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Lifting Women Up: Gender Quotas and the Advancement of Women on Corporate Boards

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ABSTRACT

Research Question/Issue: The introduction of gender quotas on corporate boards can disrupt the status quo, resulting in externalities that affect women's advancement within the company. This study investigates whether boardroom quotas contribute to promoting women further up the corporate ladder and facilitate access to a broader spectrum of positions.

Research Findings/Insights: Using legislative changes in Germany as a natural experiment, we find that quotas increase female representation on affected boards. However, quotas may also have adverse effects on women's executive careers; they fall short of eliminating the glass ceiling and fail to level the playing field for women, both inside and outside the firm.

Theoretical/Academic Implications: The incentives provided by the quota to hire female candidates for a mandated board may hinder their prospects for advancement to executive roles. Drawing from institutional theory, we interpret this as evidence of decoupling—firms comply with the law but do not necessarily change their stance on gender diversity at the top. Additionally, when women accessing the board have backgrounds more closely aligned with executive positions (proxied by their affiliation with the capital side of the board), the negative effect on the non-affected executive board is larger. This suggests a substitution effect, whereby women enter nonexecutive positions instead of pursuing executive careers.

Practitioner/Policy Implications: Policy design needs to consider the desired outcomes and unintended effects, carefully weighing the trade-offs among them. Relying solely on quotas is insufficient to achieve gender equality in corporations.

1 | Introduction

Gender diversity at the top of corporations has become an increasing concern in recent years. One of the most popular measures for promoting diversity is the implementation of gender quotas on corporate boards. In 2003, Norway passed a groundbreaking law mandating that women occupy at least 40% of board seats in all public companies. This case garnered significant attention as it successfully increased the proportion of women directors from 5% in 2001 to 40% in 2008. Following Norway's example, other countries such as Austria, Belgium, France, Germany, Iceland, Italy, the Netherlands, and Portugal have implemented national gender quotas in their legislation. More recently, the European Union reached a political agreement to establish a 40% female quota for non-executive director (NED) positions in all European listed

companies (Bravo and Pronina 2022). Quotas are also gaining momentum in the United States, as evidenced by California's pioneering move in 2018 to implement the first state-level mandate for gender quotas on corporate boards (California Corporations Code Section 301.3).[1]

Numerous studies have examined the effects of boardroom quotas and, for the most part, the financial consequences of increasing the percentage of women on board seats (Ahern and Dittmar 2012; Matsa and Miller 2013; Nygaard 2011; Eckbo, Nygaard, and Thorburn 2016; Tyrefors and Jansson 2017; Ferrari et al. 2018; Greene, Intintoli, and Kahle 2020; Maida and Weber 2022). Others have focused on the consequences of quotas on a firm's nonfinancial outcomes, particularly regarding environmental policies and corporate social responsibility (for a review, see Nguyen, Ntim, and Malagila 2020). However, research on the effect of gender quotas on women's advancement is not as extensive (Kirsch 2018). Given this, our study aims to fill this gap by examining the consequences of gender quotas on women's representation on boards and their impact on female career trajectories.

First, we investigate whether gender quotas enhance women's representation on boards. Unlike most other countries, Germany has a dual-board system: a management board with executive functions and a supervisory board with monitoring and advisory functions. Hence, the German dual-board system allows us to examine the impact on both the affected and non-affected boards within the same firm. Our primary finding shows that the quota increases the share of women on the affected board; however, it does not promote the presence of women in the managerial bodies not targeted by the quota law. Moreover, we observe that the share and number of female members on the management board are lower in treated firms after the quota; that is, companies tend to counteract quotas on boards where they are not mandatory. This finding aligns with the hypothesis of "means–ends" decoupling as described by Bromley and Powell (2012).

Our second primary finding indicates that women's likelihood of holding the board presidency remains unchanged. This suggests that women do not necessarily close the gap with men in the highest ranked board positions, despite the gender quota. Moreover, this supports the existence of a "glass ceiling," which manifests as a decrease in female representation as the professional rank increases (Wang and Kelan 2013; Bozhinov, Koch, and Schank 2018).

Further, our analysis reveals that the negative impact on the management board is larger for firms that have previously nominated women to the capital side of the supervisory board. We posit that members from this side of the supervisory board may serve as closer substitutes for management board roles, implying that firms may appoint women to the board primarily to fulfill legal requirements, subsequently reducing their availability for potential executive positions. This suggests a substitution effect, in which women accept nonexecutive positions instead of pursuing executive careers. Consequently, women may transition into portfolio-career NEDs, holding multiple nonexecutive positions across different companies and deviating from the executive trajectory.

Finally, the mandatory quota increases the number of positions women hold simultaneously on supervisory boards across multiple firms. Consequently, part of the growth in female representation on boards may benefit women insiders already serving on boards. This aligns with the documented "golden skirts" phenomenon observed in other cases (Smith 2014; Huse 2011; Bertrand et al. 2019).

Our study is most closely related to the body of literature investigating the rationale for gender quotas in the upper echelons of firms, focusing on their potential positive externalities. These include reducing wage gaps, enhancing female labor participation, providing equal promotion opportunities, and fostering a more egalitarian representation of women in leadership roles. Significantly, the study of the trickle-down effect of the Norwegian quota by Bertrand et al. (2019) revealed no significant impact on women employed in affected companies. Similarly, Maida and Weber (2022) found no evidence of changes in the percentage of women in the top earning positions in Italy, whereas Bozhinov, Koch, and Schank (2018) documented a remuneration gap in German boards that were affected by the quota. Nevertheless, empirical evidence on the impact of quotas on female careers in business and the feminization of the upper echelons remains scarce.

Our study contributes to the emerging body of research on the rise of female career NEDs. Anecdotal evidence has highlighted a novel phenomenon: Women leave or do not pursue executive careers in favor of becoming NEDs. In the United States and the United Kingdom, researchers have observed that most women serving on corporate boards hold independent directorships akin to nonexecutive positions (Adams and Ferreira 2009; Tunyi et al. 2023). These women are also more vulnerable to dismissal upon losing their status as independent directors (Main and Gregory-Smith 2018). Despite these observations, a notable lack of empirical evidence exists regarding the phenomenon of career NEDs in relation to gender quotas.

Finally, our study adds to the broader literature on the impact of women on organizational boards. Descriptive studies, such as those by Adams and Ferreira (2009) and Bozhinov, Koch, and Schank (2018), show that female directors tend to have higher participation rates and are more likely to join monitoring committees. However, they do not significantly impact gender inequality in employee earnings within organizations (van Hek and van der Lippe 2019), except at the executive level (Carter, Franco, and Gine 2017). Bozhinov, Joecks, and Scharfenkamp (2021) found that firms with women on the nominating committee have a higher probability of employing at least one woman on the management board. However, Fleischer (2022) uncovered no evidence of a positive spillover effect from the number of women on a nonexecutive board to future diversity on the executive board. Importantly, none of these studies exploit the introduction of gender quotas to examine the causal effect of increased female presence on the board.

The remainder of this study is organized as follows. Section 2 provides details of the German corporate system and Gender Quota Law. Section 3 presents the hypotheses, and Section 4 describes the data and empirical strategy. The empirical results are presented in Section 5. Section 6 presents the results of several robustness checks. Finally, Section 7 concludes.

2 | The German Corporate System

This section focuses on three characteristics of the German corporate system that are relevant to our analysis: the dual-board system, system of employee co-determination, and regulations on gender quotas for boards.

2.1 | The Dual-Board System

Similar to most other countries, the ownership structure of German firms includes both listed and private companies. Most private companies are structured as limited liability companies (GmbH, or *Gesellschaft mit beschränkter Haftung*), whereas most listed firms adopt the legal structure of stock corporations (AG, or *Aktiengesellschaft*) or European limited-liability companies (SE, or *Societas Europaea*).

Listed companies can also form legal partnerships limited by shares (KgaA, or *Kommanditgesellschaft auf Aktien*).

The Stock Corporation Act applies to stock corporations, partnerships limited by shares, and partially to companies with limited liability.[2] It establishes a mandatory two-tier structure with a management board (*Vorstand*) and a supervisory board (*Aufsichtsrat*).

The management board (or executive board) is responsible for independently managing the company's interests. It oversees the firm's executive duties and daily affairs to achieve the firm's objectives, which are not directly controlled by shareholders or the supervisory board. Conversely, the supervisory board (also known as the nonexecutive board) supervises and monitors the management board, appointing members to the management board, overseeing their activities, providing advice on fundamental decisions, and determining their compensation. Additionally, it sets the long-term goals of the company and integrates the voices of other stakeholders, such as employees and lobbyists (Aluchna 2013).

The dual-board system is a characteristic feature of Germany.[3] The system originated in the 19th century but was formally adopted in its modern iteration following the Second World War. The dual-board system is designed to separate the management and control within a firm. By law, shareholders elect members of the supervisory board during general meetings, and no supervisory board member can simultaneously be a member of the management board. However, in practice, some crossover has historically happened between the two boards. For example, it is not uncommon for management board members to transition to the supervisory board after retirement, including becoming the chairman of the supervisory board (Jungmann 2006).

2.2 | Co-determination

In the German corporate system, supervisory board members are either representatives of shareholders or labor (Carley 1998; Schulten and Zagelmeyer 1998). A specific form of employee participation is regulated by the co-determination system. The proportion of worker representatives varies from one-third to one-half depending on the size of the company.

Under the Co-Determination Act,[4] a company with more than 2000 employees has parity co-determination. In this case, half of the supervisory board members must be affiliated with the employee side (*Arbeitnehmerseite*), whereas the other half must be affiliated with the capital side (*Kapitalseite*). The chairperson represents the capital side and holds the deciding vote in all industries except coal, iron, and steel companies, where the chair is independent.[5]

In companies with more than 8000 employees, employee representatives are elected by delegates, although they are directly elected by the workforce in companies with fewer than 8000 employees (Page 2018). Capital-side representatives do not necessarily have to be from within the firms, and their selection process is more professionalized. The representatives are ratified by the shareholders in the General Assembly.

For companies subject to parity co-determination, the Stock Corporation Act regulates the size of their supervisory boards. Firms with between 2000 and 10,000 employees must have 12 seats on the board (six on the employee side and six on the capital side), firms with between 10,001 and 20,000 employees must have 16 seats (eight on each side), and firms with more than 20,000 employees must have 20 seats (10 on each side).[6]

2.3 | The German Boardroom Quota

Since 2002, the German Corporate Governance Code has advocated for diversity in the election of management boards, executive staff, and supervisory boards (Burow, Fedorets, and Gibert 2018). Nevertheless, women's participation on corporate boards in Germany has typically been very low. In 2015, women constituted less than 20% of the nonexecutive boards and less than 5% of the management boards in the top 200 German corporations (Holst and Kirsch 2015).

In March 2015, Germany introduced a compulsory gender quota for the supervisory boards of its largest listed companies. This measure was celebrated as a historic achievement in promoting gender equality in corporations. Justice Minister Heiko Maas, a proponent of the measure, described the quota as “the greatest contribution to gender equality since women got the vote” in 1918 (Smale and Miller 2015). However, the path to its approval was rife with controversy, and an unexpected shift in the balance of power in the parliament was instrumental in making the quota a reality.

Shortly before the introduction of the quota, a majority conservative cabinet of the Christian Democratic Union (CDU), supported by its liberal coalition partner, the Free Democratic Party, strongly opposed a fixed “hard” quota, whereas the Ministry for Family Affairs advocated for a “flexi-quota” (Federal Ministry for Family Affairs, Senior Citizens, Women and Youth of the Federal Republic of Germany 2011). This approach relied on companies' voluntary commitments. The flexi-quota was implemented in 2011, allowing companies to set their own goals and determine the timeframe to achieve

them. This policy was intended to take effect only if the economy failed to triple the average proportion of women on boards by 2013.[7]

The government coalition rejected two proposals for a compulsory boardroom quota introduced by the opposition parties.[8] Germany also voted against the European Commission's pro-quota initiative in 2012. Chancellor Merkel publicly supported the Minister for Family Affairs by advocating for a more flexible legislative framework, whereas the Liberal Coalition Party strongly rejected the idea of business quotas. However, in September 2013, a federal parliamentary election was held, resulting in the incumbent CDU winning by a significant margin (as expected), falling only five seats short of an absolute majority. Nonetheless, their former minority partners failed to meet the 5% vote threshold, thereby denying them seats in the Bundestag for the first time in their history. This unexpected outcome prevented a reenactment of the former government coalition. The CDU and Social Democratic Party of Germany (SPD), being the only two parties capable of forming a government, initiated negotiations to form a coalition government. The Social Democrats prioritized the gender quota on the new government's agenda (Lang 2015). In 2014, a decision on the regulation of the quota was announced (Connolly 2014). The Ministry for Family Affairs drafted the "Bill for the Equal Participation of Women and Men in Executive Positions in the Private Sector and in Public Service,"[9] which was subsequently approved on March 6, 2015. The law came into force on May 1, 2015, and the quota became effective on January 1, 2016.

The bill, referred to as the Gender Quota Law (GQL), affects the supervisory boards of listed firms subject to parity co-determination. As stated in Section 2.1, companies have two boards in the German dual-board system. Therefore, only one of the two boards of the company is affected by the quota, whereas the other one is not.[10]

Companies falling under the purview of the GQL must adhere to the following provisions: (i) a mandatory 30% quota for the underrepresented gender on supervisory boards and (ii) voluntary quotas for the management board members, determined by each company individually. In summary, as of January 1, 2016, the GQL mandates a minimum of 30% representation of the underrepresented gender on the supervisory board.[11] Any impacted firms that fail to meet the threshold will be prohibited from electing a new male member to their supervisory board. Otherwise, such an election will be declared void, and the seat will remain vacant until new elections are held or a member is appointed by the court.[12] Furthermore, failure to meet the quota constitutes an administrative offense that can result in a fine of up to 50,000 euros.

In recent years, the share of women on boards has increased in the largest German firms (Figure 1). Notably, supervisory boards, which are directly impacted by the GQL, have had a higher percentage of women than management boards throughout the analyzed period. In 2016, the first year that the quota obligation became effective, the percentage of women on the supervisory board was approximately 14%, which was still far from the mandated 30% goal set by the GQL.

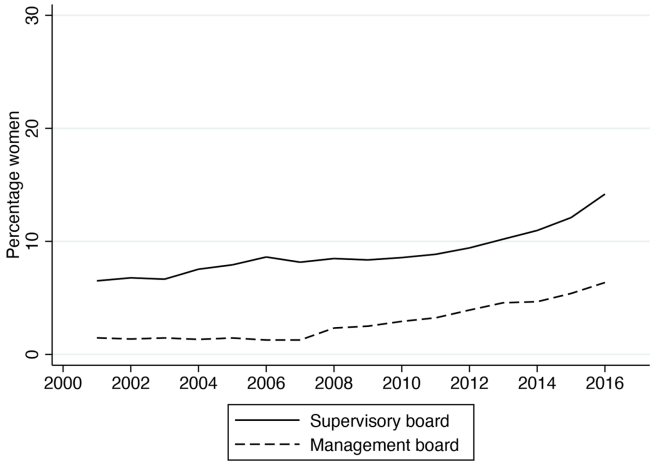

FIGURE 1 | Evolution of the share of women on supervisory boards and management boards for the largest German firms. This figure shows the average percentage of women on supervisory boards (solid line) and management boards (dotted line) between the years 2000 and 2016 in the largest German companies. Percentage women is the number of women over the total number of board members, expressed in percentage points. *Source:* "Die Großen 500" [CD-ROM] Neuhasel: Müssig Verlag, 2000–2017. [Colour figure can be viewed at wileyonlinelibrary.com]

3 | Hypothesis Development

This study examines female leadership to determine if implementing positive gender discrimination through legislation can improve female representation at the top of corporations. Specifically, we investigate the effect of gender quotas on the advancement of women in boardrooms. Do these quotas contribute to lifting more women further up the corporate ladder and into other traditionally male-dominated roles? To address this question, we consider a legislative change in Germany as a natural experiment—the introduction of a gender quota on the supervisory boards of the largest listed companies. We find substantial side effects that may benefit some women at the expense of others in the short term and promote certain career paths. Subsequently, we present the tested hypotheses.

3.1 | Spillover to Executive Boards: Legitimacy and Decoupling

We draw upon institutional theory to investigate whether the increase in female representation extends to other areas traditionally dominated by men. This theory examines the relationships between organizations and their institutional environments and analyzes how they may influence firm behavior (North 1990). In this institutional environment, *legitimacy* refers to the general acceptance of a practice as desirable or appropriate within a socially constructed system of norms (Suchman 1995). Firms seek legitimacy to ensure their survival (Suchman 1995).

Norms and rules have important consequences for organizations operating in an institutional environment, and they influence which organizational practices are considered legitimate (DiMaggio and Powell 1983; Meyer and Rowan 1977).

Consequently, the GQL may enhance the normative legitimacy of gender diversity, thereby triggering an increase in female participation in other managerial bodies, such as the management board (Zhang 2020).

Nevertheless, as Terjesen and Sealy (2016) point out, a "new regulation such as the quota can raise concerns about whether the goal is integrity in the sense of meeting the spirit of the new law or considerations of compliance, responding more to the letter of the law." This practice fits the concept of *decoupling* proposed by Meyer and Rowan (1977), which suggests that organizations may comply with institutional pressures and adopt new structures without necessarily implementing the intended practices in a meaningful way. The two boards jointly form the governing body of a firm (i.e., its group of directors). Firms may perceive them as a collective authority and decide on a unified composition. When gender diversity is perceived merely as a regulatory requirement lacking intrinsic value, organizations may counterbalance the mandated increase in female participation on one board by appointing fewer women to the other area of the governing body, namely, the other board.

Hypothesis 1. *In the presence of decoupling, an increased female share on the supervisory board is expected to have a negative spillover effect on the management board.*

Bromley and Powell (2012) identify two types of decoupling: symbolic adoption and symbolic implementation. Symbolic adoption occurs when practices are not genuinely implemented due to a lack of interest or ability, causing a "gap" between policy and actual practice (Brunsson and Olsen 1993). Contrastingly, a practice may be genuinely implemented; however, its impact on advancing an organization's main goals may be uncertain or unclear (Wijen 2014). This type of symbolic implementation results in a "means–ends" decoupling.

Firms' engagement in means–ends decoupling depends on several internal and external factors. First, societal context matters. As these policies are adopted in response to societal pressures, we postulate that firms embedded in a more favorable context to the existing norm will face more pressure and, thus, are less likely to engage in decoupling. A more favorable context for gender diversity policies can be exemplified by more progressive or left-leaning societies because these policies enjoy broader acceptance among the public, politicians, and policymakers. Our test separates the impact of the gender quota on the management boards of firms based on their region. We hypothesize that the pressure to conform to the norm will be lower in less progressive leaning regions. Consequently, decoupling is expected to be higher, and we anticipate observing a larger negative effect of the GQL.

Hypothesis 1a. *In more conservative regions, we expect to observe a larger negative effect on the share of women on the management board following the implementation of the Gender Quota Law (GQL).*

The degree of decoupling may also be influenced by internal factors, such as the alignment of organizational culture with the norm prior to the enactment of the GQL. Firms that consider diversity as a core value are likely to exhibit better alignment; hence, we anticipate observing less decoupling in such cases. We measure the strength of firm diversity based on the presence of a female president on the supervisory board. The presence of a female chairperson implies that the firm has already partially internalized the value of diversity, leading us to expect a smaller reduction in the number of women on the supervisory board after the enactment of the GQL.

Hypothesis 1b. *Firms with a female chairperson on the supervisory board are expected to display a smaller negative effect of the GQL on the share of women on the management board.*

Another factor to consider is the extent of institutional pressure or cost of implementation. Each firm faces a different degree of change based on its prior situation. Firms with a higher proportion of females on the affected board will necessitate fewer adjustments to comply with legal requirements, whereas those without women on the board will encounter greater challenges. The difference between the current share of women on the board and the mandated share imposed by the GQL influences the dissonance between the existing norm and the firm's internal values. The larger this disparity, the more we anticipate observing decoupling in those firms.

Hypothesis 1c. *We expect a larger adverse effect on the proportion of women on the management board as the percentage of women that firms are obligated to increase in compliance with the GQL rises.*

3.2 | Female Board Presidency: Glass Ceiling

Another question of interest is whether the quota may help lift women up to the very top positions, shattering the so-called "glass ceiling." It seems reasonable to expect that once women achieve certain positions of power, they can advance to the highest echelons of the firm. However, this may not be the case if women on the board are not perceived as equals. A practical implication may be that despite women reaching top positions within a firm, they may lack the actual power to enact meaningful changes. Eagly (2016) suggests that this may happen because women are "disadvantaged in groups composed mainly of the other gender ..., and this disadvantage can hamper their contributions."

The highest ranked positions, such as those of the chairperson or head of some board subcommittees, have more power to influence decisions. The chairperson of the board "is often seen as the most influential director on a board by being responsible for managing the board, setting its agenda, and having a close relationship with the chief executive officer" (Seierstad and Opsahl 2011). Moreover, as explained in Section 2, the chairperson's vote is a tiebreaker in the case of a board deadlock. If women on the board do not have an improved chance of becoming chairpersons, this may indicate that they do not have as much influence over decisions as men do. Thus far, studies examining the effect of board quotas on the feminization of chairs have found mixed results (Wang and Kelan 2013; Bozhinov, Koch, and Schank 2018).

Hypothesis 2. *Firms affected by the Gender Quota Law (QGL) are expected to have an increased likelihood of having a female chairperson on the board.*

3.3 | Women Shift From Management Board to Supervisory Board

As discussed in Section 2, co-determination is a fundamental aspect of the German corporate system involving employee participation on the supervisory board. Representatives often differ in their qualifications and experience. Employee representatives are selected from the company's workforce, whereas individuals on the capital side of the board can be anyone, regardless of their connection to the firm. Capital-side members often include former management board members, individuals from other companies, or notable societal figures, such as professors and politicians. The appointment of board members has undergone professionalization with the involvement of nomination committees and headhunters. Notably, the recruitment processes and professional profiles of capital-side board members tend to align more closely with those of management board members than with their counterparts on the employee side.

Starting on January 1, 2016, any vacancy in a company that fails to meet the quota must be filled by a female candidate. We assume that members of the capital side are closer substitutes for management board members than employee-side members. Consequently, we anticipate that companies that appoint women to the capital side of the supervisory board may encounter greater difficulties in finding women on the management board in the future. This is because a female candidate hired on a mandated board may be disregarded, at least in the short term, for a forthcoming opening on the management board. Over time, we expect this to result in a more pronounced negative impact on the proportion of women on the management board, indicating a shift in women from the management to the supervisory board, particularly on the capital side.

Hypothesis 3. *Firms that have hired women for the capital side of the supervisory board in the past are expected to experience a larger negative effect on the share of females on the management board compared to firms that have hired women for the employee side of the supervisory board.*

3.4 | Concentration of Multiple Board Appointments: Golden Skirts

Gender board quotas have the potential to broaden the opportunities for a more extensive group of female candidates to attain board membership. This can help reduce the opportunity gap between women insiders who already hold directorships within the firm and women outsiders, thereby fostering equality among women. Studies have demonstrated that compared to the general female population, female directors display characteristics that are more similar to their male counterparts than with the average woman, including traits like risk aversion (Adams and Funk 2012). Consequently, requiring firms to consider female director talent from a broader pool of women could affect the prevailing leadership style in boardrooms. Additionally, it may level the playing field for women competing for limited opportunities, thus reducing the incentives for "queen bee" situations to arise (Bagues, Sylos-Labini, and Zinovyeva 2017; Faniko, Ellemers, and Derks 2021).[13]

Simultaneously, gender quotas also have the potential to result in women insiders accumulating more board nominations, leading to what is commonly referred to as the "golden skirts" phenomenon (Smith 2014). In such cases, the increase in female representation may primarily benefit women already serving on boards rather than increasing the participation of new women, thus leading to the formation of a small elite group of women directors that is similar to the traditional "old boys' network" (Huse 2011). Consequently, this contradicts the goal of achieving a more widespread distribution of power among women overall (Seierstad and Opsahl 2011). The increase in corporate golden skirts exacerbates the existing inequalities among women and may overburden female insiders with excessive duties.

The golden skirts phenomenon has been examined by researchers and the media and has been found to increase after the implementation of gender quotas on boards (e.g., evidence from Norway as shown by Bertrand et al. 2019). In Germany, theoretical limits exist to the extent to which this phenomenon may occur. Under the Stock Corporation Act presented in Section 2, an individual cannot hold more than 10 supervisory board positions, and the seat of the chairperson counts as two positions. Additionally, management board members cannot hold more than three positions on the supervisory boards of external companies in the same or similar industries (Deloitte 2016).

Hypothesis 4. *The implementation of the Gender Quota Law (GQL) is expected to result in a growth in the number of positions women hold simultaneously on the supervisory boards of multiple firms.*

4 | Data and Empirical Specification

4.1 | Data Description

The dataset contains information on 1128 firms from 2000 to 2016. The data were obtained from the Die Großen 500 database, which provides managerial and financial information based on the public records of the largest German firms regarding sales volume.[14]

The main advantage of this dataset is its inclusion of the full names of executive and supervisory board members, along with their affiliations to either the capital or employee side of the supervisory board. Although other sources of data (e.g., Orbis) offer more comprehensive business information, data on the historical composition of boardrooms, which is essential for our analysis, are unavailable. For data on the number of employees and firms' financial variables, we have complemented the database with financial data from Datastream and Compustat Global by manually matching the company names.

We focus our analysis on the years of 2008–2016, which yields 7953 firm-year observations. The overall number of treated and untreated firms is shown in Appendix A. Approximately 100 German companies were obliged to implement the gender quota; we have 94 treated firms in our database. The firms are spread across various industries and regions, such that the effect is not confined to a specific region or economic sector.

Board members are classified by gender based on their first names. We listed all the names of board members and manually assigned them to the categories "male" or "female" whenever their gender was unambiguous. If the gender classification based on the first name alone was not possible (for instance, if the first name was foreign or unisex), we perform an Internet search using both the first and last names to identify public records, journal articles, or other business data sources where the person was referenced. Then, we assign the gender according to the visual inspection of a picture or the personal pronouns used to refer to the person or their job title.[15] In Table 1, we present selected summary statistics of the main variables. Women hold a minority of board seats; on average, management boards have 0.2 female members, and supervisory boards have 1.8 female members. Approximately 50% of the firms do not have any women on their supervisory boards, and more than 85% do not have any women on their management boards.

Figure 2 plots the evolution of the share of women on the supervisory board and on the management board over time. The solid lines represent firms affected by the GQL, and the dotted lines represent unaffected firms. The share of women on both boards of treated firms increased vis-à-vis untreated firms from 2011 onward after the introduction of the flexi-quota. As explained in the previous section, the flexi-quota obliged companies to set individual voluntary quotas and comply with them over a self-determined period of time. Quotas could be set to zero, and this was indeed the case in many instances. In 2014, it became evident that the GQL would impose a rigid quota solely to the supervisory board unlike the flexi-quota. Figure 2 indicates that the share of women on the supervisory boards of treated firms continued to rise, surpassing 20% in 2016. Contrastingly, women's share on management boards decreased immediately after 2014 for treated firms, and, subsequently, it advanced more slowly than in untreated firms, where women continued to occupy more positions.

4.2 | Empirical Specification

Considering the causal effects of the quota, we estimate the following difference-in-differences model:

$$Y_{i,t} = \beta \text{Treated}_i \times Post2014_t + \gamma X_{i,t} + \kappa_i + \tau_t + u_{i,t}, \quad (1)$$

where $Y_{i,t}$ is the dependent variable, representing the share of women on the board; *Treated* is a dummy variable that takes the value of 1 if the firm is affected by the GQL and 0 if it is not; $X_{i,t}$ is the size of the firm proxied by the number of employees; and *Post*2014 is a dummy variable that takes the value of 1 in the posttreatment years and 0 in the pretreatment years. The specification includes year and firm fixed effects.[16] Standard errors are clustered at the firm level.

Ahern and Dittmar (2012) and Matsa and Miller (2013) were the first to study the pioneering Norwegian experiment that introduced gender board quotas into public firms. Due to the lack of a proper control group of unaffected firms, Ahern and Dittmar (2012) employed a difference-in-differences approach using the firm's pre-quota variation in female participation (i.e., the firm's percentage of female directors before the quota interacted with year dummies) as an instrument to measure the percentage change in female directors. Despite some criticism of this approach (Ferreira 2015), it remains a widely used empirical strategy in the study of boardroom quota effects (Bertrand et al. 2019; Tyrefors and Jansson 2017; Greene, Intintoli, and Kahle 2020). In contrast, Matsa and Miller (2013) employed a triple-difference estimation by constructing three "ad hoc" control groups (private firms in Norway and public firms and private firms in other Nordic countries) and using the Abadie et al. (2004) matching algorithm. In this study, we utilize the German quota's exclusive application to listed firms with more than 2000 employees to create three comparison control groups within the country: (i) listed firms with fewer than 2000 employees, (ii) large (equal to or more than 2000 employees) unlisted firms, and (iii) firms that fall into neither category. Given this, we can determine the consequences of the quota for the affected firms by isolating the effects that can be attributed to different trends in large or listed firms. Additionally, following Matsa and Miller (2013), we match each affected firm with its five closest neighbors from the control group based on the annual difference in the share of women on the respective board, the share of women, firm size, and, in some cases, financial controls before the reform. Subsequently,

TABLE 1 | Descriptive statistics.

	Affected firms				Non-affected firms			
	Mean	SD	Min	Max	Mean	SD	Min	Max
Members' management board	4.8	1.9	2.0	11.0	4.2	2.0	1.0	16.0
Members' supervisory board	14.4	4.4	1.0	22.0	10.2	6.2	1.0	40.0
Female members' management board	0.2	0.4	0.0	2.0	0.2	0.5	0.0	4.0
Female members' supervisory board	1.7	1.7	0.0	8.0	0.9	1.4	0.0	8.0
Employees	53,024.3	94,105.4	6.0	642,292.0	12,780.9	33,256.0	0.0	570,000.0
EBITDA over assets	0.1	0.1	−0.3	0.7	0.1	1.0	−16.4	20.4
Debt over assets	0.2	0.2	0.0	1.7	0.2	0.2	0.0	0.9

Note: This table presents descriptive statistics of the total number of members of management boards (first row) and supervisory boards (second row); the number of female members of management and supervisory boards (third and fourth row); the number of employees; earnings before interest, taxes, depreciation, and amortization (EBITDA) over assets; and the percentage of debt measured as debt over assets. The first column presents the mean value, the second presents the standard deviation, and the third and fourth columns present the minimum and maximum values, respectively.
Source: "Die Großen 500" [CD-ROM] Neuhäsel: Müssig Verlag, 2000–2017, Datastream and Compustat Global.

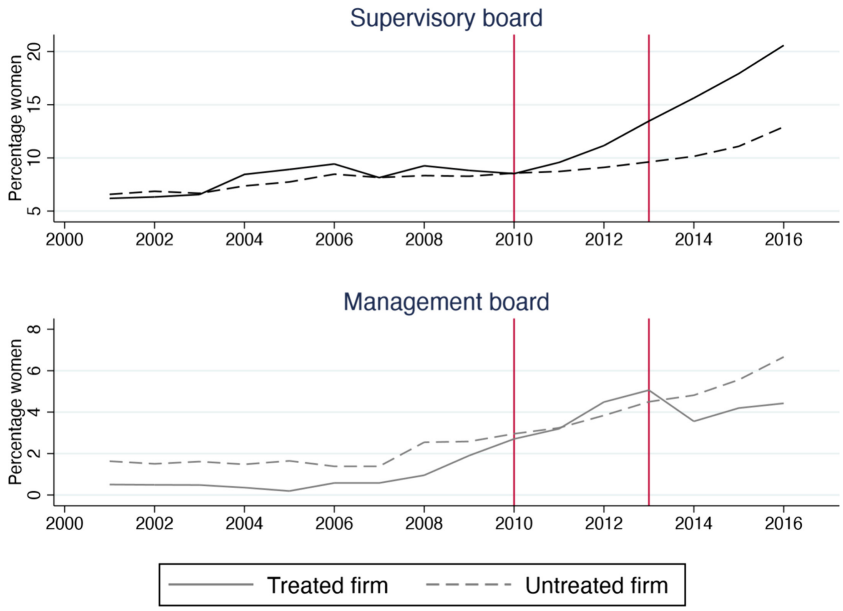

FIGURE 2 | Evolution of the share of women on supervisory boards and management boards. This figure shows the average percentage of women on supervisory boards (panel above) and management boards (panel below), between 2008 and 2016, split by treated (solid line) and untreated (dotted line) firms. Percentage women is the number of women over the total number of board members in percentage points. A treated company is defined as a company that satisfies the two criteria required by law to fall under the obligation of implementing a gender quota: being listed on the stock exchange and being subject to the Co-Determination Act. The rest are considered untreated. The first vertical line marks the introduction of the flexi-quota (2011), and the second vertical line marks the introduction of the Gender Quota Law (2014). *Source:* "Die Großen 500" [CD-ROM] Neuhasel: Müssig Verlag, 2000–2017.

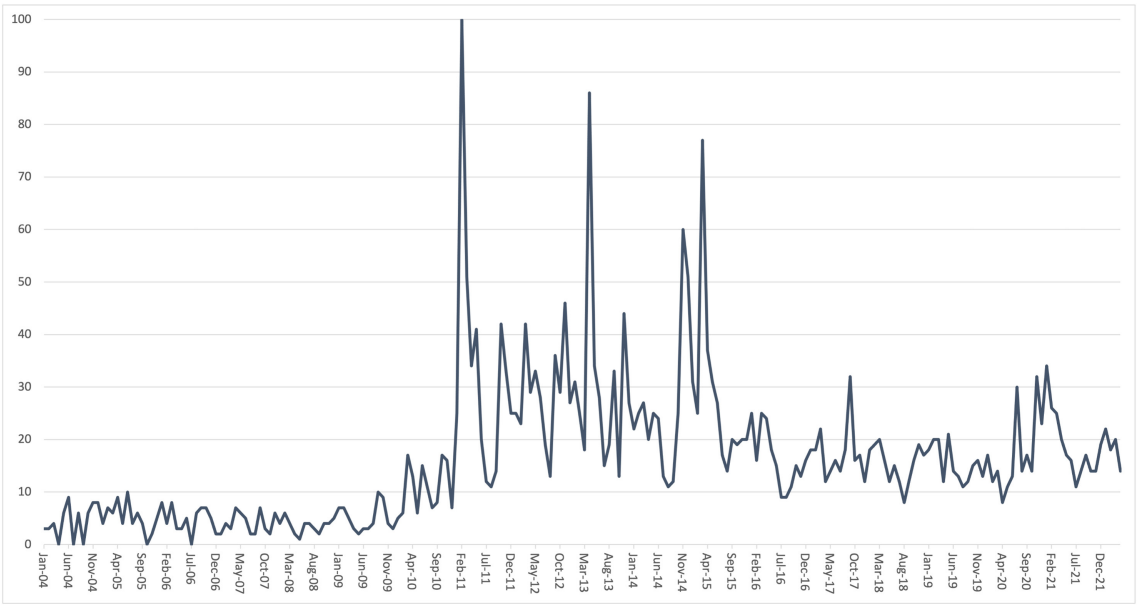

FIGURE 3 | Google Trends search for the topic "Frauenquote" in Germany. This figure shows the volume of Google searches in Germany for the topic "Frauenquote" ("gender quotas") between 2004 and 2022. Units are an index with a maximum value equal to 100. [Colour figure can be viewed at wileyonlinelibrary.com]

we conduct our difference-in-differences estimation with the matched samples, controlling for the propensity score.

4.2.1 | Treatment Year

The treatment year is 2014, the year the gender quota was agreed upon after the surprise election outcome removed the former government's opposition to a rigid quota. Before this occurred, we assume that the possibility of a gender quota was unlikely. Consequently, companies would not have acted proactively in anticipation of its implementation. Figure 3 highlights the trends in Google searches within Germany for the topic "Frauenquote" ("gender quotas"). Interest in the term can be seen as representative of awareness among the population and hints at possible anticipation effects. Spikes in Google searches are apparent

from February to March 2011, April 2013, November 2014, and March 2015. The first spike, in 2011, corresponds to the announcement of the flexi-quota (The Guardian 2011). The following spike in April 2013 coincides with the German parliament rejecting a boardroom quota proposed by opposition parties (Deutsche Welle News 2013). This was yet another reassurance against the imposition of a hard quota. After the formation of the CDU-SPD government coalition following the 2013 federal election, interest in the topic of gender quotas rose again with the announcement of the GQL in November 2014. The last spike in March 2015 corresponds to the official approval of the GQL in parliament. After the announcement of the GQL in 2014, firms became aware of the upcoming quota and, therefore, could react to it.

Prior to 2014, we assume that the government opposed the quota. The elections were conducted on November 22, 2013. Since the beginning of August 2013, election polls estimated the former junior government party FDP to be above the 5% threshold that grants representation in parliament. The incumbent CDU led in polls with an estimated 40% of the electorate, and together with the FDP, they were close to or above the absolute majority. More importantly, the coalition of the other two big parties, the SPD and the Greens, was not forecast to be able to form an alternative government.[17] The parties that were supposed to reenact the former ruling coalition were known to explicitly oppose a hard quota in the past and did not consider it a legislative priority.

4.2.2 | Treated and Control Group

First, we classify the treated firms according to the public records of eligible firms. Eligibility is recorded based on the list of 108 firms produced by DIW Berlin for the "Managerinnen-Barometer" in 2015.[18] Subsequently, we cross-check this classification twice: first, with the list of 107 firms elaborated by the Hans-Böckler-Stiftung, a foundation that undertakes research in the areas of business and administration in Germany, and second, with the 103 affected firms suggested by Bozhinov, Koch, and Schank (2018), which was based on the Women-on-Board list by the FidAR organization. Based on these lists, we select 94 distinct eligible firms from our sample, which we classify as "treated," and the remaining firms are categorized as "untreated."

The requirements of the GQL are summarized in Table 2. Listed firms subject to parity co-determination are affected by the GQL. However, it is important to note that this does not make our analysis a comparison of listed versus unlisted firms.[19] We compare a specific category of firms (listed and co-determined) to firms that are lacking either one or both requirements. We acknowledge that the group of treated firms is similar to no other: Firms that are both listed and particularly large (which makes them co-determined) may have particular characteristics and could have followed a different path over time, even in the absence of the GQL. This violates the assumption of parallel trends required in Equation (1). In the next section, we propose modifications to the baseline empirical specification to make our analysis more robust to trend differentials.

The first modification is to allow for a linear trend difference, as in Equation (2).

$$Y_{i,t} = \beta \text{Treated}_i \times Post2014_t + \delta \text{Treated}_i \times \text{Year}_t + \gamma X_{i,t} + \kappa_i + \tau_t + u_{i,t}, \quad (2)$$

where $Y_{i,t}$ is the share of women on the board, $\text{Treated}_i \times \text{Year}_t$ is the interaction between the year and the dummy variable *Treated*, and the remaining variables have the same meaning as in Equation (1). The specification includes year and firm fixed effects.[20] Standard errors are clustered at the firm level.

Bilinski and Hatfield (2019) recommended this approach to assess the robustness of parallel trends. The advantage of the model in Equation (2) is that it allows the treated and control groups to have linear trends with different slopes. If the treatment effect does not differ significantly from that of the baseline model (which assumes parallel trends), the hypothesis of parallel trends cannot be rejected.

Furthermore, we consider another specification focusing only on the subset of firms that are either listed or co-determined. In this case, the treated firms are listed and subject to parity co-determination, whereas the listed (but not co-determined) and co-determined (but unlisted) firms are two separate control groups. Small unlisted firms are excluded from the sample. Because our dataset does not contain information on the listed status of the firm or parity co-determination, we need to construct proxy variables. For listed status, we first merge our dataset with Compustat International to collect stock price information and combine it with information on the legal designation of the firm. We consider a firm to be listed if its legal designation is a stock corporation (*Aktiengesellschaft*), and we have information on stock prices for that year. We also consider all the European companies (*Societas Europaea*) as listed. We set firms without information on legal designation as missing and

TABLE 2 | Summary of the Gender Quota Law requirements.

		Supervisory board		Management board	
		2011	2013	2011	2013
Listed	Co-determination	$\geq \text{share}_{t-1}$	30%	$\geq \text{share}_{t-1}$	0%
	Without co-determination	0%	0%	0%	0%
Unlisted	Co-determination	0%	0%	0%	0%
	Without co-determination	0%	0%	0%	0%

Note: This table summarizes the requirements firms have to meet to fall under the purview of the GQL and the legal obligations it establishes.

consider the rest unlisted.[21] Regarding "co-determined" status, we follow the Co-Determination Act and consider any firm with 2000 employees or more in our sample to be subject to parity co-determination.

Then, we estimate the following equation for the subsample of firms meeting at least one GQL requirement:

$$Y_{i,t} = \beta_1 Listed_i \times Codet_i \times Post2014_t + \beta_2 Listed_i \times Post2014_t + \beta_3 Codet_i \times Post2014_t + \gamma X_{i,t} + \kappa_i + \tau_t + u_{i,t}, \quad (3)$$

where $Y_{i,t}$ is the share of women on the board; $Listed_i$ and $Codet_i$ are dummy variables that take the value of 1 if the firm is listed and subject to parity co-determination, respectively, and 0 otherwise; $X_{i,t}$ is the size of the firm proxied by the number of employees; and $Post2014$ is a dummy that takes the value of 1 in the posttreatment years and 0 in the pretreatment years. The specification includes year and firm fixed effects.[22] Standard errors are clustered at the firm level. Including the interaction term $Listed_i \times Post2014_t$ allows listed and unlisted firms to behave differently after the GQL. The interaction $Codet_i \times Post2014_t$ lets firms evolve differently after 2014 due to their size. Having accounted for the differences resulting from either being a listed company or being large, the residual effect that we find on both listed and large firms (i.e., treated firms) is plausibly due to the quota.

Finally, using propensity score matching, we create a control group of untreated companies closest to certain pretreatment characteristics of the affected firms (Abadie and Imbens 2016). We estimate propensity scores using a probit model with common support and without replacement. Subsequently, we select each firm's closest neighbor based on the difference in the share of women in 2008–2009, 2009–2010, 2010–2011, 2011–2012, and 2012–2013 on the respective boards and the share of women and the number of employees in 2013. Then, we estimate Equation (1) for the subsample of treated firms and their matched controls (selected as explained above). We assume that if the two groups (treated and matched controls) have a similar pre-reform trend, they would continue to evolve in a similar way without introducing the gender quota. The fact that no other major events affected exclusively listed and co-determined firms in Germany during that time helps sustain this assumption.

Figure 4 allows us to visually inspect the trends in the share of women on boards for both the supervisory (above) and management boards (below). As shown, we achieve parallel trends prior to the GQL. Similar to Figure 2, the share of women on the supervisory board increases after the intervention. Contrastingly, it decreases on the management board and subsequently flattens out with respect to untreated firms.

5 | Quota's Effects on Board Composition in German Firms

In this section, we test Hypotheses 1–4 described in Section 3. In what follows, we refer to the supervisory board as the board "targeted" by the law, given the imposition of a rigid 30% quota on this board. Regarding the management board, the GQL requires each company to specify its desired quota goal, as explained in Section 2.[23] Consequently, we refer to the management board as a "nontargeted" board because of the voluntary nature of the quota and the lack of enforcement.

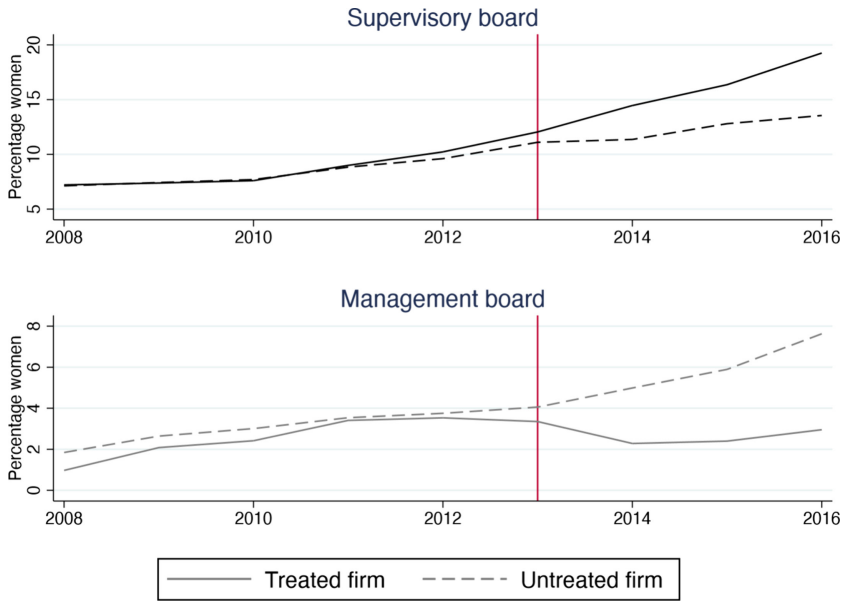

FIGURE 4 | Evolution of the share of women on supervisory boards and management boards (matched sample). This figure shows the average percentage of women on supervisory boards (panel above) and management boards (panel below) between 2008 and 2016, split by treated (solid line) and untreated (dotted line) firms. Percentage women is the number of women over the total number of board members in percentage points. A treated company is defined as a company that satisfies the two criteria required by law to fall under the obligation of implementing a gender quota: being listed on the stock exchange and being subject to the Co-Determination Act. A control group of untreated firms has been created using propensity score matching on the five closest neighbors based on the share of women in 2008–2009, 2009–2010, 2010–2011, 2011–2012, and 2012–2013 in the respective boards and the share of women and the number of employees in 2013. 2014 marks the introduction of the Gender Quota Law. *Source:* "Die Großen 500" [CD-ROM] Neuhasel: Müssig Verlag, 2000–2017. [Colour figure can be viewed at wileyonlinelibrary.com]

5.1 | Effects on the Supervisory Board

First, we evaluate compliance with the GQL. If the costs outweigh the sanction penalty, firms may be unwilling or unable to hire women for supervisory board positions, even in the face of sanctions. To evaluate the effects of the GQL on the targeted board, we use the share of women on supervisory boards as a dependent variable and estimate Equations (1)–(3). Additionally, we estimate Equation (1) using a sample of treated firms and matched controls. For each board, we match the firms based on the annual differences in the share of women in the years leading up to the GQL, pre-reform share of women, and number of employees, as explained in Section 4. Appendices B and C present a graph depicting the common support and a table showing the percentage of bias reduction for each matching procedure.

The results are summarized in Table 3. Column 1 presents the estimation results of Equation (1) with an unrestricted sample of firms covered in the database, whereas Column 2 presents a balanced panel of firms present in the sample during the entire estimation period. Column 3 refers to Equation (2), which includes the differential time trends for the treated and control firms. The difference in trends is significantly higher for the treated firms. Column 4 refers to the estimation of Equation (3) within the subsample of firms that meet at least one requirement of the GQL, and the last column presents the estimation results using propensity score matching.

Following the announcement of the GQL, firms affected by the law experienced a greater increase in the presence of women on the targeted board than unaffected firms. The estimate indicates an increase in the share of women on supervisory boards, ranging from 1.5 to 3.5 percentage points between 2014 and 2016, depending on the specification. The results provide evidence of compliance with the GQL. Imposition of gender quotas grants normative legitimacy to gender diversity. Reading the results through the lens of institutional theory, a regulatory change prompts organizations to perceive increasing the presence of women on the mandated board as important to align with societal values and to ensure their survival.

5.2 | Effects on the Management Board

This section primary tests the decoupling hypothesis (Hypothesis 1). Companies may strive to appear diverse in terms of social legitimacy while harboring doubts about the benefits of gender diversity. This decoupling may confine the increased female presence to the targeted board, failing to extend it to other company structures where it is not mandated. To test this, we examine the effect of the gender quota on the share of women on the nontargeted board by estimating Equations (1)–(3), with the share of women on the management board as the dependent variable.

Table 4 reports a decrease in the share of women after 2014 in firms affected by the quota. On average, an approximately 3% reduction was observed in the share of women in the treated firms compared to control firms from 2014 to 2016. The estimation results made using the entire sample are presented in Column 1, whereas the results from the balanced sample are shown in Column 2. Column 3 incorporates controls for differential linear trends across groups as specified in Equation (2), and Column 4 adjusts for the effects of being listed or co-determined as outlined in Equation (3). Column 5 presents the estimation results using propensity score matching.

TABLE 3 | Effect of the gender quota on the targeted board.

	All firms	Balanced panel	Linear trend	Near-eligible firms	PSM
	(1)	(2)	(3)	(4)	(5)
	Share women	Share women	Share women	Share women	Share women
Treated × *Post*2014	3.570***	3.382***	1.474*		2.918***
	(0.749)	(0.839)	(0.765)		(1.012)
Listed × *Co-det* × *Post*2014				3.262***	
				(0.791)	
Size controls	Yes	Yes	Yes	Yes	Yes
Linear trend	No	No	Yes	No	No
Time FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Observations	4184	3095	4184	2961	1644
R-squared	0.17	0.16	0.17	0.22	0.25
F-statistic	26.48	20.33	24.57	24.09	17.73

Note: This table shows the average effect of the gender quota on the supervisory boards of the largest German firms between 2008 and 2016. The dependent variable is the share of female members among the total members of the supervisory board. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law by being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. Listed firms are stock corporations with publicly traded stocks, and Co-det(ermined) firms are those with 2000 employees or more. "All firms" refers to the whole sample, and "balanced panel" to a balanced sample of firms present in the database from 2008 to 2016. "Linear trends" includes differential time trends for treated and control firms. "Near-eligible firms" refers to firms that satisfy only one of the two requirements of the quota law, and "PSM" to a sample of treated firms and matched controls using propensity score matching. Standard errors are clustered at the firm level in parentheses.
*$p < 0.1$, ***$p < 0.01$.

TABLE 4 | Effect of the gender quota on the nontargeted board.

	All firms	Balanced panel	Linear trend	Near-eligible firms	PSM
	(1)	(2)	(3)	(4)	(5)
	Share women	Share women	Share women	Share women	Share women
Treated × *Post*2014	−2.288***	−3.241***	−3.125***		−2.938***
	(0.812)	(0.865)	(0.972)		(0.989)
Listed × *Co-det* × *Post*2014				−2.717***	
				(0.864)	
Size controls	Yes	Yes	Yes	Yes	Yes
Linear trend	No	No	Yes	No	No
Time FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Observations	4184	3095	4184	2961	1666
R-squared	0.05	0.05	0.05	0.06	0.05
F-statistic	5.24	4.44	5.03	4.45	2.92

Note: This table shows the average effect of the gender quota on the management boards of the largest German firms between 2008 and 2016. The dependent variable is the share of female members among the total members of the management board. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law by being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. Listed firms are stock corporations with publicly traded stocks, and Co-det(ermined) firms are those with 2000 employees or more. "All firms" refers to the whole sample, and "balanced panel" to a balanced sample of firms present in the database from 2008 to 2016. "Linear trends" includes differential time trends for treated and control firms. "Near-eligible firms" refers to firms that satisfy only one of the two requirements of the quota law, and "PSM" to a sample of treated firms and matched controls using propensity score matching. Standard errors are clustered at the firm level in parentheses.
***$p < 0.01$.

The 3% reduction in female representation on the nontargeted boards of the affected firms is an average. It may be concentrated particularly in small firms because they are less visible and more likely to escape societal scrutiny. To verify this claim, we exclude the largest firms from the sample to investigate if they are the primary drivers of the observed results. The first column of Table 5 presents the main regression results, excluding firms with assets larger than the mean. The second column excludes firms with assets larger than the mean plus one standard deviation, and the third column excludes firms with assets larger than the mean plus two standard deviations. These results indicate that the effect is not particularly significant for smaller firms.

Another explanation for these findings may be an increase in board size (Greene, Intintoli, and Kahle 2020). The increase in the proportion of women on the supervisory board could result from the addition of women to an already established board. Contrastingly, the decrease in the proportion of women on the management board might be due to the addition of new male members. German law concerning co-determined firms regulates the size of the supervisory board, as explained in Section 2.2; however, it does not address the size of the management board. Conditional on the firm's size (measured by the number of employees), the size of the supervisory board is fixed. Therefore, a change in the proportion of women on the board translates into a corresponding change in the number of women. To investigate the board expansion hypothesis, we replace the left-hand side of Equation (1) with the number of female board members and estimate it using propensity score matching. The results are detailed in Columns 4 and 6 of Table 6. As expected, the number of female members increases on the targeted board, compared to firms unaffected by the law, by approximately half an additional woman, whereas on the management board, the number of women decreases by a smaller yet statistically significant amount (0.121).

To grasp the economic significance of the effect, note that the average number of women serving on management boards in 2013 was 0.21 women (0.26 for affected firms). In the affected firms, this number ranged from zero to two women per firm, with more than 75% of the firms having none. Consequently, there is inherently limited scope for further reductions. However, despite the scarcity of women on management boards, some firms chose to remove one of the few female members, potentially eliminating all women from many management boards.[24] This reduction is unlikely to be related to general market tightness for women directors because it would affect the hiring ability of both constrained and unconstrained firms.

Overall, the first two columns of Table 6 present the cumulative effects of the combined boards in the affected firms following the implementation of the gender quota. We do not observe any effect on either the share or number of women when considering the two boards jointly. The magnitude of the changes induced by the GQL is not large. Notably, however, our analysis examines the immediate effect 3 years after the quota announcement when the provisions of the GQL were not yet enforceable. Moreover, Germany has more conservative values and lower levels of female labor participation than Norway, where the gender quota produced large and fast results in terms of enhancing women's participation in the affected boards. Changes are likely to occur at a slower pace when a country's socioeconomic characteristics are less favorable. In addition, the sanctions foreseen in the GQL are

TABLE 5 | Effect of the gender quota on the nontargeted board, excluding the largest firms.

	All firms			PSM		
	Size < mean	Size < mean + 1 SD	Size < mean + 2 SD	Size < mean	Size < mean + 1 SD	Size < mean + 2 SD
	(1)	(2)	(3)	(4)	(5)	(6)
	Share women	Share women	Share women	Share women	Share women	Share women
Treated × *Post*2014	−2.873***	−2.314***	−2.374***	−2.845***	−2.963***	−2.984***
	(0.870)	(0.843)	(0.829)	(0.886)	(0.896)	(0.902)
Size controls	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	3827	4034	4153	1612	1722	1804
R-squared	0.04	0.04	0.05	0.04	0.04	0.04
F-statistic	3.98	4.40	4.92	2.76	2.85	3.11

Note: This table indicates the average effect of the gender quota on the management boards of the largest German firms between 2008 and 2016. The dependent variable is the share of female members over the total members of the management board. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law: being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. "All firms" refers to the whole sample, and "PSM" to a sample of treated firms and matched controls using propensity score matching. Columns 1 and 4 exclude firms that have larger assets than the mean, Columns 2 and 5 exclude firms that are larger than the mean plus one standard deviation, and Columns 3 and 6 exclude firms that are larger than the mean plus two standard deviations. Standard errors are clustered at the firm level in parentheses.

***$p < 0.01$.

TABLE 6 | Effect of the gender quota on targeted and nontargeted boards using propensity score matching.

	All boards		Supervisory board		Management board	
	(1)	(2)	(3)	(4)	(5)	(6)
	Share women	Num. women	Share women	Num. women	Share women	Num. women
Treated × *Post*2014	0.0132	−0.410	2.918***	0.476***	−2.938***	−0.121**
	(0.00834)	(0.377)	(1.012)	(0.159)	(0.989)	(0.0520)
Size controls	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1626	1626	1644	1644	1666	1666
R-squared	0.28	0.01	0.25	0.24	0.05	0.04
F-statistic	18.54	1.20	17.73	14.58	2.92	2.44

Note: This table shows the average effect of the gender quota on the percentage of women and the number of women on the boards of the largest German firms between 2008 and 2016. The dependent variable is the share of female members over the total members of both boards in Column 1, the share of female members over the total members of the supervisory board in Column 3, and the share of female members over the total members of the management board in Column 5. The number of women on the respective boards is presented in Columns 2, 4, and 6. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law: being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. Estimation made using propensity score matching on the five closest neighbors based on the difference in the share of women in 2008–2009, 2009–2010, 2010–2011, 2011–2012, and 2012–2013 in the respective board and the share of women and the number of employees in 2013. Standard errors are clustered at the firm level in parentheses.
**$p < 0.05$, ***$p < 0.01$.

milder than those in other similar regulations. In Germany, firms can be fined and the seat left vacant, whereas the strongest sanctions in Norwegian law contemplate the dissolution of noncompliant firms. This may have created fewer incentives for prompt compliance, thus explaining why the effects are not as large.

Our findings provide evidence of a negative spillover effect of the quota on female representation on the executive board of the firm, resulting in women's share remaining largely unchanged across all firm directors when both boards are considered together. Formal compliance with the normative change was "decoupled" from the further integration of women within the organization, as evidenced by the results observed on the management boards. Means–end decoupling in the GQL context implies that firms strive to uphold the existing state of affairs by largely maintaining their board structure even as they adhere to formal regulations.

In the remainder of this section, we provide evidence for how internal and external factors influence incentives to engage in decoupling.

To test Hypothesis 1a, which states that firms facing more institutional pressure from society engage in less decoupling and have a lower reduction in the share of women on the management board, we separate our regressions by region. We classify them into regions that are more progressive leaning and regions that are more conservative leaning based on the ruling party in that region in 2013.[25] The results in Table 7 underline that the negative effect of the GQL on the share of females on the management board persists only in more conservative regions; this implies that the values and norms in a region matter for the existence of the negative spillover in the direction postulated.

Next, we focus on Hypothesis 1b. We test if firms with strong diversity policies before the GQL responded by decreasing the share of women on the management board after the passage of the law. We separate firms based on the presence of a female chairperson on the supervisory board. Table 8 presents the results for the subsamples of firms with and without female chairpersons. The negative effect of the GQL on the management board is no longer statistically significant for firms led by a female chairperson on the supervisory board. According to institutional theory, decoupling is less likely when a firm inherently values the content of the norm.

Finally, we test whether the negative effect on the management board is greater for firms that are required to hire more women to comply with the GQL. To investigate Hypothesis 1c, we need to find a source of variation among the affected firms in terms of the necessity to hire women. As explained in Section 2, firms are subject to different board size requirements based on the number of employees. As a consequence of rounding, the effective required threshold of women on boards may differ across firms with different board sizes.[26] For example, for a board size of 12 members, 30% results in 3.6; thus, four women are needed to satisfy the requirement, which is effectively a quota of 33%.

We estimate Equation (1) separately for the corresponding effective thresholds. As seen in Table 9, the negative effect on the management board is more significant for the highest threshold of the supervisory board. Hence, firms that are required to exert greater effort to meet the quota engage in decoupling to a greater extent by reducing the presence of women on the executive board.

TABLE 7 | Effect of the gender quota on nontargeted boards, organized by regional political orientation.

	All firms		PSM	
	Conservative	Progressive	Conservative	Progressive
	(1)	(2)	(3)	(4)
	Share women	Share women	Share women	Share women
Treated × *Post*2014	−3.823***	−0.529	−3.818***	−1.539
	(1.175)	(1.135)	(1.291)	(1.171)
Size controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	1968	2010	970	784
R-squared	0.05	0.05	0.05	0.05
F-statistic	2.78	2.92	1.76	1.99

Note: This table shows the average effect of the gender quota on the management boards of the largest German firms between 2008 and 2016. The dependent variable is the share of female members among the total members of the management board. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law: being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. "All firms" refers to the whole sample, and "PSM" to a sample of treated firms and matched controls using propensity score matching. Regions are classified as conservative or progressive based on the ruling party in each region in 2013. Standard errors are clustered at the firm level in parentheses.
***$p < 0.01$.

TABLE 8 | Effect of the gender quota on nontargeted boards of firms with and without a female chairperson.

	All firms		PSM	
	No female chair	Female chair	No female chair	Female chair
	(1)	(2)	(3)	(4)
	Share women	Share women	Share women	Share women
Treated × *Post*2014	−1.962**	11.71*	−2.202**	1.207
	(0.773)	(6.488)	(0.902)	(1.920)
Size controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	4003	153	1557	56
R-squared	0.05	0.20	0.04	0.36
F-statistic	4.67	1.35	2.51	

Note: This table shows the average effect of the gender quota on the management boards of the largest German firms between 2008 and 2016. The dependent variable is the share of female members among the total members of the management board. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law: being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. "All firms" refers to the whole sample, and "PSM" to a sample of treated firms and matched controls using propensity score matching. Firms are classified as female chaired if the chairperson of the supervisory board is currently a woman. Standard errors are clustered at the firm level in parentheses.
*$p < 0.1$, **$p < 0.05$.

5.3 | Quota's Effects on Female Careers

5.3.1 | Female Board Presidency

If women were to participate on an equal footing in board roles, given the same level of ability, increasing female representation on the board would imply a corresponding increase in representation among board presidencies. However, if women face a second glass ceiling, the increase in the share of women on the boards of affected firms will not translate into an increase in the chances of having a female chairperson on the board, as Hypothesis 2 postulates.

In order to test Hypothesis 2, we estimate the following linear probability model:

$$Y_{i,t} = \beta \text{Treated}_i \times Post2014_t + \gamma X_{i,t} + \kappa_i + \tau_t + u_{i,t}, \quad (4)$$

where $Y_{i,t}$ is a dummy variable that takes the value of 1 if the chairperson is female and 0 otherwise. The remaining variables

TABLE 9 | Effect of the gender quota on nontargeted boards by the effective gender quota.

	All firms		
	33.33%	**31.25%**	**30%**
	(1)	**(2)**	**(3)**
	Share women	**Share women**	**Share women**
Diff-in-Diff	−4.177**	−1.704	−1.258
	(1.412)	(1.509)	(1.495)
Time FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	1488	662	807
R-squared	0.08	0.04	0.07
F-statistic	2.68	1.32	2.21
	PSM		
	33.33%	**31.25%**	**30%**
	(1)	**(2)**	**(3)**
	Share women	**Share women**	**Share women**
Diff-in-Diff	−4.928**	−1.185	−1.738
	(1.473)	(1.130)	(1.636)
Time FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	727	455	582
R-squared	0.08	0.03	0.05
F-statistic	2.21	0.78	1.22

Note: This table shows the average effect of the gender quota on the percentage of women on both boards of the largest German firms between 2008 and 2016. The dependent variable is the share of female members among the total members of the management board. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law: being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. Column 1 refers to firms subject to a 33.33% effective gender quota, Column 2 to a 31.25% effective gender quota, and Column 3 to a 30% effective gender quota. "All firms" refers to the whole sample, and "PSM" to a sample of treated firms and matched controls using propensity score matching. Standard errors are clustered at the firm level in parentheses.
**$p < 0.05$.

have the usual meaning. As shown in Table 10, we find no evidence that the GQL increases the likelihood of a female chairperson on the board.

5.3.2 | Women Shift From Management Board to Supervisory Board

NEDs serve on a supervisory board composed of employee representatives and capital representatives. To test Hypothesis 3, we explore whether the rise in females on the capital side of the firm's board—as opposed to the employee side of the board—is linked to a larger reduction in female managers. As substitutability is higher between these two bodies, we can read this as an indication that women taking capital-side NED positions are the (missing) women who do not follow the CEO's track. Employee representatives, by contrast, are less likely to be on track to become CEOs.

We estimate Equation (1) with the share of women on the management board as a dependent variable in two different samples. One group of firms reported a greater increase in the share of women on the capital side of the supervisory board rather than on the employee side between 2013 and 2016. The opposite was true for the other group. Table 11 demonstrates that the spillovers to the management board are significant and particularly large when changes to the capital side of the board are more important. Thus, the negative spillovers to female representation on the executive board are associated with firms that have exerted greater effort to hire women on the capital side than on the employee side of the board. Owing to quota requirements, a female candidate might be more likely to shift to the supervisory board, effectively interfering with the best match between the candidate's abilities and the board's tasks. This highlights the possibility that more women will pursue careers as NEDs instead of managers, which is in line with the findings of Adams and Ferreira (2009), Main and Gregory-Smith (2018), and Tunyi et al. (2023).

5.3.3 | Concentration of Multiple Board Appointments

A board member may simultaneously hold positions on the boards of more than one firm; this is referred to as a multiple mandate. Hypothesis 4 states that, after the implementation of the GQL, there may be a significant increase in the demand for qualified women to serve on boards, potentially leading to a rise in multiple mandates for women. We define the *Female mandates ratio* as the average number of mandates held by a woman on the board of a firm in a given year divided by the average number of mandates held by a man on the same firm and in the same year.

$$\textit{Female mandates ratio}_{j,t} = \frac{\textit{average number of mandates per female}_{j,t}}{\textit{average number of mandates per male}_{j,t}}, \quad (5)$$

where j represents the firm and t represents the time period. A ratio higher than 1 indicates that women hold more board positions than men. In treated firms, the *Female mandates ratio* increased by almost 50% from 2013 to 2016 (from 0.12 to 0.18).

We estimate Equation (1), where $Y_{i,t}$ represents the *Female mandates ratio* on the supervisory board, *Treated* takes the value of 1 if the firm is affected by the GQL and 0 otherwise, and 2014 is the treatment year. Column 1 of Table 12 displays the positive effect of the GQL on the female mandates ratio on the supervisory boards of the treated firms. A more detailed analysis indicates that the movements in this ratio are driven by a decrease in the number of multiple mandates held by men. Column 3 of Table 12 shows that men hold, on average, approximately two to three fewer mandates than before the reform. This indicates that there are fewer available positions for men as membership is spread across different people. In Column 2 of Table 12, contrary to men, women experience an increase in the number of positions they accumulate. After the quota, there is an average

TABLE 10 | Effects of the gender quota on the gender of the chairperson of supervisory boards.

	All firms	Balanced panel	Linear trend	Near-eligible firms	PSM
	(1)	(2)	(3)	(4)	(5)
	Female chair	Female chair	Female chair	Female chair	Female chair
Treated × *Post*2014	−0.0125	−0.00251		−0.0394	−0.00739
	(0.0212)	(0.0119)		(0.0269)	(0.0165)
Listed × *Co-det* × *Post*2014			−0.0104		
			(0.0157)		
Size controls	Yes	Yes	Yes	Yes	Yes
Linear trend	No	Yes	No	No	No
Time FE	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Observations	3076	3076	2936	1629	4156
R-squared	0.00	0.00	0.01	0.02	0.00
F-statistic	1.15	1.06	1.57	1.00	1.37

Note: This table shows the average effect of the gender quota on the likelihood that the chairperson of a supervisory board is a woman. The dependent variable is a dummy variable that takes the value of 1 if the chairperson is female and 0 otherwise. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law: being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. Listed firms are stock corporations with publicly traded stocks, and Co-det(ermined) firms are those with 2000 employees or more. "All firms" refers to the whole sample, and "balanced panel" to a balanced sample of firms present in the database from 2008 to 2016. "Linear trends" includes differential time trends for treated and control firms. "Near-eligible firms" refers to firms that satisfy only one of the two requirements of the quota law, and "PSM" to a sample of treated firms and matched controls using propensity score matching. Standard errors are clustered at the firm level in parentheses.

TABLE 11 | Spillover to the management board of an increase in the share of women on the employee side with respect to the capital side of the supervisory board.

	All firms		PSM	
	Capital side	Employee side	Capital side	Employee side
	(1)	(2)	(3)	(4)
	Share women	Share women	Share women	Share women
Treated × *Post*2014	−2.692*	−1.258	−4.285***	−3.005
	(1.490)	(1.669)	(1.616)	(2.089)
Size controls	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	1132	759	608	379
R-squared	0.07	0.04	0.06	0.13
F-statistic	2.49	1.95	1.47	1.88

Note: This table shows the average effect of the gender quota on the percentage of women on the management board of the largest German firms between 2008 and 2016, split according to the side of the supervisory board that experienced the largest increase in the share of women after the reform. "Capital side" refers to the sample of firms that increased the share of women on the capital side of the supervisory board more than the employee side between 2013 and 2016. "Employee side" refers to the sample of firms that increased the share of women on the employee side of the supervisory board more than in the capital side between 2013 and 2016. The dependent variable is the share of female members over the total members of the management board. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law: being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. "All firms" refers to the whole sample, and "PSM" to a sample of treated firms and matched controls using propensity score matching. Standard errors are clustered at the firm level in parentheses.
*$p < 0.1$, ***$p < 0.01$.

increase of almost one mandate for women who occupy positions in the treated firms. We interpret this as an indication of power concentration among women who are insiders as a result of the quota.

We observe this "golden skirts" phenomenon only for the supervisory board and not for the management board.[27] This phenomenon, coupled with the evidence from the previous subsection of women shifting from the management board to the supervisory

TABLE 12 | Effect of the gender quota on multiple mandates.

	All firms		
	(1)	(2)	(3)
	Female mandates ratio	Mandates per women	Mandates per men
Treated × *Post*2014	0.0297**	0.909***	−2.984***
	(0.0124)	(0.265)	(0.890)
Time FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	4176	4184	4184
R-squared	0.10	0.13	0.17
F-statistic	18.32	13.32	14.70
	PSM		
	(1)	(2)	(3)
	Female mandates ratio	Mandates per women	Mandates per men
Treated × *Post*2014	0.00980	0.612*	−2.977***
	(0.0181)	(0.334)	(1.134)
Time FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	1643	1644	1644
R-squared	0.16	0.17	0.20
F-statistic	12.73	9.09	7.13

Note: This table shows the average effect of the gender quota on multiple mandates held by each gender on the supervisory boards of the largest German firms between 2008 and 2016. The dependent variable in Column 1 is the ratio of females with multiple mandates to males with multiple mandates in the supervisory board. In Column 2, the variable is the number of women in the supervisory board holding more than one board position simultaneously, whereas in Column 3, it is the number of men in the supervisory board holding more than one board position simultaneously. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law: being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. "All firms" refers to the whole sample, and "PSM" to a sample of treated firms and matched controls using propensity score matching. Standard errors are clustered at the firm level in parentheses.
*$p<0.1$, **$p<0.05$, and ***$p<0.01$.

board, gives credence to the hypothesis that some women are becoming serial NEDs.

6 | Robustness Checks

This section presents several robustness checks.

6.1 | Effects of the Flexi-Quota

As explained in Section 2, the flexi-quota was a voluntary commitment set by listed and co-determined firms regarding the share of women on their boards. This was applicable to both supervisory and management boards. This flexi-quota could have motivated firms to increase the share of women on management boards beyond their desired level. Once the GQL was passed and the flexi-quota was removed, they returned to their previous situation.

We study the treatment of the flexi-quota in conjunction with the GQL and estimate the following difference-in-differences equation using OLS:

$$Y_{i,t} = \beta_1 \text{Treated}_i \times Post2014_t + \beta_2 \text{Treated}_i \times \text{Flexi}-\text{quota}_t + \gamma X_{i,t} + \kappa_i + \tau_t + u_{i,t} \quad (6)$$

This equation represents the baseline specification, though we also estimate similar specifications with linear trends and with two "near-eligible" control groups, as described in Equations (2) and (3).[28] The variable *Flexi-quota* is a dummy variable that takes the value 1 from 2011 to 2013, when the flexi-quota was in place.

As shown in Table 13, including the flexi-quota treatment does not alter the expected sign or magnitude of the effect of the GQL. The coefficient of the flexi-quota is insignificant, indicating that the behavior of the affected firms regarding the management board during the flexi-quota period did not significantly differ from that of the unaffected firms.

In Appendix E, we estimate Equation (6) using the share of women on the supervisory board as the dependent variable. In this analysis, we find a positive and significant effect of the flexi-quota on the increase in the share of women on boards. However, we still find an independent and generally greater positive effect of the GQL.

TABLE 13 | Effect of the gender quota on nontargeted boards with controls for the flexi-quota period.

	All firms	Balanced panel	Linear trend	Near-eligible firms	PSM
	(1)	(2)	(3)	(4)	(5)
	Share women	Share women	Share women	Share women	Share women
Treated × *Flexi-quota*	0.585	−0.0945	−0.0604		0.347
	(0.871)	(1.009)	(1.031)		(1.059)
Treated × *Post*2014	−1.977*	−3.288***	−3.217**		−2.763**
	(1.089)	(1.137)	(1.629)		(1.253)
Listed × *Co-det* × *Post*2014				−2.430**	
				(1.139)	
Listed × *Co-det* × *Flexi-quota*				0.581	
				(0.917)	
Size controls	Yes	Yes	Yes	Yes	Yes
Linear trend	No	No	Yes	No	No
Time FE	Yes	Yes	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Observations	4184	3095	4184	2955	1666
R-squared	0.05	0.05	0.05	0.61	0.05
F-statistic	5.04	4.15	4.62	5.78	2.72

Note: This table shows the average effect of the gender quota on the percentage of women on the management board of the largest German firms between 2008 and 2016. The dependent variable is the share of female members over the total members of the management board. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law: being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. Listed firms are stock corporations with publicly traded stocks, and Co-det(ermined) firms are those with 2000 employees or more. The variable "Flexi-quota" is a dummy variable that takes the value 1 for the years 2011–2013 and 0 otherwise. "All firms" refers to the whole sample, and "balanced panel" to a balanced sample of firms present in the database from 2008 to 2016. "Linear trends" includes differential time trends for treated and control firms. "Near-eligible firms" refers to firms that satisfy only one of the two requirements of the quota law, and "PSM" to a sample of treated firms and matched controls using propensity score matching. Standard errors are clustered at the firm level in parentheses.
*$p < 0.1$, **$p < 0.05$, and ***$p < 0.01$.

The flexi-quota did not differentiate between the supervisory and management boards, providing a broad mandate to increase female representation on any board. Consequently, the proportion of women started rising modestly, particularly on supervisory boards. Furthermore, the flexi-quota was voluntary and scheduled to take effect only in 2023 if certain conditions regarding the overall representation of women on boards in the economy were not met. In our opinion, this situation created an opportunity for firms that were more inclined to enhance the presence of women in their ranks to proactively appoint them to the board, anticipating the changes that would occur later on. Companies had the freedom to decide the number of women to hire and which board to assign them to, rather than being obligated to commit to a specific minimum percentage for a particular board. This may explain why we do not observe a spillover effect on the management board during the flexi-quota period.

6.2 | Placebo Test for Eligibility

Using the same baseline regression as in Equation (1), we randomly select the treated firms from the sample. Finding any effect in this random group of firms (the placebo group) would place the validity of our treatment into question. As expected, we find no effect for the placebo group of firms in the results for the entire sample or matched sample in Table 14. The targeted board of the placebo group did not see an increase in the share of women, and we do not find a spillover effect on the nontargeted board.

6.3 | Inclusion of Financial Controls

Our baseline regression framework, represented by Equation (1), incorporates several control variables. Specifically, we have included controls for firm size, year fixed effects, and firm fixed effects.

The inclusion of firm size as a control variable is important in our research setting because it represents one of the criteria for a firm to fall under the purview of the GQL. However, we also recognize the potential influence of other financial variables, such as measures of profitability and indebtedness. To capture these dimensions, we gather three key financial variables for each firm and year: earnings before interest, taxes, depreciation, and amortization (EBITDA); long-term debt; and total assets. Additionally, we calculate the debt percentage by dividing the long-term debt by total assets. These data were obtained from the Datastream and Compustat Global databases. We merged the datasets by manually matching company names.

Consistent with our previous analysis, we employ a matching strategy. For each treated company, we identify a suitable control

TABLE 14 | Effect of the gender quota on the boards of placebo-treated firms.

	All firms			
	Supervisory board		Management board	
	(1)	(2)	(3)	(4)
	Share women	Num. women	Share women	Num. women
Placebo	0.259	0.0437	−0.0550	−0.00457
	(0.184)	(0.0261)	(0.267)	(0.0109)
*Post*2014	9.767***	1.309***	3.960***	0.176***
	(0.736)	(0.107)	(1.002)	(0.0479)
Placebo × *Post*2014	−0.261	−0.0444	−1.187	−0.0408
	(0.458)	(0.0598)	(0.658)	(0.0280)
Time FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	4184	4184	4184	4184
R-squared	0.16	0.15	0.05	0.05
F-statistic	20.31	17.43	5.27	5.42
	PSM			
	Supervisory board		Management board	
	(1)	(2)	(3)	(4)
	Share women	Num. women	Share women	Num. women
Placebo	−0.00819	0.0294	−0.514	−0.0225
	(0.288)	(0.0464)	(0.320)	(0.0155)
*Post*2014	11.44***	1.614***	3.322**	0.171**
	(0.971)	(0.153)	(1.023)	(0.0561)
Placebo × *Post*2014	0.00815	−0.0208	−0.440	−0.00855
	(0.674)	(0.1000)	(0.687)	(0.0390)
Time FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	1889	1889	1825	1825
R-squared	0.26	0.23	0.04	0.04
F-statistic	18.06	15.18	3.59	3.18

Note: This table shows the average effect of the gender quota on the percentage of women on supervisory boards and management boards of placebo-treated firms between 2008 and 2016. The dependent variables are the share of female members over the total members of the board in Columns 1 and 3 and the total number of female members of the supervisory board in Columns 2 and 4. The treatment year is 2014. Placebo-treated firms are randomly selected, whereas the remaining firms are considered untreated. Standard errors are clustered at the firm level in parentheses.
**$p < 0.05$, ***$p < 0.01$.

group comprising the five closest firms based on a set of matching variables. These variables are the difference in the share of women on the respective boards in the years before the quota and the percentage of women on the board, number of employees, EBITDA, and the debt percentage in 2013. Subsequently, we reestimate Equation (1) using the treated firms and their matched controls and extend the model by introducing the financial variables—log of the size of the firm, EBITDA, and debt percentages—as additional regressors.

Table 15 presents this study's results. Notably, merging the three datasets reduces the sample size to approximately 800 firms. The point estimates remain consistent and statistically significant.

6.4 | Dynamics of the Gender Quota

The empirical specification estimated is as follows:

$$Y_{i,t} = \sum_{t=2008}^{2016} \beta_t \text{Treated}_i \times \text{Years}_t + \gamma X_{i,t} + \kappa_i + \tau_t + u_{i,t}, \quad (7)$$

where Years_t represents year dummies for the years of 2008–2016 and the remaining variables have the usual meaning. We estimate Equation (7) using propensity score matching, following the methodology described in Section 5. The errors are clustered at the firm level.

TABLE 15 | Effect of the gender quota on the board using propensity score matching and including financial controls.

	Supervisory board		Management board	
	(1)	(2)	(3)	(4)
	Share women	Num. women	Share women	Num. women
Treated × *Post*2014	2.748*	0.488**	−2.955**	−0.117*
	(1.576)	(0.242)	(1.305)	(0.0606)
Log firm size	−0.292	−0.0418	1.489**	0.111***
	(0.613)	(0.0771)	(0.587)	(0.0415)
EBITDA over assets	−2.332	0.308	9.383**	0.533*
	(5.802)	(0.761)	(4.398)	(0.286)
Debt over assets	0.419	0.867	3.018	0.153
	(4.199)	(0.584)	(4.009)	(0.268)
Time FE	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Observations	867	867	770	770
R-squared	0.40	0.36	0.07	0.06
F-statistic	16.37	12.66	2.31	2.60

Note: The dependent variables are the share of female members over the total members of the board in Columns 1 and 3 and the total number of female members of the supervisory board in Columns 2 and 4. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law: being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. "Log firm size" is the logarithm of the number of employees; "EBITDA over assets" is the earnings before interest, taxes, depreciation, and amortization divided by total assets; and "Debt over assets" is long-term debt divided by total assets. Estimation made using propensity score matching on the five closest neighbors based on the difference in the share of women in 2008–2009, 2009–2010, 2010–2011, 2011–2012, and 2012–2013 in the respective board and the share of women, the number of employees, EBITDA, and debt over assets in 2013. Standard errors are clustered at the firm level in parentheses.
*$p < 0.1$, **$p < 0.05$, and ***$p < 0.01$.

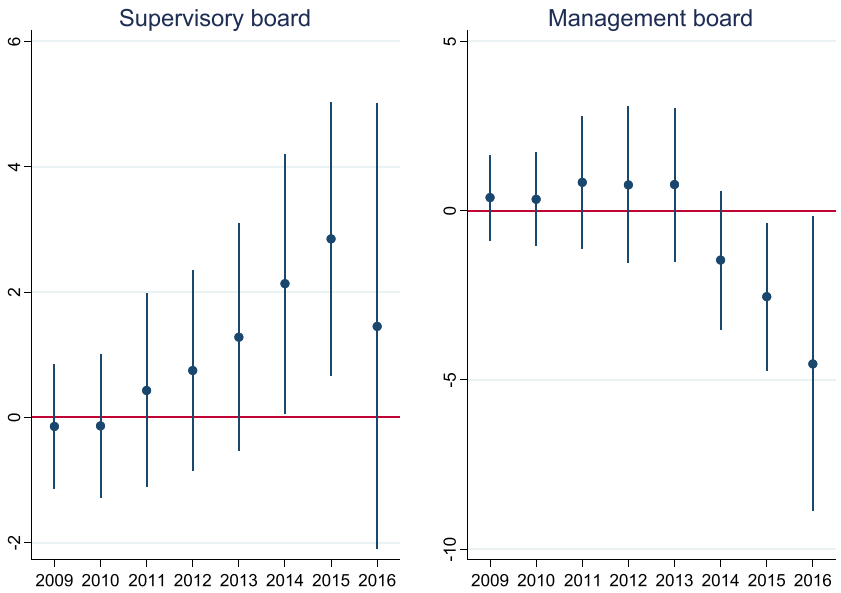

FIGURE 5 | Effect of the gender quota on the share of women in supervisory boards and management boards over time. This figure plots the coefficient β of Equation (7.1) on the right-hand scale, which measures the average effect of the Gender Quota Law (GQL) during each year indicated on the horizontal axis. Treated firms are those that satisfy the requirements of the quota law: being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. Estimation made using propensity score matching with errors clustered at the firm level. The dots represent the point estimates, and the lines are 90% confidence intervals. [Colour figure can be viewed at wileyonlinelibrary.com]

The results are graphically represented in Figure 5. In the left side of the graph, the coefficients of the estimation for β in Equation (7) are plotted year by year. Prior to 2014, no significant trend is observed; however, a positive but insignificant trend emerges thereafter on the supervisory board. The right-hand side of the graph corresponds to the management board. In this graph, the effect is consistently negative and significant from 2015 onward.

TABLE 16 | Alternative specification propensity score matching.

	Supervisory board		Management board	
	(1)	(2)	(3)	(4)
	Share women	Number women	Share women	Number women
Treated × *Post*2014	2.738***	0.242	−5.027***	−0.181***
	(1.008)	(0.194)	(1.601)	(0.0563)
Observations	406	406	406	406

Note: This table shows the average effect of the gender quota on the percentage of women and the number of women on the boards of the largest German firms between 2008 and 2016. The dependent variable is the average share of females in the period before (2011–2013) and after (2014–2016) the reform. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law: being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. Estimation made using propensity score matching on the five closest neighbors based on the difference in the share of women in 2008–2009, 2009–2010, 2010–2011, 2011–2012, and 2012–2013 in the respective board and the share of women and the number of employees in 2013. Standard errors are clustered at the firm level in parentheses.
***$p < 0.01$.

6.5 | Two-Step Estimation of Standard Errors in Propensity Score Matching

Given the nature of our panel data and the specification of our model, which includes year and firm fixed effects, we use a matched sample of control firms generated through propensity scores calculated by estimating the following probit equation:

$$Y_i = \alpha + \beta X_i + u_i, \tag{8}$$

where the dependent variable is *Treated*, a dummy variable that takes the value of 1 if the firm is affected by the GQL and 0 otherwise, and the vector X_i represents the control variables, including the annual difference in the share of women on the respective boards for 2008–2013, the percentage of women on the board in 2013, and the number of employees in 2013.

The standard errors of the difference-indifferences estimation in the main analysis are not adjusted to account for the previous step. To address this issue, we transform the yearly data into two observations per individual: an average for the period before the reform (2011–2013) and an average for the period after the reform (2014–2016). Using an algorithm that correctly computes the standard errors, we obtain consistent results and robust effects, as shown in Table 16. We prefer to maintain the panel structure of the data in our main specification, allowing us to control for time fixed effects by including year dummies.

7 | Conclusion

Gender quotas are increasingly gaining traction in the European corporate framework, as evidenced by their gradual expansion into a growing number of countries. Only 6 years have passed since the introduction of gender quotas on nonexecutive boards.

Germany has implemented a second law, the Second Act on Equal Participation of Men and Women in Management Positions (FuPoG II), which mandates minimum representation of each gender on the management board. In November 2022, the European Parliament adopted a new law to impose gender quotas on boards across all European countries. However, the first state in the United States to introduce a boardroom quota is facing significant pushback.

Within this context, it is crucial to understand the impact of quotas not only on the gender composition of the targeted board but also on the broader advancement of women on boards. Do boardroom quotas contribute to promote women? In this study, we used a legislative change in Germany as an exogenous shock to the presence of women on boards and documented several findings. First, we provided evidence of quota compliance among the affected firms regarding the targeted board. Although increased female representation at the board level has the potential to foster female advancement in other areas, our findings do not support this hypothesis. In contrast, we uncover negative spillover effects related to female access to executive roles within the firm, specifically to positions on the management board.

This can be attributed to firms ensuring compliance with the law while compensating for the increased presence of women on one board by appointing fewer women at the top across the organization, as hypothesized by the "decoupling theory." Furthermore, we cannot reject the existence of a second glass ceiling that makes it difficult for women to access the presidency of the board despite their increased representation at the table. Finally, our empirical evidence suggests that some women may accumulate non-executive board positions instead of entering managerial roles.

Increasing women's representation on boards is a valuable tool for enhancing diversity; however, it is not the ultimate solution to achieve greater gender equality as some believe it to be. More needs to be done by combining quotas with other initiatives that promote female talent across all capacities within the firm and allow women to drive the changes that will enable them to thrive in corporations.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from Müsig Verlag. Restrictions apply to the availability of these data, which were used under license for this study. Data are available from the author(s) with the permission of Müsig Verlag.

Endnotes

[1] The Californian quota has faced challenges, most recently in May 2022. A Los Angeles Superior Court judge enjoined the measure in Crest *v.* Padilla (Crest—AB 979) due to insufficient justification for the need for remedial discrimination, a requirement for a constitutionally admissible quota.

[2] *Aktiengesetz* of September 6, 1965 (Bundesgesetzblatt 1965, I, 1089).

[3] Only a few other European countries, such as Austria, Denmark, Finland, and the Netherlands, have a similar system.

[4] *Gesetz über die Mitbestimmung der Arbeitnehmer* of May 4, 1976 (Bundesgesetzblatt I S. 1153).

[5] For more details on the regulation of the co-determination regime in Germany, see Addison and Schnabel (2009).

[6] The number of seats for firms under other co-determination regimes is determined according to the company type, economic sector, and stock capital.

[7] The percentage of women on boards in 2013 missed that mark, but the obligation was never implemented.

[8] One proposal, introduced by the Social Democrats (SPD), targeted the supervisory boards of listed firms with parity co-determination. The second, introduced by the SPD and Greens, targeted both the supervisory and management boards of the same firms.

[9] *Gesetz fur die gleichberechtigte Teilhabe von Frauen und Männern an Führungspositionen in der Privatwirtschaft und im öffentlichen Dienst* (Bundesgesetzblatt Jahrgang 2015 Teil I Nr. 17 S. 642).

[10] If a company has more than 2000 employees, half of the supervisory board members must be affiliated with the employee side and the other half with the capital side. The quota applies to the joint board as a whole, and not to each side individually.

[11] The law did not affect elections occurring before January 1, 2016, or the ongoing terms of current board members.

[12] These sanctions have been enforced in practice. For instance, Villeroy & Boch, a ceramics manufacturer, had to leave a position on its supervisory board vacant for several months in 2018.

[13] "Queen bee" refers to a female who sabotages other women's progress in male-dominated environments because it could hurt her own possibilities to access the very few existing jobs for females.

[14] Since 1970, "Die Großen 500" or "Die Großen 500 auf einen Blick" ("Deutschlands Top-Unternehmen mit Anschriften, Umsätzen und Management") by Luchterhand Verlag has released annual updates of its database in print. Accompanying disks were introduced in 1994, followed by the introduction of CD-ROMs in 2000. From 2000 to 2017, the publisher changed to Müssig Verlag, and the resource was titled "Die Großen 500" [CD-ROM] Neuhasel: Müssig Verlag, 2000–2017. The data are accessible through the DIW Berlin Library and other German institutions with OCLC reference 634902939 and ID number 2015473-2 in the Zeitschriften Datenbank catalog.

[15] The German language distinguishes between males and females in the declination of job titles. For example, a male CEO is referred to as *Vorsitzender*, whereas a female CEO is *Vorsitzende*.

[16] The constant and the variable *Treated* are absorbed by the inclusion of firm dummies, and the variable *Post*2014 is absorbed by the inclusion of year dummies.

[17] Based on the Pollytix German election trend, the forecast is calculated daily from the weighted average of all federal voting intention polls for the previous 20 days. The polling agencies considered include Allensbach, Emnid, Forsa, Forschungsgruppe Wahlen, GMS, Infratest Dimap, and INSA/YouGov.

[18] We thank Elke Holst, former Research Director of Gender Studies at DIW Berlin, for sharing this information with us.

[19] There is also a group of listed firms that are unaffected by the GQL, namely, firms without parity co-determination.

[20] The constant and the variable *Treated* are absorbed by the inclusion of firm dummies, and the variable *Post*2014 is absorbed by the inclusion of year dummies.

[21] Other legal designations are *Einzelunternehmen, Genossenschaft, offene Handelsgesellschaft, Kapitalgesellschaft, Kommanditgesellschaft auf Aktien, rechtsfähiger Verein, Stiftung des Privätrechts*, and *Anstalt des öffentlichen Rechts*.

[22] The inclusion of firm dummies absorbs the constant and the variable *Listed*×*Codet*, and the inclusion of year dummies absorbs the variable *Post*2014.

[23] Sanctions for noncompliance are not foreseen other than the requirement of a public explanation of the failure to meet the goal.

[24] Extreme cases, such as firms with a 0% share of women and firms with a higher than 30% share of women on the targeted board before 2013, have been explored to investigate heterogeneity in the effects. However, these cases delivered inconclusive results due to the low number of observations in those categories. Results are available upon request.

[25] The Baden-Wurttemberg, Bavaria, Hesse, Saarland, and Sachsen regions are classified as conservative, whereas the Brandenburg, Bremen, Hamburg, Mecklenburg-Vorpommern, Lower Saxony, North Rhine-Westphalia, Rhineland-Palatinate, Schleswig-Holstein, and Thuringia regions are classified as progressive. Berlin and Saxony-Anhalt had a governing coalition in 2013 that included two major parties, one progressive and one conservative; as a result, they have been excluded from the analysis.

[26] The methodology for this calculation can be found in Appendix F.

[27] See Appendix F for more details.

[28] The two control groups comprise firms that satisfy one of the requirements to be eligible under the law but not the other.

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Appendix A Number of Firms per Year by Treatment

	Untreated	Treated	Total
2008	582 (86.2)	93 (13.8)	675 (100.0)
2009	599 (86.6)	93 (13.4)	692 (100.0)
2010	613 (86.8)	93 (13.2)	706 (100.0)
2011	623 (87.0)	93 (13.0)	716 (100.0)
2012	632 (87.2)	93 (12.8)	725 (100.0)
2013	665 (87.6)	94 (12.4)	759 (100.0)
2014	671 (87.6)	95 (12.4)	766 (100.0)
2015	672 (87.6)	95 (12.4)	767 (100.0)
2016	573 (85.8)	95 (14.2)	668 (100.0)
2017	96 (52.2)	88 (47.8)	184 (100.0)
Total	5726 (86.0)	932 (14.0)	6658 (100.0)

Note: This table shows the total number of firms in the database and their percentages (in parentheses) for the period between 2008 and 2016, split by their treatment status. A treated company is defined as a company that satisfies the two criteria required by the law to fall under the obligation of implementing a gender quota: being listed on the stock exchange and being subject to the Co-Determination Act. The rest are considered untreated.

Source: "Die Großen 500" [CD-ROM] Neuhasel: Müssig Verlag, 2000–2017.

Appendix B Propensity Score Matching on the Supervisory Board

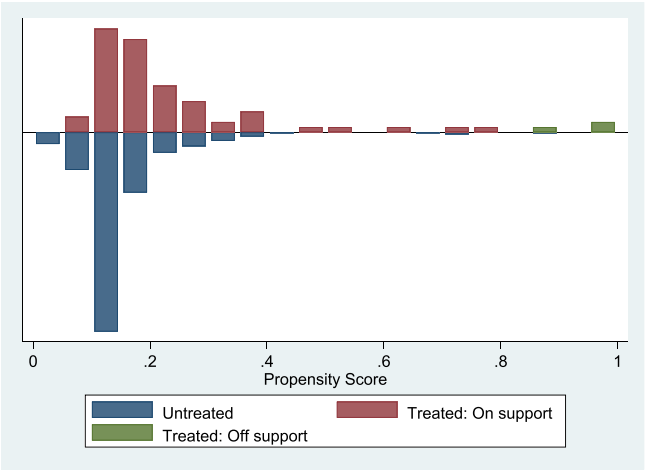

FIGURE B1 Common support. This figure shows the common support of propensity score matching based on the difference in the share of women on supervisory boards in the years before the GQL (2009–2010, 2010–2011, 2011–2012, and 2012–2013), the share of women in 2013, and the number of employees in 2013. The bars represent the propensity score histograms by treatment status: treated firms (above the line) and untreated firms (below the line). [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE B1 Bias reduction table.

		Mean Treated	Mean Control	%bias	%reduct |bias|	*t*-test *t*	p>|t|	V(T) V(C)
Share difference	U	−0.298	0.208	−13.1	−1.1	0.27	1.75[a]	
2009	M	−0.256	−0.329	1.9	85.7	0.11	0.914	1.82[a]
Share difference	U	0.191	0.61	−12.5	−0.83	0.406	0.35[a]	
2010	M	0.2	0.213	−0.4	96.8	−0.03	0.975	0.92
Share difference	U	1.347	0.102	28.1	2.1	0.036	0.9	
2011	M	1.254	1.738	−10.9	61.1	−0.53	0.596	0.52[a]
Share difference	U	1.532	0.265	25.5	1.9	0.058	0.87	
2012	M	1.587	2.082	−10	60.9	−0.5	0.615	0.59[a]
Share difference	U	1.998	0.886	21.3	1.67	0.096	1.19	
2013	M	2.087	2.199	−2.1	89.9	−0.1	0.917	0.65
Share women	U	13.077	10.627	23.7	1.73	0.085	0.74	
2013	M	12.788	14.056	−12.3	48.2	−0.71	0.478	0.69
Employees	U	55,863	14,326	52.9	5.77	0	8.03[a]	
2013	M	37,193	29,736	9.5	82	0.76	0.447	0.81

Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	*R*	%Var
Unmatched	0.095	35.330	0.000	25.300	23.700	68.2[b]	4.07[b]	43
Matched	0.009	1.580	0.979	6.7	9.5	21.800	0.46[b]	43

Note: This table shows the percentage of bias reduction after using propensity score matching.
[a] If variance ratio outside [0.62; 1.61] for U and [0.61; 1.63] for M.
[b] If B>25%, *R* outside [0.5; 2].

Appendix C Propensity Score Matching on the Management Board

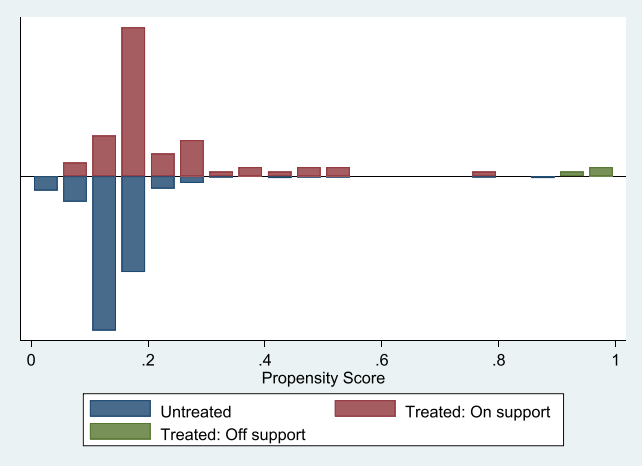

FIGURE C1 Common support. This figure shows the common support of propensity score matching based on the difference in the share of women on management boards in the years before the GQL (2009–2010, 2010–2011, 2011–2012, and 2012–2013), the share of women in 2013, and the number of employees in 2013. The bars represent the propensity score histograms by treatment status: treated firms (above the line) and untreated firms (below the line). [Colour figure can be viewed at wileyonlinelibrary.com]

TABLE C1 Bias reduction table.

		Mean Treated	Mean Control	%bias	%reduct |bias|	*t*-test *t*	p>|t|	V(T) V(C)
Share difference	U	1.111	0.077	21.8	1.91	0.057	2.18[a]	
2009	M	0.995	1.557	−11.9	45.7	−0.51	0.609	0.62
Share difference	U	0.484	0.266	7.7	0.56	0.578	0.72	
2010	M	0.299	0.169	4.6	40.5	0.36	0.722	0.93
Share difference	U	0.753	0.448	5.5	0.43	0.671	1.11	
2011	M	0.888	0.437	8.1	−48.2	0.36	0.723	0.44[a]
Share difference	U	0.618	1.09	−6.9	−0.48	0.635	0.48[a]	
2012	M	0.397	0.472	−1.1	84.1	−0.08	0.94	0.73
Share difference	U	−0.13	0.924	−17	−1.13	0.26	0.36[a]	
2013	M	−0.163	−0.264	1.6	90.5	0.11	0.913	0.60[a]
Share women	U	3.669	4.85	−11.2	−0.77	0.439	0.52[a]	
2013	M	3.286	3.868	−5.5	50.7	−0.39	0.697	0.95
Employees	U	55,863	14,326	52.9	5.77	0	8.03[a]	
2013	M	37,193	34,519	3.4	93.6	0.28	0.78	0.89
Sample	Ps R2	LR chi2	p>chi2	MeanBias	MedBias	B	*R*	%Var
Unmatched	0.087	32.410	0.000	17.600	11.200	64.0[b]	3.78[b]	71
Matched	0.007	1.250	0.990	5.2	4.6	19.200	0.710	29

Note: This table shows the percentage of bias reduction after using propensity score matching.
[a] If variance ratio outside [0.62; 1.61] for U and [0.61; 1.63] for M.
[b] If B>25%, *R* outside [0.5; 2].

Appendix D Target Number of Women by Firm Size

For companies subject to parity co-determination, the size of the supervisory board is determined by law. Firms with between 2000 and 10,000 employees must have 12 seats on the supervisory board. For firms with between 10,000 and 20,000 employees, the requirement is 16 seats. Finally, for firms with more than 20,000 employees, the requirement is 20 seats (Section 7[1]1, 2 Co-Determination Act). Consequently, based on their board size, firms need to hire a varying number of women to meet the 30% quota requirement. The resulting number may include decimals, which need to be rounded. According to the Gender Quota Law, rounding up is applied for decimals equal to or greater than 0.5, whereas rounding down is used for decimals less than 0.5. This makes the effective quota different than the theoretical 30% quota. For example, for a board size of 12 members, 30% results in 3.6; thus, four women are needed to satisfy the requirement, which effectively is a quota of 33%. The effective quotas that arise from rounding calculations are summarized in Table D1.

TABLE D1 | Effective threshold for the gender quota required on the supervisory board.

Number of employees	Number of women required	Effective gender quota
Between 2000 and 10,000	4	33.33%
Between 10,000 and 20,000	5	31.25%
More than 20,000	6	30%

Note: This table presents the number of women required on the supervisory board of firms affected by the Gender Quota Law according to the number of employees of a firm and the corresponding effective gender quota threshold.
Source: Own calculation.

Appendix E Effect of the Gender Quota on the Targeted Boards With Controls for the Flexi-Quota Period

	All firms	Balanced panel	Linear trend	Near-eligible firms	PSM
	(1)	(2)	(3)	(4)	(5)
	Share women	Share women	Share women	Share women	Share women
Treated×*Flexi-quota*	1.699***	2.000***	0.650		0.913
	(0.579)	(0.676)	(0.783)		(0.730)
Treated×*Post*2014	4.473***	4.384***	2.460**		2.441**
	(0.889)	(0.990)	(1.154)		(1.135)
Listed×*Co-det*×*Post*2014				4.047***	
				(0.936)	
Listed×*Co-det*×*Flexi-quota*				1.591**	
				(0.641)	
Size controls	Yes	Yes	Yes	Yes	Yes
Linear trend	No	No	Yes	No	No
Time FE	Yes	Yes	Yes	No	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes
Observations	4184	3095	4184	2955	1889
R-squared	0.17	0.17	0.17	0.80	0.26
F-statistic	24.66	19.20	22.57	6.58	19.96

Note: This table shows the average effect of the gender quota on the percentage of women on the supervisory boards of the largest German firms between 2008 and 2016. The dependent variable is the share of female members among the total members of the supervisory board. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law: being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. "Listed" firms are stock corporations with publicly traded stocks, and "Co-det(ermined)" firms are those with 2000 employees or more. "Flexi-quota" is a dummy variable that takes the value of 1 for the years 2011–2013 and 0 otherwise. "All firms" refers to the whole sample, and "balanced panel" to a balanced sample of firms present in the database from 2008 to 2016. "Linear trends" includes differential time trends for treated and control firms. "Near-eligible firms" refers to firms that satisfy only one of the two requirements of the quota law, and "PSM" to a sample of treated firms and matched controls using propensity score matching. Standard errors are clustered at the firm level in parentheses.
** $p < 0.05$, *** $p < 0.01$.

Appendix F Effect of the Gender Quota on Multiple Mandates of the Management Board

	All firms		
	(1)	(2)	(3)
	Female mandates ratio	Mandates per women	Mandates per men
Treated×*Post*2014	−0.0156	−0.0359	−0.296
	(0.0136)	(0.0588)	(0.234)
Time FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	4181	4184	4184
R-squared	0.04	0.05	0.07
F-statistic	4.17	5.83	9.08
	PSM		
	(1)	(2)	(3)
	Female mandates ratio	Mandates per women	Mandates per men
Treated×*Post2014*	−0.0414***	−0.124*	−0.262
	(0.0154)	(0.0698)	(0.304)
Time FE	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes
Observations	1825	1825	1825
R-squared	0.06	0.06	0.07
F-statistic	3.53	4.41	4.09

Note: This table shows the average effect of the gender quota on multiple mandates held by each gender on the management boards of the largest German firms between 2008 and 2016. The dependent variable in Column 1 is the ratio of females holding multiple mandates to males holding multiple mandates in the management board. In Column 2, the dependent variable is the number of women in the supervisory board holding more than one board position simultaneously, whereas in Column 3, it is the number of men in the supervisory board holding more than one board position simultaneously. The treatment year is 2014. Treated firms are those that satisfy the requirements of the quota law: being listed and subject to parity co-determination under the Co-Determination Act. The remaining firms are considered untreated. "All firms" refers to the whole sample, and "PSM" to a sample of treated firms and matched controls using propensity score matching. Standard errors are clustered at the firm level in parentheses.
* $p<0.1$, *** $p<0.01$.