dummy and the high competition dummy are positive and statistically significant in all columns. They show that when both internal and external promotions are used to measure executives' career advancement, the gender promotion gap is still lower when competition goes up. These findings suggest that the baseline results are unlikely to be driven by the differential effects of competition on men's and women's turnover decisions.

**Table 8**  
**Turnover and product market competition.**

This table reports the estimates of linear probability models of the turnover indicator regressed on the interaction terms between the female indicator and high competition indicators. The sample consists of executives at the corporate rank of vice president or above in listed U.S. firms from 2000 to 2021. *Turnover* is an indicator variable that equals one if an executive leaves the firm. *Female* is a dummy variable that equals one if an executive is female. In Column (2), *High competition* is a dummy variable that equals one if a firm's HHI is below median. In Column (3), *High competition* is a dummy variable that equals one if a firm's product similarity score is above median. In Column (4), *High competition* is a dummy variable that equals one if a firm's product market fluidity is above median. Variable definitions are in Appendix 1. All regressions include firm, year, function, and rank fixed effects. t-statistics are calculated with standard errors clustered at the industry level.

	Dependent variable = Turnover			
	(1)	HHI (2)	Similarity (3)	Fluidity (4)
Female	0.006*** (4.199)	0.013** (2.388)	0.016*** (2.972)	0.017*** (2.970)
High competition		0.001 (0.528)	0.001 (0.729)	0.005** (2.037)
Female * High competition		-0.002 (-0.976)	0.001 (0.653)	-0.002 (-0.672)
MBA	0.010*** (8.664)	0.010*** (8.442)	0.010*** (8.427)	0.010*** (8.455)
Ivy League	0.006*** (4.100)	0.005*** (3.515)	0.006*** (3.722)	0.006*** (3.784)
Inside dir	-0.000 (-0.084)	0.001 (0.311)	0.001 (0.401)	0.001 (0.487)
Age	-0.121*** (-6.290)	-0.122*** (-6.735)	-0.119*** (-6.313)	-0.118*** (-6.259)
Age squared	0.016*** (8.026)	0.016*** (8.632)	0.016*** (8.067)	0.016*** (8.010)
CEO exp	0.009*** (5.661)	0.009*** (5.923)	0.009*** (5.740)	0.009*** (5.649)
Industry exp	0.004*** (3.498)	0.004*** (3.175)	0.004*** (3.410)	0.004*** (3.373)
Firm tenure	-0.011*** (-7.560)	-0.012*** (-7.235)	-0.011*** (-7.311)	-0.011*** (-7.210)
CFO	0.011*** (5.136)	0.010*** (5.202)	0.011*** (5.132)	0.011*** (5.091)
COO	0.011*** (3.284)	0.012*** (3.637)	0.012*** (3.461)	0.012*** (3.575)
Total assets	0.007*** (4.068)	0.010*** (5.999)	0.009*** (5.292)	0.009*** (5.428)
Female * Total assets		-0.001 (-1.216)	-0.001** (-2.038)	-0.001* (-1.905)
Constant	0.258*** (5.726)	0.234*** (5.222)	0.236*** (5.175)	0.230*** (5.045)
Observations	621,682	584,314	593,342	589,617
Adjusted R <sup>2</sup>	0.047	0.045	0.045	0.045

\* Denote statistical significance at the 10%.

\*\* Denote statistical significance at the 5%.

\*\*\* Denote statistical significance at the 1%.

#### 4.3. Family responsibilities

The third potential omitted variable is family responsibilities. It is well-documented that family responsibility is a main drive for the gender differences in the labor market (Bertrand et al., 2010; Goldin, 2014). Women may move to firms that face less competition and offer a better work-life balance. In the baseline results, the firm fixed effects allow me to compare executives within the same firm and alleviates the self-selection concern.

To further address this concern, I study the promotion gap of executives who are over 50 years old. These executives are less likely to have young children. Therefore, both male and female executives can concentrate on their careers.

I start with checking whether the gender gap is lower among executives who are over 50 years old. Column (1) in Table 10 shows the coefficient on the interaction term between the female and age-over-50 indicators is significantly positive, which suggests a lower gender promotion gap among older executives. This aligns with the idea that beside demand-side factors, supply-side factors also play a role in women's career. Women with more family responsibilities face higher barriers, which is consistent with Bertrand et al. (2010) and Goldin (2014).

Next, I show that in the sample of executives with relatively less family responsibilities, the association between the gender gap and competitive threat is still present. In Columns (2) and (4), I restrict the sample to executives who are over 50 years old. The coefficients on the interaction terms between the female and high competition indicators are 0.002, 0.004, and 0.004, closely

**Table 9**  
**External and internal promotions.**

This table reports the linear probability model estimates of the alternative promotion variable regressed on the interaction terms between the female indicator and high competition indicators. The sample consists of executives at the corporate rank of vice president or above in listed U.S. firms from 2000 to 2021. *Promotion (internal & external)* is a dummy variable that equals one if an executive moves to a higher rank position within or outside the firm, or moves to a position of the same rank in a company that is at least twice the size of the executive's previous firm. *Female* is a dummy variable that equals one if an executive is female. In Column (2), *High competition* is an indicator variable that equals one if a firm's HHI is below the median. In Column (3), *High competition* is an indicator variable that equals one if a firm's product similarity score is above the median. In Column (4), *High competition* is an indicator variable that equals one if a firm's product market fluidity is above the median. Variable definitions are in Appendix 1. All regressions include firm, year, function, and rank fixed effects. t-statistics are calculated with standard errors clustered at the industry level.

High competition	Dependent variable = Promotion (internal & external)			
	(1)	HHI (2)	Similarity (3)	Fluidity (4)
Female	-0.009*** (-9.722)	-0.020*** (-4.408)	-0.020*** (-4.763)	-0.019*** (-4.536)
High competition		-0.001 (-0.724)	-0.000 (-0.058)	0.001 (0.478)
Female * High competition		0.004** (2.026)	0.003** (2.095)	0.003* (1.903)
MBA	0.003*** (4.361)	0.003*** (4.247)	0.003*** (4.398)	0.003*** (4.443)
Ivy League	0.008*** (7.764)	0.008*** (7.342)	0.008*** (7.138)	0.008*** (7.125)
Inside dir	0.048*** (14.826)	0.050*** (14.635)	0.049*** (14.568)	0.049*** (14.526)
Age	0.079*** (11.829)	0.080*** (11.264)	0.079*** (11.391)	0.079*** (11.282)
Age squared	-0.009*** (-13.755)	-0.009*** (-13.023)	-0.009*** (-13.174)	-0.009*** (-13.034)
CEO exp	0.006*** (4.797)	0.006*** (4.591)	0.006*** (4.602)	0.006*** (4.381)
Industry exp	-0.001 (-0.747)	-0.001 (-0.728)	-0.000 (-0.586)	-0.000 (-0.622)
Firm tenure	0.003*** (3.849)	0.004*** (3.844)	0.003*** (3.796)	0.003*** (3.836)
CFO	0.032*** (8.726)	0.033*** (8.751)	0.032*** (8.789)	0.032*** (8.724)
COO	0.083*** (19.117)	0.085*** (17.763)	0.085*** (18.067)	0.084*** (18.062)
Total assets	0.002** (2.365)	0.002** (2.067)	0.002* (1.771)	0.002* (1.802)
Female * Total assets		0.001** (2.293)	0.001** (2.417)	0.001** (2.349)
Observations	544,385	512,249	519,875	516,594
Adjusted R-squared	0.037	0.038	0.038	0.038

\* Denote statistical significance at the 10%.

\*\* Denote statistical significance at the 5%.

\*\*\* Denote statistical significance at the 1%.

matching the baseline results shown in Table 3 (0.004, 0.004, and 0.003). However, only one of these coefficients is statistically significant, and the coefficient in Column (4) is marginally insignificant (t-stat 1.530). Given that the sample of executives over 50 years old is less than half the size of the baseline sample, the reduced statistical significance could be attributed to lower statistical power. Thus, my interpretation of the results is that, although the gender promotion gap is smaller among older executives, demand-side barriers are still present.

#### 4.4. Other market disciplinary force

The competition measures based on text analysis of SEC filings 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 behavior. Considering discrimination as a particular form of inefficient management behavior, I expect that a takeover threat can reduce it. Heyman et al. (2013) document a substitutional effect of takeover and product market competition on gender gap 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 indicates that a firm in the same industry is more likely to become a target; the threat can have a disciplinary



Table 10

**The gender promotion gap in executives who are over 50 years old.**

This table reports the linear probability model estimates of the promotion indicator regressed on the indicator of old executives and the interaction terms between the female indicator and high competition indicators in the subsample of old executives. The sample consists of executives at the corporate rank of vice president or above in listed U.S. firms from 2000 to 2021. Column (1) includes all executives; Columns (2)-(4) include executives who are over 50 years old. *Promotion* is a dummy variable that equals one if an executive moves to a higher rank position within the same firm. *Female* is a dummy variable that equals one if an executive is female. *Age over 50* is a dummy variable that equals one if an executive is over 50 years old. In Column (2), *High competition* is an indicator variable that equals one if a firm's HHI is below median. In Column (3), *High competition* is a dummy variable that equals one if a firm's product similarity score is above median. In Column (4), *High competition* is a dummy variable that equals one if a firm's product market fluidity is above median. Variable definitions are in Appendix 1. All regressions include firm, year, function, and rank fixed effects. t-statistics are calculated with standard errors clustered at the industry level.

Subsample	Dependent variable = Promotion			
	All	Age over 50	Age over 50	Age over 50
High competition		HHI	Similarity	Fluidity
	(1)	(2)	(3)	(4)
Female	-0.021*** (-4.978)	-0.011* (-1.906)	-0.012** (-2.288)	-0.012** (-2.049)
Age over 50	-0.014*** (-16.925)			
Female * Age over 50	0.007*** (4.049)			
High competition		0.000 (0.106)	0.002 (1.152)	0.001 (0.579)
Female * High competition		0.002 (0.867)	0.004* (1.693)	0.004 (1.530)
MBA	0.004*** (4.165)	0.003** (2.060)	0.003** (2.087)	0.003** (2.104)
Ivy League	0.009*** (7.018)	0.003** (2.082)	0.003** (2.023)	0.003** (1.995)
Inside dir	0.053*** (14.519)	0.050*** (12.934)	0.050*** (12.741)	0.050*** (12.554)
Age		0.092** (2.315)	0.088** (2.262)	0.091** (2.379)
Age squared		-0.010*** (-2.865)	-0.010*** (-2.829)	-0.010*** (-2.950)
CEO exp	0.002 (0.837)	0.002 (1.184)	0.002 (1.245)	0.002 (0.982)
Industry exp	-0.002* (-1.723)	-0.001 (-0.530)	-0.001 (-0.481)	-0.001 (-0.486)
Firm tenure	0.004*** (4.146)	0.001 (0.868)	0.001 (0.844)	0.001 (0.780)
CFO	0.033*** (8.851)	0.026*** (4.848)	0.026*** (4.851)	0.026*** (4.937)
COO	0.084*** (18.279)	0.081*** (13.762)	0.080*** (13.816)	0.079*** (13.807)
Total assets	0.003*** (2.839)	0.005*** (3.694)	0.005*** (3.302)	0.004*** (3.270)
Female * Total assets	0.001** (2.199)	0.001 (0.884)	0.001 (0.945)	0.001 (0.863)
Observations	490,257	209,261	212,385	210,945
Adjusted R-squared	0.034	0.034	0.034	0.034

\* Denote statistical significance at the 10%.

\*\* Denote statistical significance at the 5%.

\*\*\* Denote statistical significance at the 1%.

effect on the firm. I use the number of takeovers in an industry to measure the takeover threat. Firms that are takeover targets are excluded from this analysis.

Table 11 displays the results of the linear probability model estimates of the effect of takeover threat on the gender promotion gap. The coefficients on the interaction terms between the female dummy and the number of takeovers are significantly positive, which suggests that the gap is smaller in firms facing a higher takeover threat. This indicates that even if the disciplinary force does not come from the product markets but from other channels, such as the market for corporate control, it can still affect the gender promotion gap as long as it improves firm efficiency.

While in this Section 1 show that the alternative hypotheses are unlikely to be the driving force behind my results, I caveat that I cannot categorically rule out the possibility that competition affects the gender promotion gap through a mechanism other than diminishing discrimination.

**Table 11**  
**Promotions and takeover threat.**

This table reports the linear probability model estimates of the promotion indicator regressed on the interaction terms between the female indicator and takeover variables. The sample consists of executives at the corporate rank of vice president or above in listed U.S. firms from 2000 to 2021. The sample excludes takeover targets. *Promotion* is a dummy variable that equals one if an executive moves to a higher rank position within the same firm. *Female* is a dummy variable that equals one if an executive is female. *N<sup>o</sup> takeovers* measures the number of takeover events in an industry divided by 10. *N<sup>o</sup> takeovers (ln)* is the natural logarithm of *N<sup>o</sup> takeovers*. Variable definitions are in Appendix 1. All regressions include firm, year, function, and rank fixed effects. t-statistics are calculated with standard errors clustered at the industry level.

Takeover threat	Dependent variable = Promotion			
	<i>N<sup>o</sup> takeovers</i> (1)	<i>N<sup>o</sup> takeovers</i> (2)	<i>N<sup>o</sup> takeovers (ln)</i> (3)	<i>N<sup>o</sup> takeovers (ln)</i> (4)
Female	-0.010*** (-9.703)	-0.020*** (-4.555)	-0.010*** (-9.038)	-0.021*** (-4.737)
Takeover threat	-0.000 (-0.174)	-0.001 (-0.230)	-0.006 (-0.864)	-0.007 (-0.921)
Female * Takeover threat	0.004** (1.978)	0.004* (1.907)	0.007* (1.702)	0.008* (1.825)
MBA		0.003*** (3.801)		0.003*** (3.794)
Ivy League		0.009*** (7.262)		0.009*** (7.261)
Inside dir		0.055*** (15.163)		0.055*** (15.160)
Age		0.087*** (11.950)		0.087*** (11.947)
Age squared		-0.010*** (-13.791)		-0.010*** (-13.787)
CEO exp		0.003* (1.828)		0.003* (1.825)
Industry exp		-0.001 (-1.195)		-0.001 (-1.196)
Firm tenure		0.005*** (4.342)		0.005*** (4.338)
CFO		0.032*** (8.827)		0.032*** (8.828)
COO		0.084*** (18.021)		0.084*** (18.023)
Total assets		0.003** (2.553)		0.003** (2.583)
Female * Total assets		0.001** (2.320)		0.001** (2.391)
Observations	481,985	481,985	481,985	481,985
Adjusted R-squared	0.028	0.035	0.028	0.035

\* Denote statistical significance at the 10%.

\*\* Denote statistical significance at the 5%.

\*\*\* Denote statistical significance at the 1%.

## 5. Conclusion

Women make up nearly half of the labor force. Yet in 2023, only 8% of CEOs in the largest U.S. companies were female.<sup>16</sup> Using a newly available dataset from BoardEx, I study whether and why there is a gender gap in executive promotions.

My research uncovers a significant gender gap in executive promotions within publicly listed U.S. companies. The gender promotion gap is lower in firms facing intensified product market competition. It also declines with increased public attention to gender equality and in firms fostering a respectful culture and board gender diversity. Taken together, my results point to the enduring prospect of discrimination in high-profile positions, although it is not the only factor at play. This disparity also partly arises from the limited experience of female executives in roles that entail profit-and-loss responsibilities.

The study highlights factors that could alleviate discrimination. Some interventions need not be new. Enhancing firm efficiency through market-based disciplinary forces, such as encouraging competition in the product markets, can also foster gender diversity among corporate leaders.

### CRedit authorship contribution statement

**Jing Xu:** Writing – review & editing, Writing – original draft, Visualization, Validation, Software, Resources, Project administration, Methodology, Formal analysis, Data curation, Conceptualization.

<sup>16</sup> <https://www.catalyst.org/research/women-ceos-of-the-sp-500/>

## Declaration of Generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author used ChatGPT in order to copy editing. After using this tool/service, the author reviewed and edited the content as needed and takes full responsibility for the content of the publication.

## Appendix A. Variable definitions

Variable	Definition	Source
<b>Executive characteristics</b>		
Age	Age of an executive divided by 10	BoardEx
Age squared	Age squared after being divided by 10	BoardEx
CEO	Dummy variable: 1 if an executive is Chief Executive Officer. 0 otherwise.	BoardEx
CEO experience	The number of years that the executive worked in CEO positions divided by 10.	BoardEx
CEO turnover	Dummy variable: 1 if a firm changes CEO. 0 otherwise.	BoardEx
CFO	Dummy variable: 1 if an executive is Chief Financial Officer. 0 otherwise.	BoardEx
COO	Dummy variable: 1 if an executive is Chief Operating Officer. 0 otherwise.	BoardEx
Rank	A set of dummy variables including VP, SVP, EVP, president, CEO and rank unspecified	BoardEx
EVP	Dummy variable: 1 if an executive is executive vice president. 0 otherwise.	BoardEx
Female	Dummy variable: 1 if an executive is female. 0 otherwise.	BoardEx
Firm tenure	The number of years that an executive worked in the firm divided by 10	BoardEx
Functional area	A set of dummy variables including accounting, administration, finance, general manager, HR, IT, legal, marketing, operations, PR, R&D, sales, secretary, and strategy.	BoardEx
Industry experience	The number of years that the executive worked on full time positions in the industry divided by 10, including experience in private firms. Industry is defined as FTSE international industry classification, the classification in BoardEx.	BoardEx
Inside director	Dummy variable: 1 if an executive is an inside director. 0 otherwise.	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
President	Dummy variable: 1 if an executive is president. 0 otherwise.	BoardEx
Promotion	Dummy variable: 1 if an executive moves to a higher rank position within the same firm. 0 otherwise.	BoardEx
Promotion (internal & external)	Dummy variable: 1 if an executive moves to a higher rank position within or outside the firm or if an executive moves to a same rank position in a company whose firm size is at least twice as large as the executive's prior firm. 0 otherwise.	BoardEx
Rank unspecified	Dummy variable: 1 if an executive's rank is not specified. 0 otherwise.	BoardEx
SVP	Dummy variable: 1 if an executive is senior vice president. 0 otherwise.	BoardEx
Turnover	Dummy variable: 1 if an executive departs from the firm. 0 otherwise.	BoardEx
VP	Dummy variable: 1 if an executive is vice president. 0 otherwise.	BoardEx

## Firm characteristics

Pct female executives (industry)	The number of female executives in the industry/the number of executives in the industry	BoardEx
Pct female dirs	The number of female directors/the number of directors	BoardEx
Pct female outside dirs	The number of female outside directors/the number of outside directors	BoardEx
3 female dir.	Dummy variable: 1 if a firm has three or more female directors. 0 otherwise.	BoardEx
SVI	Google search volume index on the term “gender equality”	Google
N <sup>o</sup> takeovers	The number of takeover events in a industry divided by 10	SDC
HHI	Industry concentration	Hoberg–Phillips Data Library
Similarity	Total product similarity	Hoberg–Phillips Data Library
Fluidity	Product market fluidity	Hoberg–Phillips Data Library
High comp. (HHI)	Dummy variable: 1 if a firm’s HHI is below median in the year. 0 otherwise.	Hoberg–Phillips Data Library
High comp. (similarity)	Dummy variable: 1 if a firm’s product similarity score is above median in the year. 0 otherwise.	Hoberg–Phillips Data Library
High comp. (fluidity)	Dummy variable: 1 if a firm’s product market fluidity is above median in the year. 0 otherwise.	Hoberg–Phillips Data Library
Total assets	The natural logarithm of the total assets	Compustat

## Appendix B. Supplementary data

Supplementary material related to this article can be found online at <https://doi.org/10.1016/j.jcorpfin.2024.102680>.

## Data availability

The data that has been used is confidential.

## References

- Adams, R.B., 2016. Women on boards: The superheroes of tomorrow? *Leadersh. Q.* 27 (3), 371–386.
- Adams, R.B., Ferreira, D., 2009. Women in the boardroom and their impact on governance and performance. *J. Financ. Econ.* 94 (2), 291–309.
- Adams, R.B., Funk, P., 2012. Beyond the glass ceiling: Does gender matter? *Manage. Sci.* 58, 219–235.
- Altonji, J.G., Blank, R.M., 1999. Chapter 48 race and gender in the labor market. *Handbook Labor Econ.* 3, 3143–3259.
- Bagues, M., Sylos-Labini, M., Zinovyeva, N., 2017. Does the gender composition of scientific committees matter? *Amer. Econ. Rev.* 107 (4), 1207–1238.
- Becker, G.S., 1957. *The Economics of Discrimination*. University of Chicago Press, p. 167.
- Bell, L.A., 2005. Women-led firms and the gender gap in top executive jobs. Working paper.
- Benson, A.M., Li, D., Shue, K., 2023. Potential and the gender promotion gap. *Acad. Manag. Proc.* 2023 (1), 19580.
- Bertrand, M., Black, S.E., Jensen, S., Lleras-Muney, A., 2019. Breaking the glass ceiling? The effect of board quotas on female labour market outcomes in Norway. *Rev. Econ. Stud.* 86, 191–239.
- Bertrand, M., Chugh, D., Mullainathan, S., 2005. Implicit discrimination. *Amer. Econ. Rev.* 95 (2), 94–98.
- Bertrand, M., Goldin, C., Katz, L.F., 2010. Dynamics of the gender gap for Young professionals in the financial and corporate sectors. *Am. Econ. J.: Appl. Econ.* 2 (3), 228–255.
- Bertrand, M., Hallock, K.F., 2001. The gender gap in top corporate jobs. *Ind. Labor Relations Rev.* 55 (1), 3–21.
- Betton, S., Eckbo, B.E., Thorburn, K.S., 2008. Corporate takeovers. In: Eckbo, B.E. (Ed.), *Handbook of Corporate Finance: Empirical Corporate Finance*. Elsevier, pp. 291–430.
- Black, S.E., Brainerd, E., 2004. Importing equality? The impact of globalization on gender discrimination. *Ind. Labor Relations Rev.* 57 (4), 540–559.
- Black, S.E., Strahan, P.E., 2001. The division of spoils: Rent-sharing and discrimination in a regulated industry. *Amer. Econ. Rev.* 91 (4), 814–831.
- Blau, F.D., Kahn, L.M., 2017. The gender wage gap: Extent, trends, and explanations. *J. Econ. Lit.* 55 (3), 789–865.
- Bugeja, M., Matolcsy, Z.P., Spiropoulos, H., 2012. Is there a gender gap in CEO compensation? *J. Corp. Finance* 18, 849–859.
- Burns, N., Minnick, K., Netter, J., Starks, L., 2022. Gender pay gap across cultures. Working paper.
- Buser, T., Niederle, M., Oosterbeek, H., 2014. Gender, competitiveness, and career choices. *Q. J. Econ.* 129 (3), 1409–1447.
- Catalyst, 2004. Women and men in U.S. corporate leadership: Same workplace, different realities?. Report.
- Duchin, R., Simutin, M., Sosyura, D., 2020. The origins and real effects of the gender gap: Evidence from CEOs’ formative years. *Rev. Financ. Stud.* 34 (2), 700–762.
- Eagly, A.H., Carli, L.L., 2003. The female leadership advantage: An evaluation of the evidence. *Leadersh. Q.* 14 (6), 807–834.
- Eagly, A.H., Carli, L.L., 2007. *Through the Labyrinth: the Truth About How Women Become Leaders*. Harvard Business School Press, Boston, MA.
- Eagly, A.H., Karau, S.J., 2002. Role congruity theory of prejudice toward female leaders. *Psychol. Rev.* 109 (3), 573–598.
- Egan, M., Matvos, G., Seru, A., 2022. When Harry fired Sally: The double standard in punishing misconduct. *J. Polit. Econ.* 130 (5), 1184–1248.

- Elkinawy, S., Stater, M., 2011. Gender differences in executive compensation: Variation with board gender composition and time. *J. Econ. Bus.* 63, 23–45.
- Ewens, M., Townsend, R.R., 2020. Are early stage investors biased against women? *J. Financ. Econ.* 135 (3), 653–677.
- Fernández, R., 2007. Women, work, and culture. *J. Eur. Econom. Assoc.* 5, 305–332.
- Francis, B.B., Hasan, I., Hovakimian, G., Sharma, Z., 2023. Gender pay gap in American CFOs: Theory and evidence. *J. Corp. Finance* 80, 102404.
- Fryer, R., 2007. Belief flipping in a dynamic model of statistical discrimination. *J. Public Econ.* 91 (5–6), 1151–1166.
- Galinsky, E., Salmond, K., Bond, J., Kropf, M., Moore, M., Harrington, B., 2003. *Leaders in a Global Economy: A Study of Executive Women and Men*. Families and Work Institute, New York.
- Gayle, G.L., Golan, L., Miller, R.A., 2012. Gender differences in executive compensation and job mobility. *J. Labor Econ.* 30 (4), 829–872.
- Geiler, P., Renneboog, L., 2015. Are female top managers really paid less? *J. Corp. Finance* 35, 345–369.
- Giannetti, M., Wang, T.Y., 2023. Public attention to gender equality and board gender diversity. *J. Financ. Quant. Anal.* 58.
- Giroud, X., Mueller, H.M., 2010. Does corporate governance matter in competitive industries? *J. Financ. Econ.* 95, 312–331.
- Giroud, X., Mueller, H.M., 2011. Corporate governance, product market competition, and equity prices. *J. Finance* 66, 563–600.
- Gneezy, U., Leonard, K.L., List, J.A., 2009. Gender differences in competition: Evidence from a matrilineal and a patriarchal society. *Econometrica* 77, 1637–1664.
- Goldin, C., 2014. A grand gender convergence: Its last chapter. *Amer. Econ. Rev.* 104 (4).
- Graham, J.R., Harvey, C.R., Rajgopal, S., 2005. The economic implications of corporate financial reporting. *J. Account. Econ.* 40 (1), 3–73.
- Greene, W., 2003. *Econometric Analysis*. Pearson Education.
- Guadalupe, M., Li, H., Wulf, J.M., 2014. Who lives in the C-Suite? Organizational structure and the division of labor in top management. *Manage. Sci.* 60 (4), 824–844.
- Guiso, L., Sapienza, P., Zingales, L., 2015. The value of corporate culture. *J. Financ. Econ.* 117, 60–76.
- Guo, X., Gupta, V.K., Mortal, S., Nanda, V., 2023. Gender and managerial job mobility: Career prospects for executives displaced by acquisitions. *J. Financ. Quant. Anal.* 1–41.
- Gupta, V.K., Mortal, S.C., Guo, X., 2018. Revisiting the gender gap in CEO compensation: Replication and extension of Hill, Upadhyay, and Beekun's (2015) work on CEO gender pay gap. *Strateg. Manag. J.* 39, 2036–2050.
- Helfat, C.E., Harris, D., Wolfson, P.J., 2006. The pipeline to the top: Women and men in the top executive ranks of U.S. corporations. *Acad. Manag. Perspect.* 20 (4), 42–64.
- Heyman, F., Svaleryd, H., Vlachos, J., 2013. Competition, takeovers, and gender discrimination. *Ind. Labor Relations Rev.* 66, 409–432.
- Hill, A.D., Upadhyay, A.D., Beekun, R.L., 2015. Do female and ethnically diverse executives endure inequity in the CEO position or do they benefit from their minority status? An empirical examination. *Strateg. Manag. J.* 36, 1115–1134.
- Hoberg, G., Phillips, G.M., 2016. Text-based network industries and endogenous product differentiation. *J. Polit. Econ.* 124 (5), 1423–1465.
- Hoberg, G., Phillips, G.M., Prabhala, N.R., 2014. Product market threats, payouts, and financial flexibility. *J. Finance* 69 (1), 293–324.
- Huang, R., Mayer, E.J., Miller, D.P., 2023. Gender bias in promotions: Evidence from financial institutions. *Rev. Financ. Stud.* 37 (5), 1685–1728.
- Kale, J.R., Reis, E., Venkateswaran, A., 2009. Rank-order tournaments and incentive alignment: The effect on firm performance. *J. Finance* 64 (3), 1479–1512.
- Kanter, R.M., 1977a. *Men and women of the corporation*. Basic Books.
- Kanter, R.M., 1977b. Some effects of proportions on group life: Skewed sex ratios and responses to token women. *Am. J. Sociol.* 82 (5), 965–990.
- Keloharju, M., Knüpfer, S., Tåg, J., 2022. What prevents women from reaching the top? *Financial Manag.* 51 (3), 711–738.
- Kramer, V.W., Konrad, A.M., Erkut, S., 2006. Critical mass on corporate boards: Why three or more women enhance governance. Wellesley Centers for Women.
- La Porta, R., Lopez-De-Silanes, F., Shleifer, A., 1999. Corporate ownership around the world. *J. Finance* 54 (2), 471–517.
- Li, K., Mai, F., Shen, R., Yan, X., 2021. Measuring corporate culture using machine learning. *Rev. Financ. Stud.* 34, 3265–3315.
- Masulis, R.W., Mobbs, S., 2011. Are all inside directors the same? Evidence from the external directorship market. *J. Finance* 66 (3), 823–872.
- McKinsey, 2017. *Women in the workplace*.
- Newton, D., Simutin, M., 2015. Of age, sex, and money: Insights from corporate officer compensation on the wage inequality between genders. *Manage. Sci.* 61 (10), 2355–2375.
- Niederle, M., Segal, C., Vesterlund, L., 2013. How costly is diversity? Affirmative action in light of gender differences in competitiveness. *Manage. Sci.* 59 (1), 1–16.
- Niederle, M., Vesterlund, L., 2007. Do women shy away from competition? Do men compete too much? *Q. J. Econ.* 122 (3), 1067–1101.
- Niessen-Ruenzi, A., Ruenzi, S., 2019. Sex matters: Gender bias in the mutual fund industry. *Manage. Sci.* 65 (7), 3001–3025.
- Pande, R., Ford, D., 2012. *Gender quotas and female leadership: A review*. Background paper for the world development report on gender.
- Pikulina, E., Ferreira, D., 2023. *Subtle discrimination*. Working paper.
- Schwartz-Ziv, M., 2017. Gender and board activeness: The role of a critical mass. *J. Financ. Quant. Anal.* 52, 751–780.
- Smith, N., Smith, V., Verne, M., 2013. Why are so few females promoted into CEO and Vice President positions? Danish empirical evidence, 1997–2007. *Ind. Labor Relations Rev.* 66 (2), 380–408.
- Tate, G., Yang, L., 2015. Female leadership and gender equity: Evidence from plant closure. *J. Financ. Econ.* 117 (1), 77–97.
- Veito, J.P., Khan, W.A., 2012. Executive compensation and gender: S&P 1500 listed firms. *J. Econ. Finance* 36, 371–399.