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IZA DP No. 17401

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Emma von Essen
Uppsala University

Nina Smith
Aarhus University, IZA and CESifo

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IZA – Institute of Labor Economics

Schaumburg-Lippe-Straße 5–9
53113 Bonn, Germany

Phone: +49-228-3894-0
Email: publications@iza.org

www.iza.org

ABSTRACT

Do Women on Boards Matter? Network and Spillover Effects on Gender Gaps within Firms*

The paper explores the impact of the gender composition of Boards of Directors on gender diversity and earnings gaps among executive management using administrative data on all Danish private sector firms from 1995 to 2018. We find that it is not the quantity of women directors but the quality of the women entering the board that matters in generating positive spillovers on the gender gaps within the firms. Quality is viewed as the power, conceptualized as the possible influence in the boardroom, and operationalized as the position and board experience of the directors. A way of channeling power is also through the director's networks. Powerful women directors increase spillovers, while male directors have a negative impact. However, male directors' connections to females positively decrease the gender gaps. Interestingly, the spillovers are not large enough to generate a sustained change in the gender composition of the executive board, mainly because women executives exit to a larger extent than men.

JEL Classification: J16, M12, M51
Keywords: board of directors, gender diversity, spillover effects

Corresponding author:
Nina Smith
Department of Economics and Business Economics
Aarhus University
Fuglesangs Allé 4
8210 Aarhus V
Denmark
E-mail: nsmith@econ.au.dk

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I. Introduction

Western corporate and political worlds have focused on bringing more women into decision-making positions in the past decade. Besides the argument of creating equal opportunities for men and women, increasing women in top positions can also lead to other potential benefits for the firm. One argument for increasing the number of women on the Board of Directors (BoD) relates to firm productivity. The talent pool is much larger when board appointments are drawn from all genders, which in turn may generate positive firm performance effects (Terjesen et al., 2009; Martínez-Jiménez et al., 2020). Such performance effect may come from more independent directors (Adams and Kirchmaier, 2016; Benkraiem et al., 2017; Poletti-Hughes and Martinez Garcia, 2022), more effective work at the board (Nielsen and Huse, 2010), a higher meeting attendance, (Adams and Ferreira, 2009), and broader perspectives and resources (Hillman et al., 2002). Another argument concerns the expectation that more women on the ultimate level of decision-making at the firm–board of directors–reduces gender gaps at the other levels. This is often labeled spillover or trickle-down effects (e.g., Biswas et al., 2023). Following regulations of good corporate governance (Smith, 2018), the board of directors in many Western countries, including the U.S., has the responsibility of hiring and firing people at the highest level of management at the firm (executives) as well as setting their salaries.

A small but growing literature looking at the effects of the gender composition of the board of directors on gender equality within the firm (e.g., Kirsch, 2018), shows mixed results depending on country and policy context (Matsa and Miller, 2011; Kunze and Miller, 2017; Fedorets and Gibert, 2022). Recently, several countries have used quota policies to get more women into top positions. Norway was among the first countries to introduce binding gender quotas for board of directors in 2008, but other countries followed (Italy, France, Germany, Finland, and Iceland, among others). The purpose of

gender quotas is to provide a fast track for increasing the representation of women on the board (Hughes et al., 2017), and this change is expected to spillover to other levels of the firm. Quota policies are typically set for the largest listed firms, which constitute a small fraction of all firms and thus directly affect a relatively small number of women. Suppose more gender diversity on boards reduces gender gaps at lower levels in all firms. In that case, it can be an important intervention for regulating gender diversity across a broader set of firms. Also, spillover effects assume that female board members have the power to influence the decisions concerning gender disparities in salaries and hiring decisions for executive management. Still, our knowledge of how such spillovers operate is limited.

This paper explores the nature of the spillover effects of a more diverse gender composition of the Board of Directors on the gender gaps in representation and earnings of the C-suite in a broad set of firms. To this end, we use administrative data covering all Danish medium-sized and large private-sector companies from 1995 to 2018. First, we explore the quantity aspect, how the number of women on boards impact the gender composition of the C-suite, female CEOs, and the gender gaps in earnings. In this respect, we investigate whether women only one woman on the board becomes a token with less power, suggesting a need for a more significant number of women (relative to men) to reach a 'critical mass' of women to influence board decisions (Kanter, 1977). Alternatively, women may, in general, not help other women or even block other women from entering decision-making positions (Derks et al., 2016), implying that more women directors will not lead to positive changes in gender gaps at other levels of the firm. Second, we probe the quality aspect by exploring if and how the power of women directors matters for spillover effects. Drawing on the theoretical framework of the structural constraint of women's power on corporate boards (Terjesen et al., 2009; Ibarra, 1992), we investigate the following specific channels of power that may underlie potential spillovers at a firm: i) the professional position or experience of the firm's directors, such as cur-

rently being the CEO in another firm. ii) the size of the professional networks of female and male directors. In addition, we explore the direct connections between appointed C-suite members and the board of directors.

We show that even having only one woman on the BoD has a significantly positive relation to i) the female share of the executive board, ii) the chances of having a female CEO in the firm, iii) and a negative relation to the gender gap in pay among the executives. This suggest little indication of a token effect and no aggregate signs of queen be syndorme. More important, we show that it is not only a matter of the number of female board members. Women directors with power through their positions and board experience matter more for spillovers than other women directors. Power in the boardroom also manifests through the network connections that women and men directors have to other directors and top executives throughout their careers. The size of the network of female board members and their direct connection to appointed executives seems to enforce the relations between the number of female members of BoD and the gender gaps in the executive suite in the current period. These spillover effects are not large enough to change diversity among executives over time. We argue that it is due to the higher exit rate of female executives compared to their male counterparts. The key conclusion is that the 'quantity' of gender diversity matters, i.e., the number or share of female members on BoD. But 'quality,' i.e., the power and network of female board members, is also important, and when including both 'quantity' and 'quality' in the analysis of spillover effects from BoD to C-suite, the 'quality' effects seem to dominate.

Our study contributes with new evidence on how and when female board members may matter for gender-progressive spillover effects using a diverse range of firms (family firms and other non-listed companies). The paper probes the power of the BoD by examining top positions and professional experience. Our comprehensive data allows us to delve into detailed information on all network ties between board members and between board members and executive members.

II. Spillover effects in previous social science literature

The empirical analysis presented in this study is based on Danish data, where a dual-tier board system is the norm. In firms with a one-tier system, the executive board members are also dependent members of the supervisory board, while in firms using a dual-tier system, the supervisory board does not include executives of the same firm. In a one-tier system, the supervisory board members have more direct interaction with lower-level managers and a more direct influence on pay systems and promotions compared to a dual-tier system (Sondergeld and Wrohlich, 2023). In a dual-tier system, the relation between gender board composition and gender gaps at lower levels in the company goes via the supervisory board's influence on the gender composition of the executive board. Many other empirical studies document a significantly positive relationship between female representation in the C-suite and female positions and salaries at lower organizational levels (Bell, 2005; Cook and Glass, 2015; Kunze and Miller, 2017; Ng and Sears, 2017; Egan et al., 2022). A potential positive relationship between women on supervisory boards and executive boards will indirectly imply decreased gender gaps in the labor market.

Most quantitative empirical studies estimate the impact of the number or share of women on the board of directors on the gender of the CEO or share of women in the executive board focus primarily on one-tier firms. Although most studies in this literature violate assumptions for causal relationships, we use the word 'impact' in this section. Among the first studies are Bell (2005) and Bilimoria (2006), which found a positive correlation between the number of females on U.S. board of directors and the female share of executives and high earners in the company. These results are also found among US S&P 1500 companies for the years 1997-2009 (Matsa and Miller, 2011). They find a significantly positive relationship between the female share of board members and the female share of the top 5 earners in the company, a female CEO, and the female

share of payments among top earners after controlling for firm and industry fixed effects. In a smaller sample for 2005 of Fortune 1000 firms with headquarters in Texas Skaggs et al. (2012) found the same results, so do Gould et al. (2018) for Australia and Kim and Kim (2023) for South Korea. A few studies suggest that more women on the board are associated with a lower gap in remuneration of executives (Elkinawy and Stater, 2011; Shin, 2012) and lower level management (Kunze and Miller, 2017). Especially female directors who are members of the board's nomination committee seem to be important for these spillover effects (Guldiken et al., 2019; Bozhinov et al., 2021).

Hensvik (2014) found a negative association between more executive women and the gender wage gaps further down in Swedish organizations, explained partly by females to a larger extent than male managers seem to hire more high-skilled and high-wage women. Kunze and Miller (2017) also saw a positive spillover effect of the share of women in higher levels on promotions into lower-level positions in Norway, as did Bozhinov et al. (2021) find for Germany. However, the vast majority of studies looking at spillovers from supervisory boards in Europe explore the introduction of a binding gender quota for the board of directors (Hughes et al., 2017). Norway, which uses a two-tier system, was the first country to introduce such a quota for listed firms in 2008, and the spillover effects on the gender gaps for top executives or managers at lower levels in the companies, including pay gaps, were found to be small (Bertrand et al., 2019).[1] The same results were found when Italy, although mainly one-tier firms, introduced their step-wise quota in 2011 (Maida and Weber, 2022). Flabbi et al. (2019) studied the same quota and found a positive gender spillover effect on earnings for managers at higher levels but negative effects for lower levels in the companies. In Germany, there was a negative effect on the representation of women in executive boards after the quota had increased the share of

[1]The increase in the share of female board members mainly took place in the period 2006-2008 before the quota was put into force, and the data period for the evaluation of the potential spillover effects ended in 2014. One might argue that this is a too short period for evaluating the spillover effects on gender gaps in the labor market, and the long-run effects may be more positive than those found in Bertrand et al. (2019).

female board members (Fedorets and Gibert, 2022). One may argue that imposing a quota that forces the number of women on the board to increase introduces different underlying behaviors generating spillovers compared to behaviors generating spillovers among firms that operate under no quota restriction.

It can be that the supposition that women in top positions help other women is incorrect. Women on corporate boards may also identify with the higher-status group of men rather than their own gender (Chattopadhyay et al., 2004). If females in top positions face negative stereotypes, they may feel threatened in their professional role and less prone to promote other women (Duguid et al., 2012; Derks et al., 2016; Corwin et al., 2022). Distancing from one's own group (the 'queen bee syndrome') with women actively blocking other women from advancing can be a response to gender inequality within the organization (Derks et al., 2016). In Sweden and Denmark, Adams and Kirchmaier (2016); Adams and Funk (2012) and Smith et al. (2021) find that female top managers have significantly more masculine behaviors than other women in the firm. Besides the effect of not helping other women, they may also discourage other women from aspiring to reach the top. If women on boards behave like their male peers, some females in other positions may see a professional role in power as less attractive if perceived as masculine and conflicting with their own identity as a (more feminine) woman, and not seek top positions (Eagly, 2003). More women on the corporate board would in this context lead to negative spillover effects.

III. Theoretical framework of channels for spillovers

The theoretical literature points to a number of explanations for *positive spillovers* between the gender of the board of directors and the gender of the CEO and other C-suite members.

In most contexts, we tend to associate and bond with people who are similar to us,

homophily or similarity-attraction (Byrne, 1971). How we interact and who we attend to in work-related environments are often characterized by homophily, and ascribed characteristics like sex and age often guide and structure such divides (McPherson et al., 2001). When a woman has entered a top position, she can, deliberately or without intention, help women reach positions at lower levels of the organization or firm. There are different ways to help that will generate spillover effects–increasing women's chances of getting a position in the C-suite and receiving a pay closer to their male peers. The theories on social identity and self-categorization suggest people act consistently with their social group, and gender is a particularly salient group. Identification with the group by perceiving similarities between themselves and the members of the group may lead to in-group favoritism (e.g. Turner and Reynolds, 2011; Turner and Hogg, 1987). That women prefer to work with other women is also consistent with discrimination theory (Becker, 2010; Phelps, 1972) and theories on homophily in the institutional structures of organizations and how influence is formed within institutions and firms (Brass, 1985; Ibarra, 1992).

Discrimination and influence can be channeled through for example role models. Women can help other women reach top positions through mentoring. Incumbent male directors do not mentor female candidates to the same extent as their male peers (Singh and Vinnicombe, 2004; McDonald and Westphal, 2013). Mentoring adds job-specific knowledge and can become a fast track into the hierarchies of the firm. Another possibility is that men and women are treated differently due to imperfect knowledge and stereotypes about women's abilities, i.e., statistical discrimination (Phelps, 1972; Aigner and Cain, 1977). In particular, women in expert positions are considered less competent than their male peers when their abilities are evaluated (e.g. de Vaan and Stuart, 2022). If female directors have less gender stereotypical attitudes and unconscious bias in their performance evaluations, women on boards may facilitate the appointment of other women.

Assuming women wish to help other women to reach top positions, what would prevent them? A woman entering the board of directors as part of a minority group may become a token. The token theory suggests that the relative number of women to men matters in top positions of an organization (Kanter, 1977). Only one woman among male board members will be too visible and controlled by others. She is, therefore, not expected to be powerful in the boardroom. This suggests that female directors are not influential in their own right but only if more women are on the board (Konrad et al., 2008; Joecks et al., 2013), i.e., the number or share of women has to pass a critical mass level.

However, recent literature suggests that female directors helping other women is not about the presence of other women on the boards (Kirsch, 2022). Drawing on interviews Kirsch (2022) claims that female directors who take action supporting other women are experienced directors. The nature of spillovers is likely a question of quality of the board members. Quality, viewed as power to influence in a boardroom setting may arise from the director's resources in combination with the institution of the firm. The decision processes in the boardroom can be viewed as a power games where it is crucial to understand the rules of the games and make alliances with the powerful board members to be influential (Huse and Solberg, 2006). The key question concerning what constitutes the power of a board member is an empirical issue but professional background, experience as a top manager, and professional network may be candidates. A chairman of the board is often powerful; they typically also sit as the head of the nomination committee, which makes appointment decisions for the CEO and new board members. A female chairman is important for the female influence of board decisions concerning executive board appointments (Guldiken et al., 2019; Bozhinov et al., 2021; Corwin et al., 2022).

Professional or social networks brought to the board are an important determinant of influence in the boardroom (Stevenson and Radin, 2009), and are viewed as an essential

competence as a director (Zhu and Westphal, 2014). Taking a structured and behavioral perspective, social networks are theorized and empirically found gendered and connected to gender inequality (Brands et al., 2022). In the context of top positions in the labor market, networks can be seen as an integrated form of how institutions shape influence (Ibarra, 1992), and connections to powerful individuals generate influence within the organization (Ibarra, 1993). This implies a view of the power of networks as a shift of focus from social categories, such as gender and race, in understanding social structure to probing the nature of the social contacts of individuals and exploring the potential impact on life chances (Pescosolido, 2006).

There is not one single theory of networks (Knoke, 1990). One of the common nominators of network theory in social science is that networks are seen to bridge the micro and the macro—the social actor and the social structure. In the context of top positions on corporate boards, we narrow the perspective to the network regarded as a powerful resource, both in size and composition (Ibarra, 1993). Thus, the network is a form of social capital (Coleman, 1990), emphasizing the positive part of social interaction. In the boardroom context, the network indicates a possible utilization of position and experiences. Women are typically not part of men's networks and thus not part of the network of top positions in firms (Brass, 1985; Ibarra, 1993). Ibarra (1992, 1993) claim that female and male professional networks look and operate differently, with women's networks being less effective in receiving and retaining power in the labor market. Female directors who are well-connected to other powerful (most often male) directors can avoid stereotype biases in the boardroom (Westphal and Milton, 2000). This argument is in line with von Essen and Smith (2023) who find that having a large number of network connections, especially ties to CEOs, both the CEO in the company and CEOs in other companies or other C-suite members is a central determinant for getting a board position in the first place.

When female board members constitute a minority in the boardroom, it may be too

risky for them to advocate for other women. However, women considered powerful by others and themselves may feel less threatened by negative female stereotypes (Corwin et al., 2022). According to a recent qualitative cross-country study of listed companies by Wiersema and Mors (2023), female board members, at least in listed companies are aware of the formal and informal board processes and rules which make them powerful in the boardroom. A recent working paper suggests that larger listed companies with more professional recruitment processes are much more in the 'public eye' than smaller or family-owned companies (Timmermans et al., 2023).

To understand the association between women on corporate boards and women executives within the firm, we probe the issue of the resources of the female directors that they may use to execute power in the boardroom. We focus on resources such as having the position of an executive manager at another firm and experience and tenure of other and current supervisory boards. Further, we study the effect of the board members' network as power in the board room, guiding the spillover effects.

Power is a concept that has many definitions and may create confusion. We follow Granovetter (2017, p.91-134) in his analysis of power in the economy when considering the definitions of power in the boardroom. He uses Weber's definitions, stating that "Power can be defined as every *Chance*, within a social relationship, of enforcing one's will even against resistance, whatever the basis for this *Chance* might be." Weber (2019, p.134). The factors we explore–positions, experience, and professional networks–are all considered to generate a high probability of enforcing one's will in the boardroom context, assuming women, on average, wish to help other women.

IV. Social and institutional context

Like many other euopean countries, Denmark is a country with many small and medium-sized companies with less than 250 employees. Many of them are family-owned and

family-led. In 2021, there were 178,000 private sector companies in Denmark, but only 4,800 companies had more than 50 employees, and only about 870 firms had more than 250 employees (www.statistikbanken.dk). Currently, 145 companies are listed on the Copenhagen Stock Exchange (www.npinvestor.dk). Most Danish non-listed (about two-thirds) and all listed companies have a dual board system in which the board of directors is the highest authority in the company and none of the executive board members (CEO and other top executives) are included in the supervisory board (Oxelheim et al., 2013). However, in smaller, often family-owned firms, the CEO may also be chairman of the board of directors. Family-owned companies constitute a substantial share of private-sector companies in Denmark (von Essen and Smith, 2023; Bennedsen et al., 2007).

All corporate firms are obliged to have a board with at least 3 board members elected at the general assembly. The law also regulates the number of employees elected board members, which in most firms constitutes a significantly higher share of female board members. In our analysis, we exclude the employee-elected board members (EEBM) since they abide by a different recruitment process and have another status in the board-room compared to other directors. Elected board members have less power on the board and are not considered to have a top position. EEBM may also affect the gender diversity in the firm, but likely through other mechanisms. In Germany, employees elected board members tend to have much lower spillover effects on female representation compared to female shareholder representatives (Bozhinov et al., 2021), and in Norway (Kunze and Scharfenkamp, 2022), the quota decreased the impact of employee-elected members on gender diversity.

Since 2008, Denmark introduced regulations for good corporate governance, including recommendations concerning gender diversity on the board of directors (Smith, 2018). Many other countries, including the U.S., introduced such regulations around the same time.

Formal quota regulations have been a political issue in recent decades, but contrary

to other EU countries, Denmark has not adopted binding gender quotas for the board of directors. In 2012, a flexible quota was put into force regulating around 1100 of the largest Danish companies (in 2021, about 2400 companies, www.erhvervsstyrelsen.dk) to set ambitious targets for the female share on boards of directors and the executive boards (Gregorič and Hansen, 2017). The annual reports for the companies covered by the law have to include figures on female shares in management positions and information on the actions or policies that the company has taken to fulfill the law's intention. Importantly, there are no sanctions if the firms do not comply with the law. However, in 2026, listed companies operating within the European Union will need to have 40% of the underrepresented sex among the non-executive board members.

V. Data and measures

We use administrative register data from Statistics Denmark. The data span 1995-2018 and comprise information on all firms in the Danish labor market, their respective employees' work histories, and matched information on their directors. Data on the firms' board members is provided by the Danish Business Authority (Erhvervsstyrelsen). In 2018, 27,412 firms had a formal board of directors. We restrict it to firms with at least 50 employees to generate a relevant sample. This excludes firms without regular business activity, such as holding companies. Also, public sector firms are not included in our sample since they differ in many respects from corporate firms, particularly in their recruitment of managers. Finally, we only include firms where we can identify a CEO and other members of the executive management (C-suite).[2] This leaves us with 3,190 firms in 2018, which employ 769,685 employees. In total, the dataset includes 63,929 year-observations of firms.

[2]We include firms with an executive board consisting of only 1 person, the CEO, which are typically smaller firms. CEO is defined using DISCO codes 121, 1210, 121000-121020. Other top executives are defined as 122-123, 1220-1239, 122000-123900. Lower levels of management are defined as all occupations starting with the digit 1 but not in a CEO or other top executive (https://dst.dk/en).

Throughout the paper, we use the terminology C-suite, executive management and executive board interchangeably to denote the group of CEOs and other top executives.

Table (1) Number of firms in our sample and the number of their employees.

	1995	2007	2018
All firms with a supervisory board (BoD)	22,082	32,519	27,412
Firms with at least 50 employees	2,873	4,111	3,758
Number of private sector firms	2,841	4,041	3,676
Number of firms with an executive board (C-suite)	2,376	3,088	3,190
Number of people employed at these firms	512,630	751,400	769,685

Note. In the table, we subsequently restrict the sample of firms.

Outcome measures: We focus on spillover effects on the gender composition and the gender gap in earnings in the executive board in the current period. The composition is defined as the share of women in the C-suite of the firm each year. As an additional outcome, we use a binary indicator of whether the firm has a female CEO. The earnings of each executive board member are the total earnings, including bonuses, registered by the tax authorities during the year. We exclude pension payments from the firm, non-taxable fringe benefits, stock options, etc., on which we cannot get reliable information (Smith et al., 2013). The gender gap in earnings is defined as 1 minus the ratio of female earnings to male earnings.

Main explanatory measures: To capture the token aspect of spillovers and non-linearities, we generate a set of variables of the firm reflecting the amount of women on the board of directors at a point in time. We create four dichotomous variables: firms with i) no women on their board of directors in a given year, ii) 1 female on the board in a given year, iii) 2 females on the board in a given year, and iv) at least 3 females on the board in a given year. In sensitivity estimations, we compress these indicator variables into two continuous variables: the share of women on board and the squared value of this variable.

To capture the power of the board of directors in the boardroom, we generate variables of director position and experience as well as the size of the network. The following four variables capture position and experience: i) a dichotomous variable indicating

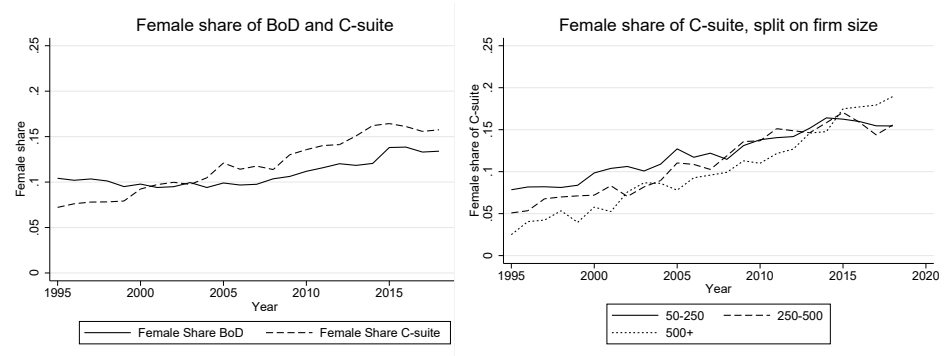
whether the supervisory board of the firm has a female chairman at a given time point, ii) the share of female and male BoD who are C-suite members of other firms at a given time point, iii) the years of experience as a board member at a given time, and iv) years of experience at the current board at a given time point. The measure of professional networks is a count of the number of connections each female and male board member has at a given time. The professional network is a combination of a cumulative count at a given time point of all the connections an individual has to top executives (CEOs and Other top executives) in his or her past and present primary workplaces and the number of connections to other board members in all the boards where the individual sits as a director at that time. The variable thus captures the average number of connections among female and male directors per firm and year.

We also use the following *additional control variables* in most specifications: i) whether the firm is listed, ii) whether the firm is family-run, iii) the age of the firm, iv) the number of employees, v) the size of the board, and vii) whether the firm has a two-tier system. Appendix A, Table 10 shows sample means and standard deviations of all these variables. In the specification with industry fixed effects, we use 10 dummy variables depicting the industry sector (classification). A firm is considered family-run if two or more family members are on the board of directors or in the executive suite. We consider parents, children, married couples, siblings, and cousins as family.

VI. Descriptive statistics

The development of women on the Board of Directors and women in the C-suites have, since the mid-2000s, been increasing at about the same rate. Panel a) in Figure 1 suggests that the slopes are similar. Panel b) shows an increase in the share of female C-suite members among firms of any size. However, the starkest increase is found among the largest firms. For the female share of BoD, the increase occurred mainly in medium

and large-sized firms (Panel c). Among small firms with less than 250 employees, which constitute the majority of Danish companies, the female share in BoD has been fairly stable, around 12 pct. The increasing share of women on BoD in larger firms may partly reflect the public and political discussion on quotas of women on BoD, which was, to some extent, initiated by the Norwegian government. In 2012, the regulation required the largest Danish firms to publish (non-binding) goals for their female representation in both C-suite and BoD (Smith et al., 2013; Smith, 2018). Finally, Panel d) shows that the gender earnings gap in the executive suite is decreasing, with the most notable decrease in the largest companies since 2015. However, only firms with both genders represented in the executive suite are, by definition, included. A closer look at the number of firms with both men and women in the C-suite does not explain the decreasing earnings gap. Thus, there seems to be equalization of earnings between male and female top executives since 1995, especially in the largest firms.



(a) Panel a

(b) Panel b

(c) Panel c

(d) Panel d

Figure (1) The share of women on BoD, C-suite, CEOs and gender earnings gap in C-suite, 1995-2018.

The graphs in Figure 1 hide that most firms in the Danish private sector do not have any women on their boards. See Table 2. In 1995, this was the case for 67 pct. of the firms, and in 2018, 63 pct. of the firms still had no women on BoD.

Table (2) Distribution of firms by number of female board members (percentages)

	1995	2007	2018
	Share of firms	Share of firms	Share of firms
0 Women on the BoD	67.34	68.85	62.88
1 Women on the BoD	24.24	22.77	26.49
2 Women on the BoD	6.78	6.99	7.40
3+ Women on the BoD	1.64	1.39	3.23
Total	100	100	100
Observations	2376	3088	3190

VII. Empirical Approach

To estimate potential spillover effects from the gender composition of the board of directors to the composition and the earnings gap in the executive board, we use linear regression models that exploit the panel structure of data covering the period 1995-2018. The decision process to appoint a C-suite member typically takes a number of months before they begin their new position. To account for the time difference, we estimate the gender composition of the BoD in the previous period to when a new C-suite member starts their position. We use three models: a pooled OLS including year dummies (time fixed effects), a model adding industry dummies (industry fixed effects), and finally, a model adding firm fixed effects (firms fixed effects). When presenting the results, we focus on the two latter models that add another layer of fixed effects separately to exploit different variations in the panel.

Our time and industry-fixed effects and time and firm fixed effects eliminate the impact from the time-constant unobserved firm and industry variables. There may still

be unobserved firm variables that vary over time, which may bias the results, and there may be unobserved industry and firm variables that covary (Kropko and Kubinec, 2020; De Chaisemartin and d'Haultfoeuille, 2022). Although we cannot fully account for potential endogeneity effects, such as reverse causality, we introduce different specifications that partly account for that. There may also be endogeneity due to unobserved variables impacting outcome variables and board composition. When we sometimes use the term 'effects' when interpreting the results, we are aware that part of the underlying assumptions of causality may not be fulfilled.[3]

Our baseline specification is:

$$Y_{\jmath,t} = \alpha + \beta_1 WoB1_{\jmath,t-1} + \beta_2 WoB2_{\jmath,t-1} + \beta_3 WoB3_{\jmath,t-1} + X'_{\jmath,t}\delta + \theta_\jmath + \gamma_t + \epsilon_{\jmath,t} \quad (1)$$

where $Y_{\jmath,t}$ is the outcome variable for firm $\jmath$ at year t (female CEO, female share of C-suite, gender earnings gap in C-suite), $WoB1_{\jmath,t-1}$,$WoB2_{\jmath,t-1}$, and $WoB3_{\jmath,t-1}$ are indicator variables for firm $\jmath$ at year t-1 having 1, 2 or 3 or more women on their board of directors in year t (indicator for 0 women is the reference category). $X_{\jmath,t}$ is a set of time-varying firm-specific control variables, $\theta_\jmath$ is a vector of either industry or firm fixed effects which controls for the unobserved time constant effects, and γ_t is a vector of year dummies. When exploring the power of the directors, the baseline specification is modified by additional explanatory variables like professional position, the experience of board members, and the size of the network connections of male and female board members (in t-1).

We estimate spillovers using the share of women in the C-suite, whether the firm has a female CEO, and the gender gap in the C-suite as outcomes. First, we explore

[3]In this area, lab experiments are difficult to use because the agents who make the decisions may be different from the persons who usually participate in experiments (Adams, 2017). We are also unable to identify valid instruments to consider this.

the quantity, looking at the influence of the number of women directors on spillovers. Then, we explore the quality by investigating the power of the directors to understand how that influences the spillovers. Finally, we study how the spillovers can depend on the networks of the male and female BoD.

VIII. The gender composition of boards and C-suite gender gaps

Table 3 shows the estimation results on the relationship between gender composition on BoD and the female share in C-suite in Columns (1)-(2), an indicator for having a female CEO in the company in Columns (3)-(4), and the gender earnings gap in Columns (5)-(6). All three outcomes are measured at the time (t). The pooled OLS and the industry fixed effect models were similar in direction and magnitude for all three outcomes. For this reason, we do not show the pooled OLS results, and Table 3 thus displays the industry and firm fixed effect models. For pooled OLS, please see Appendix A, Table 11.

Column 1 suggests that having 1, 2, or 3 or more women on the BoD in the year before the current (t-1) has a significant and positive relationship with the female share in the C-suite in the current year (t). All coefficients are relative to firms with 0 women on the BoD and within the industry category. Looking at the industry fixed effects (and within-year estimator), 1 woman increases the share by 4.3 pp, 2 women by 7.6 pp., and 3 or more women by 8.8 pp. compared to firms with no women on BoD, suggesting a slight concave relationship. Combining year and firm fixed effects in Column (2) reduces the absolute size of the coefficients, but there is still a significantly positive relationship. The size of the coefficients in the industry fixed effects are in line with the results from Germany (Bozhinov et al., 2021), which found that one more woman on BoD increases female share in C-suite by approximately 7 pp. in estimations including industry fixed effects. The lower coefficients in the firm fixed effects estimations suggest that unobserved firm, constant variables affect the female share in both C-suite and BoD.

We assume that firm fixed effects constitute a lower bound of the estimated coefficients, focusing on the variation within rather than between firms.

A token effect relates to the relative number of women. The results mentioned above, with a slightly concave relationship, allude to there being no token effect. Even just one female board member, a low relative share of women, has a significant relationship to female share in the C-suite compared to firms with no women on the BoD. In alternative estimations shown in Appendix A, Table 12, the three indicator variables for 1, 2, or 3+ female board members have been substituted by the female share of BoD and the squared value of this variable. In all estimations, the coefficient of the female share on BoD is significantly positive for the female share in the C-suite and having a female CEO. The squared term coefficient is negative or insignificant for the dependent variables (opposite for the gender earnings gap). The effect is more substantial when more women enter the board, but the increase seems to marginally decline. There is no clear confirmation of either token or critical mass explanations, as found by other studies, (Torchia et al., 2011; Joecks et al., 2013; Smith and Parrotta, 2018). The concave relationship may possibly suggest a resistance against a minority group increasing (Ibarra, 1993).

Turning to Columns (3)-(4) of Table 3, the dependent variable is whether the firm has a female CEO. The results display almost the same structure as for the share of women in the C-suite. The more female board members, the larger the probability that the gender of the CEO is female. Again, firm relative to industry fixed effects have smaller but still positive coefficients.

Among firms with both women and men executives, female C-suite members earn less than male C-suite members (see Figure 1) , which may, of course, reflect that female C-suite members possess less prestigious positions in the C-suite, such as Human Resources (HR) managers–qualitative interviews support this claim (Aldrich et al., 2015). On the other hand, this may also reflect gender bias in appointment and compensation decisions. Note that the dataset for estimation of the gender earnings gap in firms' C-suites is

much smaller (only 18,970 observations) because we can only include firms that have both genders on their executive board. Since firms without females on their executive board may be a selected sample that tends to have a higher gender earnings gap than other companies, the gender gap may be underestimated, and we cannot rule out some selection bias in the estimations. In Columns (5)-(6) of Table 3, we test whether the gender composition of the BoD seems to be related to the gender earnings gap in the C-suite. The answer is yes! The more women on the BoD, the lower the gender earnings gap in the C-suite. Industry fixed effects estimations show that if at least one woman is on the BoD, the gender earnings gap is reduced by about 9 pp. Since the gender earnings gap in the C-suite is 17-19 pct. for the firms included in this study (Table 10 in Appendix A), the size of the effect of a female board member is considerable, i.e., having at least one woman on the board almost halves the gender earnings gap according to these estimations.

Exploring firm fixed effects, in Column (6), the size of the coefficients is reduced to about 2-3 pp., which indicates that there are unobserved firm fixed effects that both have a positive impact on female representation on BoD and gender earnings gap in the C-suite. [4]

[4]We also explored the gender earnings gap using the share of women on BoD and found that the female share on BoD has a significantly negative and non-linear relation to the gender wage gap in C-suite. See Table 12 in Appendix A

Table (3) Relationship between WoB and gender gaps in the C-suite

	(1)	(2)	(3)	(4)	(5)	(6)
	Female share C-suite		Female CEO		Gender earnings gap	
1 Woman on the BoD (t-1)	0.0426***	0.0123***	0.0432***	0.0147***	-0.0917***	-0.0217*
	(0.0023)	(0.0021)	(0.0025)	(0.0026)	(0.0074)	(0.0087)
2 Woman on the BoD (t-1)	0.0761***	0.0164***	0.0564***	0.0068	-0.1104***	-0.0307*
	(0.0037)	(0.0034)	(0.0041)	(0.0043)	(0.0113)	(0.0138)
3+ Woman on the BoD (t-1)	0.0877***	0.0183***	0.0879***	0.0185**	-0.0966***	-0.0200
	(0.0058)	(0.0054)	(0.0064)	(0.0068)	(0.0180)	(0.0205)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	No	Yes	No	Yes	No
Firm fixed effects	No	Yes	No	Yes	No	Yes
Control variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	63929	63929	63929	63929	18970	18970

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses. The control variables include; i) listed firm, ii) family-run firm, iii) the age of the firm, iv) No. employees (squared), v) board size, and vi) two-tier system.

In the specification with industry fixed effects, we use ten dummy variables depicting the industry sector (classification).

The gender earnings gap is estimated as one minus the ratio of women's earnings to men's.

Only companies with both men and women in the C-suite are included.

IX. Spillovers by firm type

The Danish firms are heterogeneous in various dimensions. For example, compared to other countries, Denmark has a substantial share of family firms (Bennedsen et al., 2007). Smaller family firms differ in their institutional requirements from large listed firms, which must follow the guidelines for good corporate governance. The listed firms are also more in 'the public eye' than small family-owned companies.[5] The hiring procedures for new executive board members in listed firms are typically based on more professional procedures, often facilitated by headhunters. If this is the case, professional background or network and family connections between members of the BoD may have less influence (the network of the BoD may still inform headhunters of potential candidates). In this section, we reestimate the models exploring the spillover effect split by types of firms: Family, Listed, and Others. Table 4 shows the results from reestimating the models in Table 3 but split by the three types of firms.

The results found in Table 3 seem driven by the family and other firms. There are positive and increasing spillover effects from BoD to C-suite in family firms and a stable positive effect among other firms. For lister firms, we only find significantly positive coefficients only when there are at least 3 female board members. This alludes to a possible token effect among the listed firms. The results for a female CEO (found in Columns 4-6) are very close to the results for the share of female C-suite members. The structure of the results for the gender earnings gap is almost similar across types of firms (found in Columns 7-9). These results may suggest that the few women in the boardroom of the listed firms have less power or that the hiring processes in these firms are more professional and less gendered.

[5] A working paper by Timmermans et al. (2023) finds that spillover effects from gender diversity and BoD to diversity in management positions only exist for listed companies in a large cross-country study of European firms.

Table (4) Relationship between WoB and gender gaps in the C-suite. Split by firm type

	Family Firm	Listed Firm	Other Firm	Family Firm	Listed Firm	Other Firm	Family Firm	Listed Firm	Other Firm
	Female share C-suite			Female CEO			Gender earnings gap		
1 Woman on the BOD (t-1)	0.0295***	0.0044	0.0618***	0.0285***	0.0100	0.0634***	-0.0847***	-0.1238**	-0.0978***
	(0.0033)	(0.0113)	(0.0034)	(0.0035)	(0.0102)	(0.0039)	(0.0099)	(0.0450)	(0.0112)
2 Woman on the BOD (t-1)	0.0809***	0.0013	0.0675***	0.0549***	0.0017	0.0570***	-0.1202***	0.0158	-0.0996***
	(0.0049)	(0.0173)	(0.0063)	(0.0052)	(0.0156)	(0.0073)	(0.0137)	(0.0589)	(0.0197)
3+ Woman on the BOD (t-1)	0.1250***	0.0497*	0.0570***	0.1259***	0.0477*	0.0593***	-0.1369***	-0.2001**	-0.0608*
	(0.0093)	(0.0228)	(0.0078)	(0.0098)	(0.0206)	(0.0090)	(0.0261)	(0.0753)	(0.0259)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm fixed effects	No	No	No	No	No	No	No	No	No
Control variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	26869	2019	35416	26869	2019	35416	11117	1279	13055

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses. The control variables include i) whether the firm is listed, ii) whether the firm is family-run, iii) the age of the firm, iv) the number of employees, v) the board size, and vi) the two-tier system. In the specification with industry fixed effects, we use 10 dummy variables depicting the industry sector (classification).

X. The power of board members

So far, we have focused on the quantity relating to spillover, i.e., the number of women. However, the quality in terms of the power of these women may also guide the relationship between the gender composition of BoD and board decisions related to hiring and earnings of the C-suite. We explore two types of power: first, the position and experience of the directors may hold as a resource in the boardroom, and second, the power of board members' networks to other board members and executives.

A The power by board members' position and experience

A chairman is often powerful in the boardroom through the position. As power through a position, we also explore if being an executive member in another firm at the same time as being a director can lend the person influence in the boardroom. Being a CEO or C-suite member is typically seen as the natural way to become a powerful director (e.g. Ibarra, 1992). We also explore power through experience, as average years on the current BoD and as a director at any firm. The averages for the firms, seen in Table 5, suggest that a meager share of the firms have a female chairman, and there is also a lower share of firms with women that are C-suite members of other firms at the same time as being a director. While male directors of the firms seem to have more years of experience on any board than female directors, the average experience on the current board seems similar for both genders.

Table (5) Position and experience of Board of Directors of the firms

	Male BoD	Female BoD
Share of BoD being chairman	0.943	0.057
Share of BoD that are C-suite members in other firms	0.362	0.188
Average experience of any BoD (years)	7.165	5.877
Average experience on current BoD	4.945	5.085
Firm year observations	63929	63929

Columns (1)-(2) of Table 6 show the effect on the share of female C-suite members of

a female chairman and the share of female and male board members who are themselves CEOs in other companies. Firms with women in powerful positions increase the diversity of the C-suite. The estimated coefficient of having a female director also being a C-suite member of another firm is positive for female shares in the C-suite. In contrast, the power of male directors decreases the gender diversity of the C-suite. For female board members, the years of experience as a board member in general and at the current board are associated with an increase in the share of females on the C-suite; again, the opposite is true for the experience of male board members. The quantitative coefficients, i.e., the number of female members of BoD, become smaller and often even negative when we introduce indicators for the professional position or experience of the board members. It suggests that the spillover effects partly operate through the power of the directors. The samples are smaller in Table 6 than in Table 3 since we cannot observe the chairman and background of all BoD members for all firms in the data. The results are the same for the outcome variable female CEO. The result for the gender earnings gap is presented in Table 13 in Appendix A.

Table (6) Relationship between the directors' position and experience and the share of women in the C-suite

	(1)	(2)	(3)	(4)
1 Woman on the BoD (t-1)	0.0540***	-0.0592***	-0.0389***	-0.0374***
	(0.0033)	(0.0071)	(0.0075)	(0.0075)
2 Woman on the BoD (t-1)	0.0858***	-0.0164*	-0.0087	-0.0085
	(0.0053)	(0.0075)	(0.0080)	(0.0080)
3+ Woman on the BoD (t-1)	0.1052***			
	(0.0072)			
Female Chairman (t-1)	0.0326***			
	(0.0063)			
Female BoD - C-suite in other firms (t-1)		0.2463***		
		(0.0053)		
Male BoD - C-suite in other firms (t-1)		-0.0774***		
		(0.0063)		
Female, tenure at current board (t-1)			0.0016**	
			(0.0005)	
Male, tenure at current board (t-1)			-0.0047***	
			(0.0006)	
Female, years as a board member (t-1)				0.0011*
				(0.0005)
Male, years as a board member (t-1)				-0.0025***
				(0.0005)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Control variables	Yes	Yes	Yes	Yes
Observations	25195	16278	16278	16278

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses.

The control variables include; i) whether the firm is listed, ii) whether the firm is family-run, iii) the age of the firm, iv) the number of employees (squared), v) board size, and vi) two-tier system. In the specification with industry fixed effects, we use 10 dummy variables depicting the industry sector.

Power may be contextual. To understand how the power of the directors matters for the spillover in different firms, we also explored the positions and experiences of the directors across the three types of firms–family, listed, and others. The effect of power

in terms of positions and experiences matters for all three firm types. They are slightly attenuated among listed firms as well as other firms. See Appendix A, Table 14. For listed firms, the share of female C-suite members is influenced more positively by the power of the female's position than experience (and the effect is again negative for male directors).

B The power of board members' networks

Directors' resources in the boardroom may come from the size of their professional network, which can also bring them power. In this study, we expect firms with directors with large networks to have a possibility of finding direct or indirect suitable candidates to propose for C-suite appointments using their network compared to the case with fewer connections. If women help other women, firms where female directors increase their networks will increase the share of women in their C-suite. Table 7 suggests that the size of women directors' networks is smaller than that of men directors.

Table (7) The average number of network connections of Board of Directors

	Male directiors	Female directors
Total	10.5	2.5
To other female members of C-suite or BoD	1.5	0.4
To other male members of C-suite or BoD	9.0	2.1

The distributions are left skewed for both men and women, but the density mass is shifted more to the higher end for men's networks compared to that of women. Please see Table 2 in Appendix A.

The first and second columns of Table 8 indicate that this seems to be the case concerning influence in the board room. The larger the average number of professional network connections to other C-suite members that female board members have in a firm, the higher the female share of C-suite members. For male board members, it is the opposite: The more professional network connections that male board members in a firm have, the lower the female share of the C-suite. The pattern is similar for network effects on the gender earnings gap in the C-suite, results presented in Table 15 in Appendix A.

Table (8) Relationship between the directors' networks and the share of women in the C-suite

	(1)	(2)	(3)	(4)
1 Woman on the BoD (t-1)	0.0163***	0.0045*	-0.0003	0.0004
	(0.0025)	(0.0022)	(0.0025)	(0.0022)
2 Woman on the BoD (t-1)	0.0464***	0.0081*	-0.0294***	-0.0056
	(0.0038)	(0.0035)	(0.0040)	(0.0036)
3+ Woman on the BoD (t-1)	0.0508***	0.0087	-0.1102***	-0.0189**
	(0.0059)	(0.0055)	(0.0066)	(0.0057)
Female network	0.0058***	0.0026***		
	(0.0002)	(0.0002)		
Male network	-0.0013***	-0.0005***		
	(0.0001)	(0.0001)		
Male to female network			0.0348***	0.0129***
			(0.0008)	(0.0008)
Male to male network			-0.0046***	-0.0019***
			(0.0001)	(0.0002)
Female to female network			0.0349***	0.0074***
			(0.0014)	(0.0013)
Female to male network			-0.0003	0.0012***
			(0.0003)	(0.0002)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes
Control variables	Yes	Yes	Yes	Yes
Observations	63929	63929	63929	63929

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses.

The control variables include; i) whether the firm is listed, ii) whether the firm is family-run, iii) the age of the firm, iv) the number of employees (squared), v) board size, and vi) two-tier system. In the specification with industry fixed effects, we use 10 dummy variables depicting the industry sector.

All network connections may not have the same power in the boardroom. Female professional network connections are less valuable for female potential board members when it comes to being appointed to a board of directors (von Essen and Smith, 2023).

In contrast, for male board members, this is not the case. Therefore, in Columns (3)-(4), we split the average number of network connections into male and female network connections. The variable 'Male to female network' measures the average number of female network connections male board members in a given firm have. Concentrating on the more conservative within firm and year estimates in Columns (4) of Table 8, we find that male network connections to other males significantly negatively affect the female share in the C-suite. In contrast, male network connections to females have the strongest positive effect on the female share in C-suite. Female network connections to other females also have an impact, while their network to men has little to no effect on the female share in the C-suite. If increasing the share of women in the C-suite is a goal for the firm, the connections of the male board members to females who can become C-suite members are important. The networks may operate differently depending on the firm context. In the boardroom of listed firms, the size of the network of male directors to females matters most for the share of female C-suite members. However, female directors' networks with other females matter the most among family firms. See Appendix A, Table 16 for detailed results.

The result that suggests only one woman is enough to generate spillovers is clearly not causal since the quality, such as the director's network, channels that effect. The quality or power of the women entering the board of directors seems more relevant than the number of women on the boards.[6] The direct effect of the network suggests more robust results. We conduct two sensitivity analyses to probe the effectiveness of the networks: i) a type of placebo test and ii) an estimation where we randomly assign directors' links to other top executives. The placebo test is inspired by (Hensvik and Skans, 2016). For each firm that has directors with connections, we find a matching firm without directors that do not have such connections. We find a pool of firms that are in the same industry, of the same size, and have the same number of women on their board in the year of the

[6]Estimating the direct association between director networks and gender gaps in the C-suite, without the quantity variables give the same results Appendix A, Table 17-18

connection. Then, we randomly select a firm from this pool as a placebo firm and estimate Table 3 using the placebo firms. This exercise takes out the spillover effects of having women on the board of directors, Table 19 in Appendix A. It suggests that spillovers are primarily generated by firms with directors that have network connections. When exploring how the size of networks of the female and male BoD can influence the share of females in the C-suite, we cannot say whether or not they utilized their network connections to propose potential C-suite members at the BoD meetings. To understand if the directors' network size influences the women's share in the C-suite, we used the actual network sizes of the directors. We assigned the connections randomly, generating the exact sizes of networks but with different connections. This exercise suggests that the actual connections matter. Table 20 in Appendix A shows that when estimating Table 8 using random connections, the network variables are not significant, and the spillover is now manifested through the number of women on the board.

C Are network connections used in management hirings?

To bring us closer to the question of directors utilizing their connections for appointments, we generate a flow sample of all new C-suite members within the firms annually. In total, we observe 41,110 new appointments in the C-suite in the data between 1995 and 2018. Then, we identify the direct connections between BoD and C-suite members within the same firm the year before the managers were appointed. The connections can come from any work history related connections or family connections. Most appointed C-suite members did not have professional or family connections to BoD within the firm the year before they started (see Appendix A, Table 21 in the appendix). Also, most connections are found between male C-suite members and male BoD. A working paper, Chevrot-Bianco (2021) uses data on Danish firms to explore the effect of the flexible quota for large firms, which was introduced in 2012. The paper suggests that the requirement favored women with family relations, increasing their chances of becoming a

director by a factor of three. Women without family connections did not experience an increase in their chances of appointment. The current paper looks at the C-suite, not BoD, but the same mechanisms can potentially be present.

To estimate the association between the firms with such connections and the share of female C-suite members, we created a new firm variable with three values: i) at least one connection to a female BoD, ii) at least one connection to a male BoD, and iii) no connections. Table 9 shows that compared to C-suite appointments with no connection, firms with at least one connection to a female director positively influence the share of women in the C-suite, as it increases the share of women in the C-suite by around 30 ppt. Firms with at least one connection to a male BoD decrease the share of women on the C-suite. The results are similar for all connections and family connections.

Table (9) C-suite connections and female share of C-suite.

	(1)	(2)
	All connections	Family connections
Connection Female BoD, t-1	0.3027***	
	(0.0058)	
Connection Male BoD, t-1	-0.0569***	
	(0.0024)	
Connection Female BoD, t-1		0.3655***
		(0.0096)
Connection Male BoD, t-1		-0.0470***
		(0.0052)
Year FE	Yes	Yes
Industry FE	Yes	No
Control variables	Yes	Yes
Observations	40253	40253

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses. The control variables include i) whether the firm is listed, ii) whether the firm is family-run, iii) the age of the firm, iv) the number of employees (squared), v) board size, and vi) two-tier system. We use ten dummy variables depicting the industry sector in the specification with industry fixed effects.

The results are likely driven by the networks being gendered. Also, the prestige or power of the position of the appointed C-suite member may inform us on how BoDs use their connections.[7]

[7]In the case of connections from male BoD, they associate negatively with the share of women in the C-suite when the appointed member is a CEO or other top executives. However, there is no such spillover (positive or negative) in the case of the appointed member being in an HR position (Table 22 in Appendix A shows the estimates.). It should be noted that the observations for HR appointments are fewer, and the standard errors are larger compared to the other estimates. The results suggest that

XI. Magnitude and dynamics of spillover effects

Our results have indicated that more diversity in the directors' boardroom has positive diversity spillovers to the executive board. But how large are these spillover effects? This section illustrates our findings' magnitude and possible impact by making rough back-of-the-envelope calculations based on our results and applying a simple event-study data analysis.

Will a quota on the gender composition of BoD of 40 pct., which will be enforced in 2026 according to EU regulation, significantly change the gender composition in the executive suite? We start by asking what happens if a 40-pct. quota for women on corporate boards was imposed on all firms larger than 50 employees, given our results. A back-of-the-envelope calculation suggests that such a quota increases the share of women in the C-suite from 15.8 pct. to 20.3 pct., or by about 30 pct., all else equal. In Appendix C, we explain the calculations behind the figures. These effects seem rather small, alluding to other ongoing mechanisms. Network connections are unstable and depend on the context, particularly networks depending on work histories. As more women enter top positions, men will form networks with more women. On average, during 1995-2018, women with power in the BoD seemed to increase the share of women in the C-suite. Such dynamics are not taken into account in the calculations.

As discussed earlier, important unobserved factors like firm culture and norms may also drive the gender composition of the executive suite, and reverse causality may occur, i.e., the executive board may affect the gender diversity of the board of directors in some cases. We conducted a regression where the WoB variables were measured with a four-year lag (instead of a one-year lead). The association between women on boards and the share of women in the C-suite was still significant (see Appendix A, Table 23. This reversed causality suggests that there may be interesting dynamic effects to understand

male BoD primarily uses their connections to appoint male CEOs and other top executives, but not in less prestigious positions such as HR appointments.

regarding spillover effects. Asking what happens to the share of women in the C-suite when firms appoint women to their board for the first time requires a different analysis. To shed some light on the dynamics, we conducted a simple event study regression using the 'first time a firm appointed a female director' as the event. The model we employed estimated the change in the share of women in the C-suite four years before and ten years after the event of appointing a woman to the BoD for the first time. The coefficients describe the share of female executives for firms that appointed their first woman on the board before and after the event. The year before the event serves as the reference point. Accounting for trends over time, we introduce time dummies, i.e., comparing the effects within years. We generated an unbalanced panel of firms that appointed their first woman between 1995 and 2018, i.e., reducing the sample substantially. The year after appointing a WoB for the first time, the share of women in the C-suite in our data increases relative to the year before introducing a woman on the board. However, only four to five years after appointing a WoB, the relative share has returned to the same level as before the event–the results are presented in Appendix B, Figure 3. We are aware that the required assumptions for a causal interpretation will not be satisfied in our case (De Chaisemartin and d'Haultfoeuille, 2020). To understand why, we discuss these underlying assumptions related to our case in more detail in Appendix B.

The rough event analysis suggests that spillovers do not last. There may be multiple reasons for why that happens. One possibility is that women quit their C-suite positions to a larger extent than men. Between 2017 and 2018, female C-suite members in our data had a quit rate of 36 pct. at the same time, their male peers had 31 pct. Assuming that the quitting rates are stable within genders and nothing else changes, starting from 2018, we calculated the yearly future share of women in the C-suite. We find that it stabilizes at 18.9 pct. (compared to the actual share of 15.8 pct. in 2018). When calculating the same figures but assuming a 40-pct. quota, the share stabilizes at 23 pct. See detailed numbers in Table 24-25 in Appendix C. Thus, a quota regulation of 40 pct.

female BoD members will increase the female share in the executive board, but it is far from moving the female C-suite share to equality or, for instance, 40 pct.

XII. Discussion and Conclusion

The discussion on gender diversity in economic decision-making remains an important topic in politics and research. Besides equal opportunities and representation, another argument pertains to improving the economic performance of firms in the country or region. Most policies implemented to achieve this goal focus on enhancing women's participation on corporate boards targeting the largest and listed firms. For example, the European Union has adopted legislation for listed firms to set a target of 40 pct. of women on their supervisory boards by 2026. Such policies are expected to have a positive spillover effect on gender diversity in lower parts of the firm and throughout the economy (Hughes et al., 2017). How this spillover operates is the question we probe.

In this paper, spillover effects are defined in line with much of the broader social science literature (Kirsch, 2018; Matsa and Miller, 2011; Bell, 2005; Bilimoria, 2006; Skaggs et al., 2012), using the firm as the unit of analysis. Our research focuses on the link between women on board of directors and female top executives (and their relative pay), using national administrative data covering all Danish private sector firms from 1995 to 2018. We investigate how the power of directors is connected to generating a gender diversity spillover from board of directors to executive management. First, we consider the quantitative aspects of spillovers. Does one woman on the board become a token and, due to lack of power, cannot affect the gender gaps among executives, or are there queen bee effects suggesting that women do not help other women? Second, we explore the qualitative effects of spillovers. How does power as a resource held by directors matter for spillovers? Three types of powerful resources that may lead to influence in the boardroom are considered: i) position, ii) board experience, and iii) the

network connections of the directors.

In contrast to some previous empirical literature (Konrad et al., 2008; Joecks et al., 2013), our results lend less support for women becoming a token (Kanter, 1977)–even only one woman on the BoD positively impacts the female share of the executive board, the chances of having a female CEO, and the gender earnings gap among the top executives. It is also clear that spillovers are not only about the number of women on the board. The quality of women and men entering the boards is more central to the spillovers than the quantity. The quality in terms of power that directors can bring to the boardroom matters for increasing the gender diversity of executive positions and lowering the pay gap. Women directors with a CEO position in another firm and women with many years of board experience dominate the quantity of more women on board to generate spillovers. This is in line with research claiming that women in top positions who do support other women are typically experienced and powerful women Kirsch (2022).

The professional networks of the directors channel power. Women, to a larger extent than men directors, have other women in their networks suitable for executive positions. We find that the size of the network of female directors increases spillovers, and the gender of the connections also matters. Here, the size of women's and men's networks to women influence spillover positively. These results align with the theoretical work suggesting that men's and women's professional networks look and operate differently from one another Ibarra (1992, 1993). The data enabled us to identify each firm's board members and C-suite members and whether they were connected before the executive member was appointed. We found such direct connections from female board members to increase the share of female executives, while male direct connections have the opposite effect.

The magnitude of the spillovers is, however, relatively low. Given our results, if a 40-pct quota were imposed, it would imply a share of women among the executives

would rise in our data from 15.8 pct. in 2018 to 20.3 pct., and the effect may not be lasting. We argue that this is partly due to women quitting C-suite positions more than men. The important questions for future research projects are the network dynamics and why women quit their top executive positions. These results corroborate the claim that female directors who are well-connected to other powerful (most often male) directors are less subject to minority biases in the boardroom (Westphal and Milton, 2000), and add understanding to why there are few women in executive positions despite an increase in female board members.

Our study contributes to discussing what increases women's representation in economic decision-making. Simply adding more women to the highest corporate decision-making body will not be enough to improve diversity at other levels of the firm nor in the rest of the economy. Women do seem to help other women when they have the power to do so. However, this result points to a type of 'catch-22' problem in that powerful women in the boardroom are important for changing the diversity in the executive board. However, there are relatively few women on the executive boards, especially few female CEOs and few women with long board experience. A critical factor behind the low share of women in executive boards is the high female exit rates from the C-suite, which may also be related to firm culture, gendered life-course conditions, such as working hour hours in top management positions, childrearing, etc., which is found to decrease the size and change the composition of the network of women in top positions (Munch et al., 1997; Wrzus et al., 2013). Our results suggest that quota regulations align with the 2026 EU regulation of 40 pct. women in the BoDs of the largest companies will have an effect on the gender composition of the executive suite. However, the effect will be small unless this instrument impacts other mechanisms in the board room and the executive suite–such as firm culture and gender norms. In particular, incentives that keep women in the C-suite.

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A Appendix: Additional tables

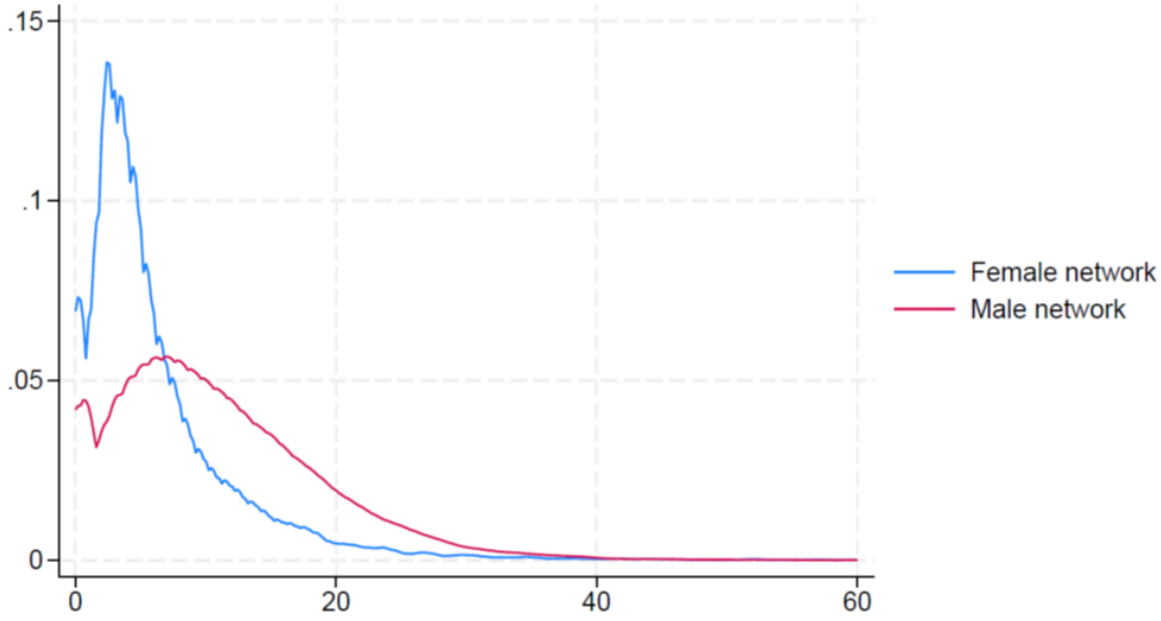
Table (10) Sample means and standard deviations

	(1) 1995	(2) 2003	(3) 2018
Outcome variables			
Female share C-suite	0.0722	0.0974	0.158
	(0.180)	(0.219)	(0.245)
Gender wage gap, C-suite	0.199	0.193	0.177
	(0.303)	(0.325)	(0.433)
Female CEO	0.0354	0.0472	0.0893
	(0.185)	(0.212)	(0.285)
Main explanatory variables			
1 Woman on the BOD (t-1)		0.159	0.247
		(0.366)	(0.432)
2 Woman on the BOD (t-1)		0.0503	0.0793
		(0.219)	(0.270)
3+ Woman on the BOD (t-1)		0.0133	0.0392
		(0.114)	(0.194)
Female share on BoD (t-1)		0.0764	0.119
		(0.169)	(0.185)
Female share on BoD (t-1) sq		0.0343	0.0484
		(0.112)	(0.113)
Power of the BoD			
Female Chairman (t-1)		0.0502	0.0737
		(0.218)	(0.261)
Female BOD - C-suite in other firms (t-1)		0.182	0.231
		(0.373)	(0.402)
Male BOD - C-suite in other firms (t-1)		0.340	0.387
		(0.345)	(0.351)
Female network	1.395	1.421	2.459
	(3.071)	(3.298)	(5.161)
Male network	8.931	9.555	10.51
	(7.348)	(7.032)	(8.272)
Male to female network	0.887	0.933	1.482
	(0.986)	(1.089)	(1.651)
Male to male network	8.044	8.623	9.027

	(7.006)	(6.675)	(7.436)
Female to female network	0.140	0.166	0.386
	(0.485)	(0.589)	(1.135)
Female to male network	1.254	1.256	2.073
	(2.836)	(3.009)	(4.367)
Additional control variables			
Family firm	0.295	0.373	0.498
	(0.456)	(0.484)	(0.500)
Listed firm		0.0335	0.0248
		(0.180)	(0.155)
Firm age	22.31	23.05	29.52
	(19.40)	(20.08)	(21.65)
Firm size	212.7	264.7	254.6
	(643.6)	(784.6)	(912.1)
Squared firm size	459237.7	685350.5	896536.0
	(8445192.5)	(8203488.3)	(22781982.5)
Board Size	4.565	4.183	3.515
	(2.070)	(1.812)	(1.878)
Two-tier-system	0.638	0.650	0.628
	(0.481)	(0.477)	(0.483)
Pri, Build, Const	0.112	0.124	0.112
	(0.315)	(0.330)	(0.316)
Manufacturing	0.460	0.364	0.291
	(0.498)	(0.481)	(0.454)
Trade, Transport	0.310	0.337	0.311
	(0.462)	(0.473)	(0.463)
Finance & services	0.104	0.149	0.238
	(0.305)	(0.356)	(0.426)
Observations	2376	2566	3190

Average coefficients and standard deviation in parentheses

Figure (2) Distribution of women and men networks



Epanechnikov kernel of all network connections for women and men directors.

Table (11) Relationship between WoB and gender gaps in the C-suite. Pooled OLS

	(1)	(2)	(3)
	Female share C-suite	Female CEO	Gender earnings gap
1 Woman on the BOD (t-1)	0.0482***	0.0478***	-0.0933***
	(0.0023)	(0.0026)	(0.0074)
2 Woman on the BOD (t-1)	0.0858***	0.0644***	-0.1131***
	(0.0038)	(0.0042)	(0.0113)
3+ Woman on the BOD (t-1)	0.1075***	0.1041***	-0.1043***
	(0.0059)	(0.0065)	(0.0180)
Constant	0.0801***	0.0399***	0.2396***
	(0.0058)	(0.0064)	(0.0230)
Observations	63929	63929	18970

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses. The control variables include; i) listed firm, ii) family-run firm, iii) the age of the firm, iv) No. employees (squared), v) board size, and vi) two-tier system. We use ten dummy variables depicting the industry sector (classification). The gender earnings gap is estimated as one minus the ratio of women's earnings to men's.

Only companies with both men and women in the C-suite are included.

Table (12) Relationship between female share on Board of Directors and gender gaps in the C-suite.

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Year FE	Industry FE	Firm FE	Year FE	Industry FE	Firm FE	Year FE	Industry FE	Firm FE
	Female share C-suite			Female CEO			Earnings gap		
Female share on BoD (t-1)	0.2117***	0.1778***	0.0497***	0.1778***	0.1504***	0.0444**	-0.4233***	-0.4130***	-0.1610***
	(0.0127)	(0.0124)	(0.0115)	(0.0139)	(0.0138)	(0.0145)	(0.0397)	(0.0397)	(0.0472)
Female share on BoD (t-1) sq	-0.0542*	-0.0321	-0.0196	-0.0110	0.0062	-0.0075	0.2935***	0.2872***	0.1787*
	(0.0211)	(0.0206)	(0.0187)	(0.0232)	(0.0229)	(0.0236)	(0.0645)	(0.0645)	(0.0728)
Constant	0.0680***	0.2519***	0.0715***	0.0290***	0.1999***	0.0118	0.2501***	0.2135***	0.3622***
	(0.0058)	(0.0074)	(0.0072)	(0.0063)	(0.0082)	(0.0091)	(0.0229)	(0.0270)	(0.0332)
Observations	63929	63929	63929	63929	63929	63929	18970	18970	18970

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses. The control variables include; i) listed firm, ii) family-run firm, iii) the age of the firm, iv) No. employees (squared), v) board size, and vi) two-tier system. We use ten dummy variables depicting the industry sector (classification). The gender earnings gap is estimated as one minus the ratio of women's earnings to men's. Only companies with both men and women in the C-suite are included.

Table (13) Relationship between position and experience of BoD members and the gender earnings gap in the C-suite.

	(1) Model 1	(2) Model 2	(3) Model 3	(4) Model 4
1 Woman on the BOD (t-1)	-0.0571***	0.0628**	0.0381	0.0361
	(0.0114)	(0.0212)	(0.0215)	(0.0216)
2 Woman on the BOD (t-1)	-0.0852***	0.0146	0.0201	0.0173
	(0.0168)	(0.0223)	(0.0228)	(0.0229)
Female Chairman (t-1)	-0.0902***			
	(0.0203)			
Female BOD - C-suite in other firms (t-1)		-0.2182***		
		(0.0141)		
Male BOD - C-suite in other firms (t-1)		0.1073***		
		(0.0186)		
Female, tenure at current board (t-1)			-0.0063***	
			(0.0014)	
Male, tenure at current board (t-1)			0.0049**	
			(0.0017)	
Female, years as a board member (t-1)				-0.0051***
				(0.0013)
Female, years as a board member (t-1)				0.0057***
				(0.0015)
Constant	0.2397***	0.0167	-0.0262	-0.0206
	(0.0474)	(0.0558)	(0.0560)	(0.0560)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes
Observations	7667	6024	6024	6024

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses. The control variables include;
i) listed firm, ii) family-run firm, iii) the age of the firm, iv) No. employees (squared), v) board size, and vi) two-tier system. We use ten dummy variables depicting the industry sector (classification). The gender earnings gap is estimated as one minus the ratio of women's earnings to men's. Only companies with both men and women in the C-suite are included.

Table (14) Relationship between position and experience of BoD members and the gender earnings gap in the C-suite split by firm type.

	(1)	(2)	(3)
	Family Firm	Listed Firm	Other
Female Chairman BoD (t-1)	0.0237***	0.2304***	0.0244*
	(0.0082)	(0.0518)	(0.0111)
Female Share C-suite (t-1)	0.3087***	0.0637*	0.1629***
	(0.0067)	(0.0301)	(0.0088)
Male Share C-suite (t-1)	-0.0857***	-0.0876*	-0.0076
	(0.0072)	(0.0408)	(0.0103)
Experience current BoD, Females (t-1)	0.0024***	0.0089*	0.0011
	(0.0006)	(0.0038)	(0.0011)
Experience current BoD, Males (t-1)k	-0.0048***	0.0079*	-0.0010
	(0.0007)	(0.0035)	(0.0012)
Experience Total BoD Females (t-1)	0.0016**	0.0118***	0.0013
	(0.0006)	(0.0021)	(0.0009)
Experience Total BoD Males (t-1) k	-0.0035**	0.0019	0.0002
	(0.0007)	(0.0028)	(0.0009)
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Firm FE	No	No	No
Observations Row 1	11117	1279	13055
Observations Rows 2-7	9698	655	6065

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses.

The results shown are selected coefficients from 4 separate regressions, see Table 6.

Table (15) Relationship between networks of BoD members and the gender earnings gap in the C-suite.

	(1)	(2)	(3)	(4)
	Industry FE	Firm FE	Industry FE	Firm FE
1 Woman on the BOD (t-1)	-0.0398***	-0.0019	-0.0447***	-0.0047
	(0.0082)	(0.0091)	(0.0084)	(0.0092)
2 Woman on the BOD (t-1)	-0.0593***	-0.0125	-0.0476***	-0.0092
	(0.0119)	(0.0140)	(0.0125)	(0.0142)
3+ Woman on the BOD (t-1)	-0.0324	0.0009	0.0037	0.0122
	(0.0184)	(0.0206)	(0.0203)	(0.0214)
Female network	-0.0088***	-0.0056***		
	(0.0006)	(0.0007)		
Male network	0.0036***	0.0021***		
	(0.0004)	(0.0005)		
Male to female network			0.0044	0.0083**
			(0.0024)	(0.0029)
Male to male network			0.0033***	0.0011
			(0.0005)	(0.0007)
Female to female network			-0.0289***	-0.0239***
			(0.0036)	(0.0043)
Female to male network			-0.0057***	-0.0031**
			(0.0008)	(0.0010)
Time FE	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	No
Firm FE	No	Yes	No	Yes
Controls	Yes	Yes	Yes	Yes
Observations	18970	18970	18970	18970

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses. The control variables include; i) listed firm, ii) family-run firm, iii) the age of the firm, iv) No. employees (squared), v) board size, and vi) two-tier system. We use ten dummy variables depicting the industry sector (classification). The gender earnings gap is estimated as one minus the ratio of women's earnings to men's. Only companies with both men and women in the C-suite are included.

Table (16) Relationship between networks of BoD members and the gender earnings gap in the C-suite by firm type

	(1) Industry FE	(2) Firm FE	(3) Industry FE	(4) Firm FE
Family firms				
Female Chairman (t-1)	0.0241**			
	(0.0082)			
Female BOD - C-suite in other firms (t-1)		0.3045***		
		(0.0068)		
Male BOD - C-suite in other firms (t-1)		-0.0981***		
		(0.0079)		
Female, tenure at current board (t-1)			0.0023***	
			(0.0006)	
Male, tenure at current board (t-1)			-0.0054***	
			(0.0007)	
Female, years as a board member (t-1)				0.0014*
				(0.0006)
Female, years as a board member (t-1)				-0.0037***
				(0.0007)
Observations	11117	9698	9698	9698
Listed firms				
Female network	0.0022**	0.0018*		
	(0.0008)	(0.0008)		
Male network	-0.0000	-0.0006		
	(0.0006)	(0.0007)		
Male to female network			0.0302***	0.0130**
			(0.0046)	(0.0048)
Male to male network			-0.0030***	-0.0021*
			(0.0008)	(0.0009)
Female to female network			0.0127*	0.0125*
			(0.0059)	(0.0060)
Female to male network			0.0003	0.0003
			(0.0010)	(0.0010)
Constant	0.1329***	0.0928	0.1174***	0.0856

	(0.0350)	(0.0493)	(0.0346)	(0.0492)
Other firms				
Female network	0.0035***	0.0017***		
	(0.0003)	(0.0002)		
Male network	-0.0011***	-0.0007***		
	(0.0001)	(0.0002)		
Male to female network			0.0321***	0.0094***
			(0.0011)	(0.0011)
Male to male network			-0.0042***	-0.0018***
			(0.0002)	(0.0002)
Female to female network			0.0255***	0.0066***
			(0.0018)	(0.0017)
Female to male network			-0.0010**	0.0007*
			(0.0003)	(0.0003)
Observations	35416	35416	35416	35416

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses. The model behind the first two rows in Column 1 in Table 6, split by firm type. The model behind rows 3-6 is Column 3 in Table 6. The control variables include; i) whether the firm is listed, ii) whether the firm is family-run, iii) the age of the firm, and iv) the number of employees. In the specification with industry fixed effects, we use 10 dummy variables depicting the industry sector (classification).

Table (17) Relationship between position and experience of BoD members and the gender earnings gap in the C-suite. Leaving out the quantity of WOB.

	(1)	(2)	(3)	(4)
Female Chairman (t-1)	0.0787***			
	(0.0061)			
Female BOD - C-suite in other firms (t-1)		0.2413***		
		(0.0053)		
Male BOD - C-suite in other firms (t-1)		-0.0778***		
		(0.0063)		
Female, tenure at current board (t-1)			0.0016**	
			(0.0005)	
Male, tenure at current board (t-1)			-0.0046***	
			(0.0006)	
Female, years as a board member (t-1)				0.0011*
				(0.0005)
Female, years as a board member (t-1)				-0.0026***
				(0.0005)
Constant	0.2347***	0.3554***	0.3907***	0.3918***
	(0.0116)	(0.0162)	(0.0167)	(0.0168)
Observations	25195	16278	16278	16278

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses.

Table (18) Relationship between the director's network and the share of women in the C-suite. Leaving out the quantity of WOB.

	(1)	(2)	(3)	(4)
Female network	0.0070***	0.0028***		
	(0.0002)	(0.0002)		
Male network	-0.0014***	-0.0006***		
	(0.0001)	(0.0001)		
Male to female network			0.0313***	0.0126***
			(0.0008)	(0.0008)
Male to male network			-0.0042***	-0.0019***
			(0.0001)	(0.0001)
Female to female network			0.0257***	0.0063***
			(0.0013)	(0.0013)
Female to male network			0.0005*	0.0013***
			(0.0002)	(0.0002)
Constant	0.2775***	0.0802***	0.2613***	0.0807***
	(0.0064)	(0.0067)	(0.0063)	(0.0066)
Observations	65631	65631	65631	65631

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses.

Table (19) Relationship between Women on BoD members and the female share in the C-suite and female CEO. Placebo.

	(1)	(2)	(3)	(4)	(5)	(6)
	Year FE	Industry FE	Firm FE	Year FE	Industry FE	Firm FE
	Female share C-suite			Female CEO		
1 Woman on the BoD (t-1), placebo	-0.0066**	-0.0076***	0.0002	-0.0110***	-0.0118***	-0.0042*
	(0.0023)	(0.0022)	(0.0016)	(0.0025)	(0.0025)	(0.0021)
2 Women on the BoD (t-1), placebo	0.0018	-0.0035	0.0018	-0.0011	-0.0053	-0.0018
	(0.0037)	(0.0036)	(0.0026)	(0.0041)	(0.0040)	(0.0033)
3+ Women on the BoD (t-1), placebo	0.0195***	-0.0020	-0.0059	0.0175**	0.0001	-0.0031
	(0.0057)	(0.0056)	(0.0041)	(0.0063)	(0.0062)	(0.0051)
Constant	0.0864***	0.2763***	0.0802***	0.0536***	0.2328***	0.0323***
	(0.0057)	(0.0073)	(0.0071)	(0.0063)	(0.0081)	(0.0089)
Observations	63906	63906	63906	63906	63906	63906

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses.

Table (20) Relationship between networks of BoD members and the gender earnings gap in the C-suite. Random connections.

	(1)	(2)	(3)	(4)
	Industry FE	Firm FE	Industry FE	Firm FE
1 Woman on the BOD (t-1)	0.0423***	0.0122***	0.0381	0.0122***
	(0.0023)	(0.0021)	(0.0215)	(0.0021)
2 Woman on the BOD (t-1)	0.0758***	0.0163***	0.0201	0.0163***
	(0.0037)	(0.0034)	(0.0228)	(0.0034)
3+ Woman on the BOD (t-1)	0.0889***	0.0184***		0.0185***
	(0.0058)	(0.0054)		(0.0054)
Female network	0.0003	0.0002		
	(0.0002)	(0.0001)		
Male network	-0.0001	-0.0000		
	(0.0001)	(0.0001)		
1 Woman on the BOD (t-1)	0.0423***	0.0122***	0.0381	0.0122***
	(0.0023)	(0.0021)	(0.0215)	(0.0021)
2 Woman on the BOD (t-1)	0.0758***	0.0163***	0.0201	0.0163***
	(0.0037)	(0.0034)	(0.0228)	(0.0034)
3+ Woman on the BOD (t-1)	0.0889***	0.0184***		0.0185***

	(0.0058)	(0.0054)		(0.0054)
Constant	0.2724***	0.0790***	-0.0262	0.0781***
	(0.0074)	(0.0072)	(0.0560)	(0.0072)
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Firm FE	No	No	No	No
Observations	63929	63929	63929	63929

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses.

The model behind the first two rows in Column 1 in Table 6, split by firm type.

The model behind rows 3-6 is Column 3 in Table 6.

The control variables include i) whether the firm is listed, ii) whether the firm is family-run, iii) the age of the firm, and iv) the number of employees. In the specification with industry fixed effects, we use 10 dummy variables depicting the industry sector (classification).

Table (21) Professional and family connections between BoD members and new members of C-suite

Type of connections	Number of appointments: All connections	Number of appointments: Family Connections
Female executive to female BoD	350	127
Female executive to male BoD	1195	455,
Male executive to male BoD	8616	1220
Male executive to female BoD	2127	1127
No connections	31416	38896
Firm year observations	41110	41110

Table (22) C-suite connections and female share of C-suite by type of position and connection

	(1)	(2)	(3)	(4)	(5)	(6)
	Professional connecitons			Family connecitons		
	HR	CFO/CEO	Other	HR	CFO/CEO	Other
Connection Female BoD, t-1	0.3715***	0.3000***	0.2378***			
	(0.0715)	(0.0120)	(0.0157)			
Connection Male BoD, t-1	-0.0734	-0.0543***	-0.0438***			
	(0.0427)	(0.0047)	(0.0059)			
Connection Female BoD, t-1				0.2777**	0.4137***	0.3386***
				(0.0845)	(0.0168)	(0.0199)
Connection Male BoD, t-1				-0.0488	-0.0473***	-0.0315*
				(0.0786)	(0.0088)	(0.0124)
Observations	361	11950	7010	361	11950	7010

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses.

Table (23) Table 4 with WoB, t+4

	(1)	(2)
	Industry FE	Industry FE
1 Woman on the BOD (t+4)	0.0402***	0.0409***
	(0.0026)	(0.0028)
2 Woman on the BOD (t+4)	0.0667***	0.0547***
	(0.0040)	(0.0044)
3+ Woman on the BOD (t+4)	0.0749***	0.0692***
	(0.0058)	(0.0064)
Constant	0.2431***	0.1941***
	(0.0082)	(0.0091)
Time FE	Yes	Yes
Industry FE	Yes	No
Firm FE	No	Yes
Controls	Yes	Yes
Observations	37562	37562

Note. * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. Standard errors in parentheses.

B Appendix: Event study

We implemented a standard version of an event study, following Equation 2. The units we are focusing on are the firms $\imath$. $Y_{\imath,t}$ describes the outcome, in our case, the share of women in the C-suite. δ_t is the fixed effects for the calendar period and β is the influence of the control variables. Of interest to us is $I_{imath,t}$, which is an indicator of the event time $\jmath$. $\gamma_\jmath$. The event took place $\jmath$ periods before the calendar time of the observation. The endpoints are m=-4 and n=10.

$$Y_{\imath,t} = \delta_t + (\sum_{\jmath \in -m,\ldots 0,\ldots,n} \gamma_\jmath I_{\imath,t-\jmath}) + \beta_{\imath,t} + \epsilon_{\imath,t} \tag{2}$$

Figure 3 displays the $\gamma_\jmath$ estimates, using the year before the firms appointed a woman to their board for the first time as the reference category ($\gamma_j - 1$ is set to zero). $\gamma_\jmath \geq 0$ represents the dynamic effects of appointing a woman to the board for the first time on the share of women in the C-suite. The coefficients before the event and $\gamma_\jmath < 0$ could be seen as a falsification test. Assuming no anticipation, no model misspecification, or omitted variables, these coefficients should not display a trend. The results suggest that there is a positive effect of appointing a woman on the board for the first time, but this effect does not seem to last.

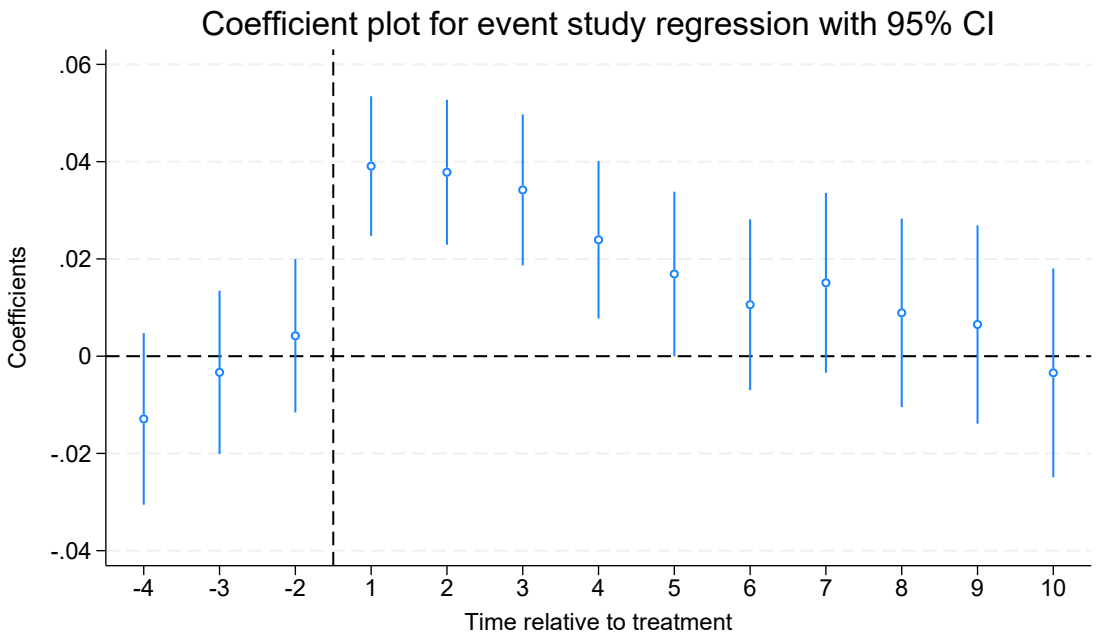


Figure (3) Event Study

However, in our setting, the required assumptions will most likely not be satisfied when using a framework where the event is considered a treatment and the not yet treated serves as a control. Foremost, we cannot rely on randomized event timing. A firm's first appointment of a female director will depend on its previous decisions. Firms also enter (have more than 50 employees) and exit (dissolution of the firm) our sample, suggesting we need to restrict the sample to make a balanced panel, which would not represent the firms in the population. Also, the assumption of parallel trends among cohorts of the first appointment of a female director demands that two firms that appointed their first female director in 2000 and 2005, respectively, would have the same change in share of female C-suite members between two years had they not appointed a female director. The event analysis also requires no anticipation– saying that in the years before appointing a female director, the share of female C-suite members would have been the same had the firm decided to appoint a female director or not (i.e., similar outcome changes in the counterfactual case).

In our case, we see increasing pre-trends (although insignificant), which can be evidence against the parallel trend assumption. However, if this increase in the share of female C-suite members were not caused by the anticipation of appointing their first female director, it would not violate the assumption. The change in female C-suite members before the appointment may have occurred without a female director's appointment. A reasonable path for a firm may be first to hire a female C-suite member, for example, an HR executive, since there is more female HR in the pipeline, before considering appointing a female director. In the literature on child penalties, pre-trends are more common than no pre-trends. See discussion in (Andresen and Nix, 2022).

The vast majority of firms in our data never appointed a woman to their board of directors (4943), and in this analysis, they are excluded. The cohort sample comprises 2770 firms that, sometime during the period, go from having 0 women on their board to appointing at least one woman. A few firms return to having no women on their boards

and then appoint a woman again, but these situations are not considered events. Since the treatment appoints a woman to the board of directors, we have a case where firms switch in and out of treatment (De Chaisemartin and d'Haultfoeuille, 2023). About 100-150 firms with no women on their boards each year appoint a woman in the following period. At the same time, about 50 firms that had a woman on their board of directors ended up with a board with no women the following period. Also, the treatment effects are not likely to be constant. Most of our firms do not have a woman on their board of directors. This has been changing slowly. In 1995, the share of firms with 0 women on their boards was above 75%. In 2018, the share was slightly less than 65%.

C Appendix: Quantification of results

Using the results from regression in Column 2 in Table 12 in Appendix A combined with the average number of females in the C-suite (found in Table 10 in Appendix A) we ask what the share of women in C-suite would have been imposing a quota of 40 pct. instead of the current share of 12 pct. Using the β coefficients from Column 2 in Table 12 we ask how the change from 12 to 40 pct WoB would change the share of women in the C-suite.

$$\delta Y = \beta_1(0.4 - 0.12) - \beta_2(0.4^2 - 0.12^2) \tag{3}$$

In the following step, we use the numbers from Table **??**, depicting the number of appointments with and without connections combined with the regression results from Column 2 in Table 9. Assuming that an increase to 40 pct. (from 12 pct) women on the BoD would proportionally affect the number of female and male board members with connections. Female board member connections to C-suite members will increase by a factor of 0.40/0.12 (labeled γ_f) and the male share will decrease by a factor of 0.6/0.881 (labeled γ_m). From Table **??** we then calculated the average share of female and male connections (labeled ξ_f and ξ_m). For this sample of firms we then calculated the change in the share of female C-suite members if a 40pct quota was introduced. Combining the calculated connections for males and females within the firm boards with the β-coefficients from Column 2 in Table 9 we found a change of share in female C-suite members of 0.05.

$$\delta Y = \beta_1(\gamma_f(\xi_f) - \gamma_f) - \beta_2(\gamma_m(\xi_m) - \gamma_m) \tag{4}$$

The quit rate is calculated using people who left the C-suite position from 2017 to 2018 or changed to a C-suite in another firm.

Table (24) New appointments into C-suite in 2018.

New male appointments into C-suite	2595
New female appointments into C-suite	622
New appointments into C-suite M+F	3217

Table (25) Leaving the C-suites between 2017 and 2018

	All	Men	Women
C-suite in 2017 but not in 2018	3.712	3.076	636
Stays in the same firm´s C-suite	8.901	7.662	1.239
Changes to another firm´s C-suite	365	314	51
Quit rate	0,314	0,307	0,357
All	12.977	11.051	1.926

Table (26) Freq. table for top executives divided into subcategories

	Stock	Flow
CEO	26,56 (41.096)	23,37 (16.236)
CFO	14,16 (21.917)	13,74 (9.542)
HR	3,22 (4.979)	3,60 (2.499)
Other	56,06 (86.739)	59,29 (41.188)
All	100 (154.731)	100 (69.465)