Welcome on Board? Appointment Dynamics of Women as Directors

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Abstract

Increasing the participation of women in top-level corporate boards is high on the agenda of policy makers. Yet, we know little about drivers and impediments of director appointment dynamics. This study builds on organizational and group-level behavior theories and empirically investigates how ex-ante board structures and gender-specific board dynamics impact voluntary and mandatory female board representation. We study a large sample of boards of listed firms in Europe between 2002 and 2019 and find evidence in line with *tokenism* theory. First, we find diverging appointment dynamics for non-executive and executive directors and no spillover effects from the first to the latter. Second, we document that the likelihood of a female non-executive director appointment is significantly larger when a woman leaves compared to when a man leaves the board. Third, we find that the share of women negatively predicts the likelihood of another female non-executive director appointment. Our results are robust to additional model specifications where we address potential endogeneity concerns using matching and instrumental variable techniques.

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1. Introduction

Boards of directors play a central role in the corporate governance of publicly-listed firms. Board structures and their determinants therefore receive considerable attention in both public debate and academic research.[4] One of the most debated trends in the development of corporate boards is the representation of women (Baker et al., 2020). In light of women earning more college degrees than men in many OECD countries for nearly 40 years (OECD, 2020), it is striking that their presence in boardrooms and c-level positions does not reflect this evolution. In 2020, women held only 6.4% of Fortune 500 chairperson roles and only around one fourth of all board members in US firms are women (Deloitte, 2021). The picture is similar in Europe. Recent publications report similar low, but increasing, levels of women in executive and non-executive board roles of listed firms in the European Union. In 2020, 31% of the non-executive, and 18% of the executive directors were women. However, only 8% filled the role of board chair and CEO (European Institute of Gender Equality, 2021). These observations raise the question of how the appointment dynamics of board directors contribute to these outcomes. In this paper, we empirically seek to identify drivers and impediments of gender diversity in the boardroom.

Besides education, work experience, and qualification in certain areas of expertise[5], other *supply-side* factors such as differences in career interrup-

[4]See Hermalin and Weisbach (1988) for a seminal study of board composition and Deutsch (2005) for a meta study.

[5]A prominent gender gap still exists throughout the entire career path in the STEM

tions (Bertrand et al., 2010) and preferences for competition (Niederle and Vesterlund, 2007; Maggian et al., 2020) have been discussed as drivers of the under-representation of women on corporate boards. At the same time, regulatory and public pressures creates positive demand for female directors, whereas institutional barriers and *demand-side* factors - including unconscious and conscious discriminatory and stereotypical biases - contribute to a 'glass ceiling' blocking women's upward mobility (Carleton et al., 1998; Gillan and Starks, 2000; Brammer et al., 2007).

In this study, we investigate how increased awareness and public pressure affect director appointment dynamics and empirically test how ex-ante gender composition of the board and the gender of any departing board member influence appointment decisions of executive and non-executive women directors. Our opposing hypotheses are based on theories about *tokenism* (Kanter, 1977, 1987) and *critical mass* (Erkut et al., 2008; Konrad et al., 2008), which suggest that ex-ante board structures have a substantial impact on group decision-making processes (Konrad et al., 2008; Broome et al., 2011) and could potentially affect the dynamics of director appointments. A *token* woman could be a response in reaction to public pressure thereby resulting in the appointment of one or a few women to signal diversity while

fields. Data from a subset of OECD countries has indicated that not only are young women less likely to graduate in engineering and computer science, moreover among graduates with science degrees, 71% of men, but only 43% of women, work as professionals in physics, mathematics and engineering (Flabbi and Tejada, 2012). In other fields, women are well-represented at early career stages and in business schools, however very few climb the ladder to the top (Maggian et al., 2020)

the board structure and especially its decisions-making process is still not diverse (Farrell and Hersch, 2005). Thus, such *tokenism* may be reflected not only in effects of ex-ante board structures and dynamics, but also in the role that this board member takes, i.e. non-executive rather than executive roles. Contrarily to the saturation effect suggested by *tokensim*, exposure to increased diversity could positively influence the appointment of women board directors. Especially once a certain threshold of female representation is reached (*critical mass*), the degree of the minority influence on group decisions and outcomes might grow (Kanter, 1977, 1987). Combined with "homophily" social-identity theory, where studies have recognized the tendency to select new group members who resemble an existing group (Pfeffer and Salancik, 1978), women's growing influence when attaining a *critical mass* may thus favor the appointment of additional women directors.

This paper seeks to contribute to research on corporate governance, particularly to work that draws attention to the importance of boardroom dynamics. We build on the organizational behavior literature and on research of minority and majority influence on group decision-making. In particular, we investigate the role of board structure for the appointment dynamics of director positions and empirically validate the theoretical framework of *tokenism* in a European boardroom setting. European boards provide an interesting setting as we observe heterogeneous institutional contexts, including various types of quotas for female representation. This study extends previous work by Farrell and Hersch (2005) who showed that during the 1990s, the likelihood of a firm adding a woman to its board in a given year depends on the number of woman already on the board. They report a negative relationship

and show that the probability of appointing a woman is higher when a woman director departs the board, pointing to a *token* effect. Our study also adds to Matsa and Miller (2011) and Bozhinov et al. (2021) and their analyses of diversity spillover effects by explicitly differentiating between non-executive and executive roles of board members and their appointment dynamics.

Our data comprises executive and non-executive director appointments in 3,353 listed European firms between 2002 and 2019. We first provide descriptive evidence on board composition for mandatory quota and non-quota implementing countries. Next, we illustrate director appointment dynamics over time, where we observe important differences between non-executive and executive roles. Whereas women have been increasingly appointed to non-executive roles as of 2010, the share of women in executive roles has been rather constant over time.

In our empirical analyses that account for country, sector, firm, and board characteristics, we find empirical support for the *tokenism* hypotheses. First, women are more likely to be appointed to non-executive than executive roles. Second, when looking at appointments into non-executive roles, we document that the likelihood of a female director appointment is significantly larger when a woman leaves compared to when a man leaves the board. Third, we find that the appointment likelihood for women declines, the more women were already on the board. Adding to these findings, we do not find support for the *critical-mass* hypotheses. In the case of executive appointments, previous proportions of women are only a weak indicator to determine the likelihood of a woman being added to the executive board. Finally, we do not find evidence for spillover effects regarding an impact of gender diversity

among non-executive directors on female executive appointments.

These results are robust to addressing potential endogeneity issues of the initial board composition using econometric matching techniques (Imbens, 2004) and an heteroscedasticity-based instrumental variable approach (Lewbel, 2012). The findings are also robust to dynamic model specifications, alternative measures of women director participation and different control variables. In further cross-sectional analyses, we examine potential differences between firms in countries with mandatory quotas and non-quota implementing countries and firms operating in male- versus women-dominated industries.

2. The Role of Gender in Board Appointment Dynamics

Growing empirical literature provides evidence that the composition and structure of boards of directors is relevant for the governance and performance of firms. Previous studies have largely focused on explaining the influence of women board directors on corporate behavior and outcomes (Terjesen et al., 2009; Ahern and Dittmar, 2012; Green and Homroy, 2018; Carbonero et al., 2021; Foss et al., 2021). It is argued that the appointment of female directors enhances the human and social capital in the boardroom because a wider and more diverse talent pool regarding knowledge and experience can be exploited (Adams and Ferreira, 2009; Terjesen et al., 2009; Kim and Starks, 2016).

Little empirical evidence focuses on the drivers and impediments of attaining such gender diversity in the boardroom. Following the *supply* logic, directors can and will be appointed from a pool of qualified candidates, re-

gardless of their gender. Even if gender disparity could be explained by factors leading to a smaller pool of qualified women compared to men, the process of director appointment would not be gender-specific. In this case, the gender of an appointed director should be independent from the initial board composition or the gender of a departing board member. Corporate governance research shows that the supply of suitable candidates can not fully explain dynamics of the observed appointment bias (Adams and Kirchmaier, 2013). During the last decades, more women entered the lower and middle management levels and thereby increased the pool of qualified candidates for the board. This is in line with findings by Singh et al. (2008) for new board appointees in the UK showing that newly appointed women directors, although slightly younger than their male counterparts, have at least equal qualifications.

Recent research therefore focuses also on *demand-based* factors in appointments. Demand for female directors can be either advanced or inhibited from internal and external sources. Institutional and cultural norms can foster unconscious or conscious biases forming the 'glass ceiling' as a barrier to female career advancement. Selection procedures for men and women seem to differ in the sense that women need stronger signals and more often additional skills in terms of education, reputation, competence, board and career experience than men to be appointed or promoted (Spence, 1973; Adams and Kirchmaier, 2013; Finseraas et al., 2016; Guo et al., 2020). Accordingly, Guiso and Rustichini (2018) find that the participation of women in management is more pronounced in countries with higher emancipation of women.

Public opinion, regulatory and reputational pressure, and shareholder ac-

tivism creates positive external demand for diversity in board composition (Carleton et al., 1998; Gillan and Starks, 2000; Brammer et al., 2007; Green and Homroy, 2018). The pressure for gender diversity comes from a number of different stakeholders that firms depend upon. For example, institutional investors increasingly scrutinize corporate boardrooms for diversity (Singh and Vinnicombe, 2004), and the reputation and credibility of a firm in both internal and external labor markets may improve by including women to the board (Ellis and Keys, 2003). Thus, all other things being equal, gender diversity within boards of directors adds legitimacy to an organization (Milliken and Martins, 1996). For instance, larger firms may have greater demands for diversity since they are more in the public eye (Agrawal and Knoeber, 2001; Carter et al., 2003).

However, since gender is only one dimension of diversity, demand for additional women may evaporate once women have some representation. That is, the addition of female board members may depend on ex-ante board composition and reflect *tokenism* rather than appointments for the appointees' skills and experiences. *Tokens* are treated as representatives of their category rather than individuals (Kanter, 1977) and are primarily appointed to signal compliance with the implicit or explicit norm, but with limiting the influence of the appointees on corporate decisions. Appointments consistent with *tokenism* may result in the addition of a few women to a board with no or low female representation. If a previous member leaves, *tokenism* should result in particular efforts to attract female candidates, especially when the exiting person is a woman.

Tokenism may be particularly strong in the presence of mandatory quotas

for the representation of female directors resulting in appointments just to fulfil the requirement. In a recent study, Foss et al. (2021) show that while generally a higher share of women in management positions is related to greater innovativeness of firms, this link is weaker when firms are subject to legally-mandated gender quotas. This evidence suggests that legally-mandated gender quotas may have unintended consequences such that women are not selected on the basis of their qualifications or are appointed into positions where diversity is not effective. Further, Gangadharan et al. (2016) argue that women who attained leadership positions through quotas face male rejection which is mitigated by higher exposure to women leaders. Such patterns may be reflected in the observation that - even though most reforms address non-executive and executive board roles combined - women tend to be appointed to non-executive positions (European Women On Boards, 2021) and typically receive lower financial compensations (Rebérioux and Roudaut, 2019). These observations stress the importance of distinguishing between appointment dynamics into executive and non-executive roles. In addition, we still know little about the influence of the representation of women in the boardroom on new appointments and whether the appointment dynamics differ depending on the roles of the directors.

While the outside pressure argument may suggest an early saturation effect of the presence of female board members on new appointment, the exposure argument suggests that the appointment of an additional woman is more likely the larger the representation of women currently on the board. Exposure to women directors may lead to men updating their beliefs about the suitability of female leaders and act as signaling to potential women can-

didates (Carrell et al., 2015; Finseraas et al., 2016; Porter and Serra, 2020). That is, when considering internal dynamics of work-group-level diversity theories, we could expect that ex-ante diversity should have a positive impact on future diversity. Beyond pure exposure, *critical-mass* theory predicts that when a certain threshold is reached, the degree of the minority's influence grows. The concept of *critical mass* hence implies that relative numbers matter for the dynamics of heterogeneous groups (Kanter, 1977, 1987). Once a certain minority reaches a critical mass, members can form coalitions and affect group decisions and outcomes. Interview-based studies suggest that the critical mass of women directors is reached when boards of directors have 'at least three women' (Erkut et al., 2008; Konrad et al., 2008). The main findings are that boards with at least three women directors change their working style because the likelihood that the minorities voices and ideas are heard increases when they are not alone (Arena et al., 2015).

Pfeffer and Salancik (1978) show the tendency to select new group members who resemble an existing group, labeling this tendency "homophily" social-identity theory. However, the empirical evidence on whether "women help women" is mixed. While Derks et al. (2016) argue that because of the *queen-bee* effect women tend not to support or even undermine women subordinates, Kleinbaum et al. (2013) suggest that female leaders may help other females advance in the firm because they are less likely to view women through the lens of traditional gender stereotypes and because they foster an organizational culture friendly to women. Both Matsa and Miller (2011) and Tate and Yang (2015) find compelling evidence for the latter argument. Whereas previous research found some support for the *critical-mass* theory

on different types of board- and firm-level outcomes (Konrad et al., 2008; Joecks et al., 2013), we still know little about its effect on the dynamics of board director appointments. The prevailing arguments would suggest that women's growing influence when attaining a *critical mass* favors the appointment of additional women directors.

Based on these considerations, we hypothesize that

Hypothesis 1a: *If tokenism theory holds, the probability of appointing a female director decreases with higher ex-ante female representation*

Hypothesis 1b: *If critical-mass theory holds, the probability of appointing a female director increases with higher ex-ante female representation and changes when attaining a critical mass*

Hypothesis 2: *If tokenism theory holds, the probability of appointing a female director increases with the previous departure of a female director.*

Finally, we take into account the different roles of non-executive and executive directors and consider that non-executive directors are responsible for appointing executive directors (Matsa and Miller, 2011; Bozhinov et al., 2021), usually through the participation in the nomination committee.

Hence, we hypothesize that

Hypothesis 3a: *If tokenism theory holds, gender-specific appointment dynamics are more important for non-executive than executive directors.*

Hypothesis 3b: *If critical-mass theory holds, the probability of appointing a female executive director increases with higher ex-ante female non-executive director representation and changes when attaining a non-executive*

critical mass.

3. Institutional Framework, Data and Method

3.1. Institutional Framework

Existing studies on gender diversity frequently rely on national data. Due to an increasing international market for top managers, we base our empirical investigation on a sample of Western European firms. This approach allows us to exploit cross-firm and cross-country variation and consider institutional and legal differences between countries in order to account for different *supply* and *demand* appointment dynamics of executive and non-executive roles.

While executive directors are responsible for the management of a firm, the tasks of non-executive directors include the advising, monitoring, appointment, and remuneration of executive directors. The type and intensity of cooperation between executive and non-executive directors in the boardroom depends on the respective structure of the board. It is assumed that two-tiered boards are characterised by more independent non-executive directors and more information asymmetries between executive and non-executive directors than one-tiered boards (Adams and Ferreira, 2007).

National corporate governance laws regarding the board structure differ in our European data set. For instance, firms in Anglo-Saxon countries are characterized by monistic 'one-tier' board structures composed of executive and non-executive directors, often including a dual CEO-Chairman position. On the other hand, a number of continental countries oblige a separation of the management and supervisory board, separating executive and non-executive roles. Some countries and Societas Europeas allow both 'one-tier'

and 'two-tier' board structures. Furthermore, several European countries have implemented distinctive voluntary and mandatory quotas for female directors, where some apply to non-executives only and some apply to all directors of the board which stresses the importance of distinguishing between different director roles.

To the best of our knowledge, our study is the first to empirically investigate the appointment dynamics of female executive and non-executive directors separately and apply a role-based categorization to account for country differences. Our role-based definition of board positions takes into account the cross-country and cross-firm variations of legal board structures. We carefully categorise directors and differentiate between non-executive and executives according to their role and position descriptions as listed in the ORBIS data base. Members of the two-tier supervisory board and one-tier directors with non-executive roles are considered as non-executive directors. In our analyses, we call them supervisory directors. One-tier directors with executive roles and members of the two-tier management board are categorized as executive directors.

3.2. Data and Sample

Our empirical analysis is based on combined data from several sources. We obtain detailed information on board members and firm ownership from the ORBIS database provided by Bureau van Dijk. Financial information stems from Worldscope provided by Refinitiv. Our main sample includes 27,486 firm-year observations from 3,353 listed firms between 2002 and 2019 in 19 Western European countries. In line with previous studies, we exclude utilities and financial firms with two-digit SIC codes 49 and 60-69 (Adams

et al., 2018). We follow Kim and Starks (2016) and restrict our attention to firm-year observations where the director appointment and departure dates are available for a particular firm.[6] In order to correctly capture the board composition, we include only firm-year observations where the data of at least two directors is available.[7]

Figure 1 shows the development of female director representation in the different countries included in our main sample. The figure illustrates that, on average, the share of women in the board of directors has been increasing in the past two decades both in countries with (Norway, Italy, France, Belgium, Germany, Austria, and Portugal) and without mandatory quotes.

Figure 1: Average Time Trend of Share Women in each Country's Boards

3.3. Definition of variables

Our main variable of interest is a dummy for at least one female director appointment to a board's executive or supervisory board in a given year. In alternative model analyses we replace our main dependent flow variable with the absolute number of appointed women and the delta between the share of women in a given year and the year before.

[6]Note that we check the sensitivity of our findings to relaxing this rule and find that our main results are robust to a left censored data sample, i.e. where directors with missing appointment dates are included in the sample.

[7]Our results and the inferences we draw from them are robust to different sample specifications, such as including only firm-years with three directors or more, as required by law.

Figure 2, Chart (a) shows that on average, 0.05 female supervisory directors were appointed in the year 2002. This number increased to 0.35 in the year 2019. We also observe a slightly increasing appointment number of female executive directors in Chart (b), yet on a significant lower level. Similar findings appear for the total share of female directors: Chart (c) shows that the fraction of female supervisory directors increased from five percent in the year 2002 to more than 25 percent in 2019. The fraction of female executive directors increased from five percent to ten percent in the same period (Chart (d)). According to our sample data the delta between the share of women on the supervisory board in two consecutive years also reflects an upward trend from 0.5 percentage points in 2003 to 1.5 percentage points in 2019 (e). In contrast, our sample shows a largely constant delta for the share of female executive directors in Chart (f).

Figure 2: Average Time Trend of Dependent Variables

To test for our *demand-based* hypotheses, we follow Matsa and Miller (2011) by using the lagged share of women directors as predictor variable. Furthermore, we include a dummy for female director resignations in the given year to test for *tokenism* in our regressions. We control for lagged board size in all regressions and test the influence of and robustness to the inclusion of other one-year lagged board-level variables in additional specifications. On the board-level, we control for the influence of the share of independent, foreign and multi-directors. Further, we account for average director age and tenure, as well as a dummy indicating whether the CEO or chairperson is a woman.

Table 1 presents descriptive statistics of our main variables reflecting the dynamics of executive and non-executive director appointments. All non-executive directors are included in the *supervisory board* observations of our sample, all executive directors are included in the *executive board* observations. As we have less data on executive directors for the key variables, our executive board sample only counts 20,672 instead of 27,486 firm-year supervisory board observations. Table A.1 in Appendix A provides the variable definitions and their respective data origins.

Table 1: Descriptive Statistics

In all specifications, we include firm age and the logarithm of total assets to control for firm size. The average age of the firms in our sample is 16.8 years with a maximum of 54 years. This low number is partly due to changes in legal structure resulting in updated firm identifiers. Our sample's median values for firm size measures amount to 201 million euros in total assets and 1,050 employees. Approximately one third of our sample's firms are considered SMEs. Further, Tobin's Q captures the expected influence of market-based firm performance on the likelihood of new (female) director appointments. Tobin's Q amounts to an average of 2.6% per year over the entire period 2002 to 2019. Additionally, the independence indicator provided by Bureau van Dijk controls for the ownership concentration, where a median value of 3 indicates an independence indicator of A- (1 indicates A+ and 9 indicates D). GDP per capita as well as total employment rate and women's participation in the labor force are included to control for country-level time-variant factors.

3.4. Empirical Methodology

We examine the specific factors that predict female director appointments according to our hypotheses in a multivariate regression framework. The probabilities of appointing female supervisory and executive directors as main dependent variables are estimated using logistic regressions for firm $i = 1$, ..., N at time period $t = 1$, ..., T

$$\begin{aligned} &P(y_{(supervisory)it}) = \alpha_{ist} + \beta_1 Predictors_{(supervisory)it} \\ &+\lambda_t + \gamma_s + \sigma_c + \mathbf{X}_{it}\delta + \varepsilon_{it} \end{aligned} \tag{1}$$

$$\begin{aligned} &P(y_{(executive)it}) = \alpha_{ist} + \beta_1 Predictors_{(executive)it} \\ &+\beta_2 Predictors_{(supervisory)it} + \lambda_t + \gamma_s + \sigma_c + \mathbf{X}_{it}\delta + \varepsilon_{it} \end{aligned} \tag{2}$$

The set of *Predictors* includes the lagged share of female (non-)executive directors and a dummy variable indicating female (non-)executive resignations. In that regard, we follow Matsa and Miller (2011) by taking into account both the lagged share of female non-executive and executive directors. The resignation and appointment variables are from the same year, as they are mostly decided at the shareholders' meeting in the first half of the fiscal year, based on the previous year's annual report. $\mathbf{X}_{it}$ is the vector of lagged board-, firm-, and country-specific controls. Furthermore, we include two-digit SIC code industry- and country-fixed effects (γ_s and σ_c in the equations) to control for time-invariant unobserved variables along those dimensions, and year-fixed effects (λ_t), controlling for aggregate time trends and fluctuations. We draw statistical inferences based on firm-clustered standard errors robust to heteroscedasticiy and autocorrelation.

Besides these sets of models, additional analyses make use of linear (OLS) estimations with firm-fixed effects for the delta of female supervisory director representation as dependent variable. Furthermore, we test the robustness of the results to controlling for persistence in the dependent variable and estimate an auto-regressive model of order two.

4. Empirical Analysis

The first set of results describes the dynamics and predictors of director appointments to the supervisory board and we present the results for appointments as executive directors afterwards. We start with presenting correlations before we account for the potential endogeneity of key variables in the model.

4.1. Main Analysis of Supervisory Director Appointments

Table 2 reports the main results for the probability of appointing women to the supervisory board. The coefficients are exponentiated and represent odds-ratios. All specifications include firm- and country-specific time-variant control variables and year-, country-, and industry-fixed effects. Specification (1) shows that the probability of appointing a female supervisory director decreases by 1.1% if the previous year's share of female supervisory directors increases by 1 percentage point. This finding is in line with Hypothesis (1a) and contradicts the exposure argument suggesting a positive effect of exposure to female director appointments (Hypothesis 1b). To account for a possible nonlinear relationship between the previous year's proportion of female non-executive directors and the likelihood of a current female director

appointment we also add the squared term of previous gender diversity but find it to be statistically insignificant.

We also see that the appointment likelihood of women increases when a woman leaves the supervisory board in that same year. In specification (1), the probability of appointing at least one woman is four times higher when a woman leaves the board, compared to only 2.4 times higher when a male director leaves the board. A t-test confirms their statistically significant difference at a 1% level. These findings provide support for Hypothesis 2 and suggest two potential mechanisms: First, voluntary and mandatory quotes appear to urge firms to at least maintain a certain number of women in supervisory roles. Second, combined with the declining probability of women at higher initial shares of women already on the board suggests that the appointed female director act as *tokens*, rather than reflecting efforts to increase the share of women on the board or even to achieve gender parity.

These insights are robust to the inclusion of the independence indicator in Specification (2) which itself reveals that a higher concentration of shareholdings negatively affects the probability of female director appointments. Specification (3) includes additional board characteristics. Due to missing values, the sample size is restricted to 10,616 observations. Even, for this sub-sample we still find the above-mentioned relationships. Moreover, this specification shows that there is no additional statistically significant effect of having a chairwoman on the board. Chairwomen do not seem to drastically support the appointment of female colleagues in the boardroom. Among the other indicators, the share of foreign directors on the board is significantly negatively associated with the propensity of further women appointments

indicating a possible substitution effect between gender diversity and other forms of diversity.

Even when allowing for triple interactions in Specification (4) to search for a potential *critical-mass* effect, we do not find evidence for it. Both higher order terms are not statistically significant. Thus, we cannot validate the hypothesis suggesting a positive *critical-mass* effect on the appointment probability.

Table 2: Predicting Female Supervisory Director Appointments

We visualize our results based on Specification (1) in Figure 3. The Figure shows the marginal effects of the share of women at different thresholds of these shares on the appointment likelihood of a woman. The marginal effect declines steeply with increasing female representation illustrating the *tokenism* hypothesis. The Figure also shows that the *critical-mass* hypothesis (Hypotheses 1b) is clearly rejected by the data. Still, we observe some evidence for the saturation of the negative effect of previous year's representation on the likelihood of female supervisory director appointment.

Figure 3: Marginal Female Representation Effect on Female Supervisory Director Appointments

Regarding the control variables on the firm-level, we find a reduced probability of appointing a female supervisory director in firms with larger boards. Further, firm size measured by total assets significantly increases the likelihood of further female supervisory directors which might reflect a higher

public pressure of larger firms to create gender balance. Likewise, better lagged firm performance, measured by Tobin's Q, is associated with higher female supervisory director appointment probability. The χ^2-statistics of the country - and industry fixed effects at the bottom of the table report F-tests for the joint significance. Their significance on the 1% level indicates a *supply-side* effect that becomes apparent on the country and industry level.

4.2. Cross-Sectional Analyses of Supervisory Director Appointments

As our time series cover an extended period of 17 years, we examine possible changes in the structure of our data between early and recent years. Particularly since the director data collection has changed in the ORBIS data base. Thus, to validate our main findings, we conduct sub-sample analyses for the years before and after 2014 in Table 3. The previous findings remain qualitatively unchanged.

Table 3: Cross-Sectionals for Predicting Female Supervisory Director Appointments

Furthermore, Table 3 provides cross-sectional evidence along the two dimensions "male- versus female-dominated industries" and "mandatory quota implementing versus non-mandatory quota implementing countries" to understand the dynamics of our main findings. Based on the literature, one might assume that firms operating in industries with relatively high shares of female supervisory directors might be characterized by different appointment procedures than firms in industries with comparatively low gender diversity. We expect *tokenism* to be more pronounced in environments with increased

external demand for female directors, and decreased supply of female candidates.

We find that appointing women as replacements for leaving directors is significantly increased in industries with low share women in the board of directors (Specification (4)), compared to industries with high share women directors (Specification (3)). Consistent with our expectations, we observe an increased effect for the sub-sample of observations where a gender quota has been implemented on the board level (Specification (5)). The difference between the appointment probability of a female director as replacement of a resigning woman versus a resigning man is significantly increased in Specification (5). These findings support the *tokenism* argument, which is stronger in environments with increased external demand for female directors, and decreased supply of female candidates.

4.3. Robustness Tests and Sensitivity Analyses of Supervisory Director Appointments

The inferences we draw from the main analysis rely on the assumption of exogenous predictors. Yet, our variables of interest, in particular the dummy for resigning female directors and the share of women on the board could be considered endogenous. In order to address this concern, we tackle potential endogeneity issues arising from confounding observable and unobservables factors influencing the predictors of interest as well as the appointment probability.

First, we rerun our main analysis on sub-samples including at least one director appointment in Specification (1) of Table 4 and at least one director resignation (Specification (2)) in each firm-year observation. In these mod-

els, we aim to reduce unobserved time-variant heterogeneity between firms resulting in particular appointment patterns. The coefficients are very close to the ones presented in the main results.

Next, we follow Nekhili et al. (2020) and employ a matching technique to account for observable differences between firms with varying initial representations of women on their boards. Since a relatively large share of firms, have zero or one woman, we distinguish between firms with and without any women on the board in the first half of our sample period (less external pressure). We use Mahalanobis Distance-based Nearest-Neighbor matching and show the results in the third Specification of Table 4. The goal of this approach is to achieve better comparability between firms with and without women on the board. That is, we only compare firms that have had at least one female director before increased external demand for female directors increased throughout Europe to those without female director in the years before 2010, but that are otherwise very similar. In addition, we employ the same matching technique to match firms that have a resigning female director and those that do not. The Standardized Differences in Means according to Hedge's g (1981) are well below the critical value of 0.2 for all control variables. Our main finding of a negative association between the initial share of women on the board and the likelihood of new women being appointed are robust to both matching approaches.

Table 4: Robustness Checks Supervisory Board

Second, we conduct a series of robustness tests to assess various research design choices in alternative model specifications. Following the logistics

regressions that provide the probability of appointing at least one female director, we now conduct OLS regressions on our main and on an alternative dependent variable. We report these results in Table 5. Linear regressions on all dependent variables (Specifications (1) and (2)) produce estimation results that are qualitatively very similar to our main specification. The negative effect of female representation on new appointments persists across all dependent variables.

Third, we investigate alternative explanations for our results. The observed relationships in line with *tokenism* theory could be driven by unobserved time-invariant firm heterogeneity within a country or industry. Even though the argument that particular firms may attract a greater supply of female talent, perhaps because of their corporate culture or specific clientele, would work against our results, we address these potential confounding effects and estimate our linear specification with firm-fixed effects. As expected, we find a larger, but consistent effect of female representation on female appointments in Specification (3) of Table 5. As a second approach to control for unobserved firm heterogeneity, we employ, similar to Matsa and Miller (2011), a dynamic model in our fourth Specification of Table 5. Here, we include lagged values of the dependent variable as auto-regressive terms to control for persistence in the dependent variable.

Finally, we strive to address remaining endogeneity concerns. We generate instrumental variables for our main predictors following Lewbel (2012) and his approach of basing identification on the correlation restriction of the product of heteroskedastic errors. We do not over-identify our model and have as many generated exogenous instruments as endogenous variables. We

perform a weak instrument test proposed by Stock and Yogo (2005) and find the F-statistic of 56.9 above the rule-of thumb critical values. The results we obtain from this heteroscedasticity-based instrumental variable approach (Specification (5) of Table 5) are in line with the results from our main and alternative specifications. We observe a negative significant effect of the share women on the appointment of at least one female director and a statistically significantly higher female appointment probability if a woman leaves the board compared to when a man leaves the board.

Table 5: Alternative Specifications Supervisory Board

4.4. Analyses of Executive Director Appointments

When analysing factors that explain the appointment dynamics of female directors to executive positions, we re-run previous models, but with the appointments to the executive board as dependent variable. The estimation results in Table 6 show a positive relationship between the lagged share of female executive directors and the probability to appoint a new female executive. These results suggest that exposure and even *critical-mass*, instead of *tokenism*, effects may matter in executive boards appointments. These results remain unchanged when additionally controlling for firm-specific independence indicators in Specification (2). However, the odds ratio for female executive representation becomes smaller and the statistical significance vanishes when controlling for board-specific indicators in Specification (3). In Specification (4), we add a triple interaction and find the positive relationship between ex-ante executive female representation and executive female

appointment to increase for low levels of female representation. This relationship inverses and becomes constant at higher levels of female representation, therefore rejecting *critical-mass* effects. Further, alternative specifications from untabulated results show inconsistent coefficients regarding the direction of the relation between director gender diversity and female executive appointment probability. We reject Hypotheses 1a and 1b for executive director appointment.

Further, Table 6 points to relatively small, but significant, differences between appointment probabilities for men or women leaving the executive board. Hypothesis 2 is still valid, but the effects are smaller for executive succession events. Together, our results indicate that evidence for *tokenism* does not appear to constantly persist in the executive board. Combining these findings, we can infer validity for Hypothesis 3a. *Tokenism* effects observed for executive appointments are weaker compared to those for non-executives. Executive appointments may rather be driven by unobservable dynamics and seem to be based on factors other than gender. One reason may be the still limited participation of women in executive boards, which results in low variation in our main variables of interest. During the period 2002 to 2019 the share of female directors among all executives accounts for a comparatively low value of about eight percent on average.

Testing the conjecture of possible spillover effects from Hypothesis 3b, we further investigate the influence of ex-ante gender diversity among the non-executive directors who are generally involved in hiring the executive of a firm. We find no consistent empirical indications of a positive or negative relation between the presence of female supervisory directors and the

promotion of women as executive directors.

Table 6: Predicting Female Executive Director Appointments

We illustrate the main effect from Specification (1) in Figure 4. The positive relationship between female executive representation and appointment is weak, but statistically significant before attaining a critical mass.

Figure 4: Marginal Female Representation Effect on Female Executive Director Appointments

5. Conclusion and Discussion

The relevance of women directors for corporate decision-making and outcomes has received considerable attention in empirical research. Yet, factors explaining the decision whether to promote female or male candidates to the board are still understudied from both a theoretical and an empirical perspective.

The present study aims to provide empirical evidence on the dynamics of this process and contribute to closing the existing research gap. Building on a new data-set of director appointments in European listed firms in the period 2002 to 2019, our empirical findings shed light on the influence of internal board characteristics and dynamics on the appointment probability of female directors. We rely on different theoretical approaches. We control for a possible *supply* effect and test opposing hypotheses from external and internal *demand* theories. First, there could be external *demand* effects driven

by public opinion, regulatory pressure or shareholder activism. In this case the nomination of female board members may reflect *tokens* rather than the candidates' competences or expertise. In contrast, the *critical-mass* argument suggests that the influence of a minority group increases after reaching a certain threshold. In this case one might expect that the likelihood of additional female director appointments increases with higher ex-ante female director representation and changes at a particular level.

The empirical evidence presented here suggests that the likelihood of female non-executive director appointments is larger when a woman retired from the board compared to when a man retired from the board. Gender thus seems to play a role in the appointment dynamics of non-executive directors. We also find that the probability to appoint women declines, the more positions are already exercised by women. These two results strongly support the *tokenism* theory for non-executive roles. In the case of executive directors the results provide mixed results regarding the relationship between existing diversity and the probability of new appointments. Moreover, we do not observe spillover effects such that female non-executive directors support more appointments of female executive directors.

The results of our analyses further show that the likelihood of female non-executive and executive director appointments depends on the country and industry of employment. This effect is more pronounced for non-executive directors suggesting an increased gender-specific external *demand* effect, consistent with our main findings. Since our data does not enable us to estimate the proportion of the *supply* effect, we encourage future research to disentangle the possible reasons for director turnover and to focus on the extent

to which eligible candidates differ in terms of industry-specific skills, general skills, and experience.

Our study has implications for both firms and policy makers. While a number of voluntary recommendations for board diversity have been formulated in national or European corporate governance codices, the empirical findings clearly suggest that solely relying on market mechanisms does not mitigate the gender gap. Quotas may therefore be an appropriate instrument to increase diversity. However, they should distinguish between different functions and roles on corporate boards and address diversity for both executive and non-executive directors to generate more equality. Also, if supply is still a limiting factor, particularly in certain areas, skills, and expertise of potential candidates, policy makers should consider further aspects to foster gender equality, particularly in the fields of education, family, and social policy.

References

Adams, R.B., Akyol, A.C., Verwijmeren, P., 2018. Director skill sets. Journal of Financial Economics 130, 641–662.

Adams, R.B., Ferreira, D., 2007. A theory of friendly boards. The Journal of Finance 62, 217–250.

Adams, R.B., Ferreira, D., 2009. Women in the boardroom and their impact on governance and performance. Journal of Financial Economics 94, 291–309.

Adams, R.B., Kirchmaier, T., 2013. From female labor force participation to boardroom gender diversity .

Agrawal, A., Knoeber, C.R., 2001. Do some outside directors play a political role? Journal of Law and Economics 44, 179–198.

Ahern, K.R., Dittmar, A.K., 2012. The changing of the boards: The impact on firm valuation of mandated female board representation. The Quarterly Journal of Economics 127, 137–197.

Arena, C., Cirillo, A., Mussolino, D., Pulcinelli, I., Saggese, S., Sarto, F., 2015. Women on board: Evidence from a masculine industry. Corporate Governance: The International Journal of Business in Society 15, 339–356.

Baker, H.K., Pandey, N., Kumar, S., Haldar, A., 2020. A bibliometric analysis of board diversity: Current status, development, and future research directions. Journal of Business Research 108, 232–246.

Bertrand, M., Goldin, C., Katz, L.F., 2010. Dynamics of the gender gap for young professionals in the financial and corporate sectors. American Economic Journal: Applied Economics 2, 228–255.

Bozhinov, V., Joecks, J., Scharfenkamp, K., 2021. Gender spillovers from supervisory boards to management boards. Managerial and Decision Economics 42, 1317–1331.

Brammer, S., Millington, A., Pavelin, S., 2007. Gender and ethnic diversity among uk corporate boards. Corporate Governance: An International Review 15, 393–403.

Broome, L.L., Conley, J.M., Krawiec, K.D., 2011. Does critical mass matter? views from the board room. Seattle University Law Review 34, 1049–1080.

Carbonero, F., Devicienti, F., Manello, A., Vannoni, D., 2021. Women on board and firm risk attitudes. evidence from exports. Journal of Economic Behavior & Organization 192, 159–175.

Carleton, W.T., Nelson, J.M., Weisbach, M.S., 1998. The influence of institutions on corporate governance through private negotiations: Evidence from tiaa-cref. The Journal of Finance 53, 1335–1362.

Carrell, S., Hoekstra, M., West, J., 2015. The impact of intergroup contact on racial attitudes and revealed preferences. doi:10.3386/w20940.

Carter, D.A., Simkins, B.J., Simpson, W.G., 2003. Corporate governance, board diversity, and firm value. Financial Review 38, 33–53.

Deloitte, 2021. Missing Pieces Report: The Board Diversity Census of Women and Minorities on Fortune 500 Boards. 6 ed. URL: file:///C:/Users/mhopf/AppData/Local/Temp/missing-pieces-fortune-500-board-diversity-study-6th-edition.pdf.

Derks, B., van Laar, C., Ellemers, N., 2016. The queen bee phenomenon: Why women leaders distance themselves from junior women. The Leadership Quarterly 27, 456–469.

Deutsch, Y., 2005. The impact of board composition on firms' critical decisions: A meta-analytic review. Journal of Management 31, 424–444.

Ellis, K.M., Keys, P.Y., 2003. Stock returns and the promotion of workforce diversity. Journal of Financial Economics .

Erkut, S., Kramer, V.W., Konrad, A.M., 2008. Critical mass: Does the number of women on a corporate board make a difference? women on corporate boards of directorsinternational research and practice, in: Vinnicombe, S., Singh, V., Burke, R.J., Bilimoria, Diana, Huse, M. (Eds.), Women on Corporate Boards of Directors: International Research and Practice. Edward Elgar Publishing, Cheltenham, UK. New Horizons in Management series, pp. 350–366.

European Institute of Gender Equality, 2021. Gender equality index 2020 - digitalisation and the future of work .

European Women On Boards, 2021. European women on boards gender diversity index 2020 URL:

https://europeanwomenonboards.eu/wp-content/uploads/2021/01/Gender-Equality-Index-Final-report-2020-210120.pdf.

Farrell, K.A., Hersch, P.L., 2005. Additions to corporate boards: The effect of gender. Journal of Corporate Finance 11, 85–106.

Finseraas, H., Johnsen, Å.A., Kotsadam, A., Torsvik, G., 2016. Exposure to female colleagues breaks the glass ceiling—evidence from a combined vignette and field experiment. European Economic Review 90, 363–374.

Flabbi, L., Tejada, M., 2012. Gender Gaps in Education and Labor Market Outcomes in the United States: The Impact of Employers‘ Prejudice. IDB Publications.

Foss, N., Lee, P.M., Murtinu, S., Scalera, V.G., 2021. The xx factor: Female managers and innovation in a cross-country setting. The Leadership Quarterly .

Gangadharan, L., Jain, T., Maitra, P., Vecci, J., 2016. Social identity and governance: The behavioral response to female leaders. European Economic Review 90, 302–325.

Gillan, S.L., Starks, L.T., 2000. Corporate governance proposals and shareholder activism: the role of institutional investors. Journal of Financial Economics 57, 275–305.

Green, C.P., Homroy, S., 2018. Female directors, board committees and firm performance. European Economic Review 102, 19–38.

Guiso, L., Rustichini, A., 2018. What drives women out of management? the joint role of testosterone and culture. European Economic Review 109, 221–237.

Guo, X., Gupta, V.K., Mortal, S., Nanda, V.K., 2020. Gender and executive job mobility: Evidence from mergers and acquisitions. SSRN Electronic Journal .

Hermalin, B.E., Weisbach, M.S., 1988. The determinants of board composition. The RAND Journal of Economics 19, 589–606.

Imbens, G., 2004. Nonparametric estimation of average treatment effects under exogeneity: A review. The Review of Economics and Statistics 86, 4–29.

Joecks, J., Pull, K., Vetter, K., 2013. Gender diversity in the boardroom and firm performance: What exactly constitutes a "critical mass?". Journal of Business Ethics 118, 61–72.

Kanter, R.M., 1977. Some effects of proportions on group life: Skewed sex ratios and responses to token women. American Journal of Sociology 82, 965–990.

Kanter, R.M., 1987. Men and women of the corporation revisited: Interview with rosabeth moss kanter. Human Resource Management 26, 257–263.

Kim, D., Starks, L.T., 2016. Gender diversity on corporate boards: Do women contribute unique skills? American Economic Review 106, 267–271.

Kleinbaum, A.M., Stuart, T.E., Tushman, M.L., 2013. Discretion within constraint: Homophily and structure in a formal organization. Organization Science 24, 1316–1336.

Konrad, A., Kramer, V., Erkut, S., 2008. Critical mass: The impact of three or more women on corporate boards. Organizational Dynamics 37, 145–164.

Lewbel, A., 2012. Using heteroscedasticity to identify and estimate mismeasured and endogenous regressor models. Journal of Business & Economic Statistics 30, 67–80.

Maggian, V., Montinari, N., Nicolò, A., 2020. Do quotas help women to climb the career ladder? a laboratory experiment. European Economic Review 123, 103390.

Matsa, D.A., Miller, A.R., 2011. Chipping away at the glass ceiling: Gender spillovers in corporate leadership. American Economic Review 101, 635–639.

Milliken, F.J., Martins, L.L., 1996. Searching for common threads: Understanding the multiple effects of diversity in organizational groups. Academy of Management Review 21, 402–433.

Nekhili, M., Gull, A.A., Chtioui, T., Radhouane, I., 2020. Gender–diverse boards and audit fees: What difference does gender quota legislation make? Journal of Business Finance & Accounting 47, 52–99.

Niederle, M., Vesterlund, L., 2007. Do women shy away from competition?

do men compete too much? The Quarterly Journal of Economics 122, 1067–1101.

OECD, 2020. Education at a Glance 2020: OECD Indicators. OECD Publishing, Paris. doi:10.1787/69096873-en.

Pfeffer, J., Salancik, G.R., 1978. The external control of organizations : a resource dependence perspective. New York [u.a.] : Harper & Row.

Porter, C., Serra, D., 2020. Gender differences in the choice of major: The importance of female role models. American Economic Journal: Applied Economics 12, 226–254.

Rebérioux, A., Roudaut, G., 2019. The role of rookie female directors in a post-quota period: Gender inequalities within french boards. Industrial Relations: A Journal of Economy and Society 58, 423–483.

Singh, V., Terjesen, S., Vinnicombe, S., 2008. Newly appointed directors in the boardroom : how do women and men differ? European Management Journal 26, 48–58.

Singh, V., Vinnicombe, S., 2004. Why so few women directors in top uk boardrooms? evidence and theoretical explanations. Corporate Governance 12, 479–488.

Spence, M., 1973. Job market signaling. The Quarterly Journal of Economics 87, 355–374.

Stock, J., Yogo, M., 2005. Asymptotic distributions of instrumental variables statistics with many instruments, in: Andrews, D.W. (Ed.), Identification

and Inference for Econometric Models. Cambridge University Press, New York, pp. 109–120.

Tate, G., Yang, L., 2015. Female leadership and gender equity: Evidence from plant closure. Journal of Financial Economics 117, 77–97.

Terjesen, S., Sealy, R., Singh, V., 2009. Women directors on corporate boards: A review and research agenda. Corporate Governance: An International Review 17, 320–337.

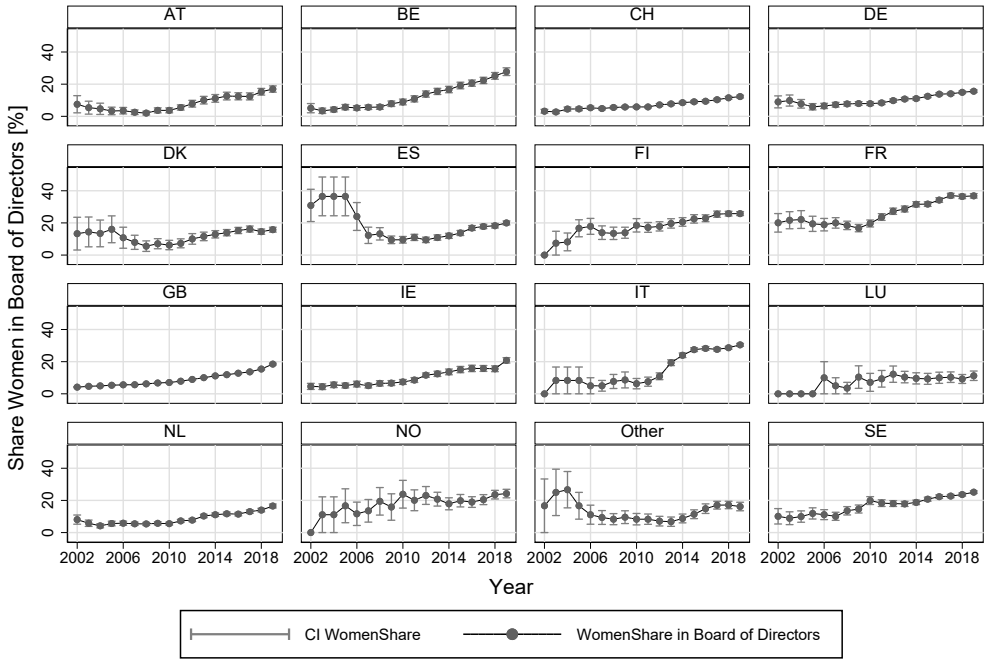
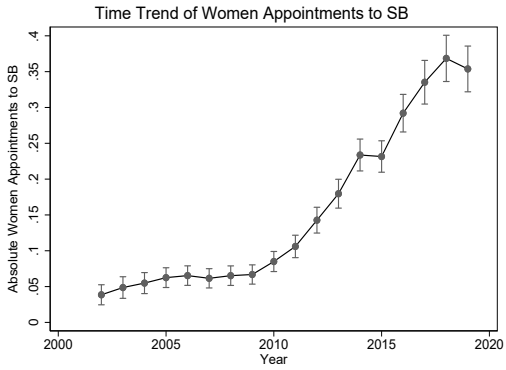
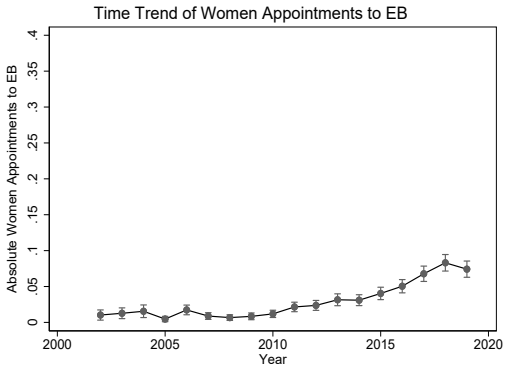


Figure 1: Average Time Trend of Share Women in each Country's Boards

Notes: This table reports the average time trend of the share women in each country's board of directors. "Other" countries have low number of observations and include Portugal, Malta, Cyprus, and Greece.

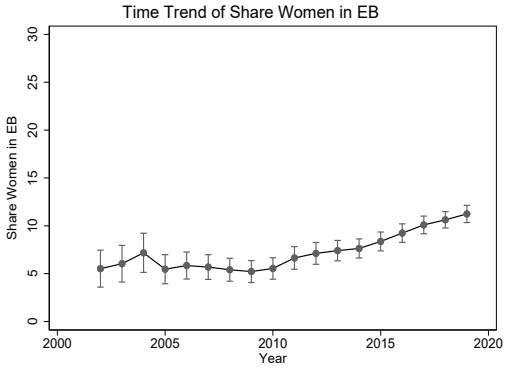


(a) Women Appointments to SB

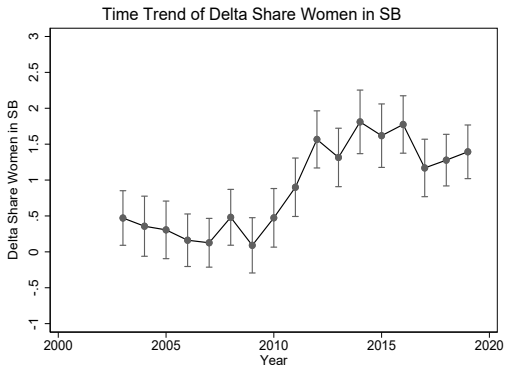


(b) Women Appointments to EB

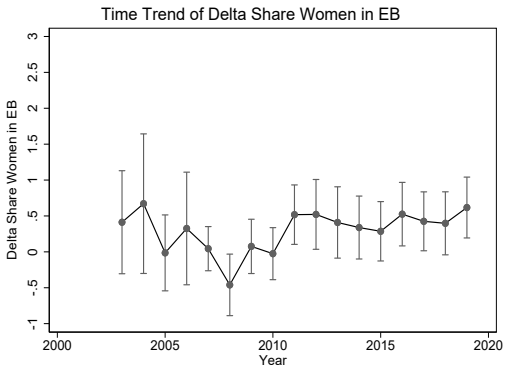
(c) Share Women in SB



(d) Share Women in EB



(e) Delta Share Women in SB



(f) Delta Share Women in EB

Figure 2: Average Time Trend of Dependent Variables

Table 1: Descriptive Statistics

Variable name	Observations	Mean	S.D.	C.V.	Min.	Median	Max.
Supervisory Board Variables							
DummyWomenApp to SB	27486	0.14	-	-	0	0	1
AbsWomenApp to SB	27486	0.19	0.58	3.05	0	0	11
AbsWomenRes from SB	27486	0.05	0.27	5.63	0	0	8
AbsMenRes from SB	27486	0.39	0.88	2.27	0	0	16
WomenShare in SB	27486	14.42	20.48	1.42	0	0	100
Executive Board Variables							
DummyWomenApp to EB	20672	0.04	-	-	0	0	1
AbsWomenApp to EB	20672	0.04	0.23	5.17	0	0	3
AbsWomenRes from EB	20672	0.01	0.10	10.64	0	0	4
AbsMenRes from EB	20672	0.11	0.39	3.47	0	0	12
WomenShare in EB	20672	7.73	21.19	2.74	0	0	100
Board characteristics:							
Director Tenure	27486	4.59	3.25	0.71	0	4	38
Share Independent Directors	27486	80.81	26.98	0.33	0	100	100
Share Foreign Directors	27486	11.72	20.72	1.77	0	0	100
Share Multidirectors	27486	36.24	24.16	0.67	0	33.33	100
Chairwoman	10693	4.54	20.07	4.42	0	0	100
CEO is a Woman	12245	3.88	18.75	4.83	0	0	100
Director Age	27018	54.52	5.59	0.10	20	54.75	88
Board Size	27486	6.36	3.66	0.58	2	6	56
Firm characteristics:							
Independence Indicator	22493	3.61	3.10	0.86	1	3	10
Employees	25773	11867.68	41989.19	3.54	0	1050	664496
Tobin's Q	27486	2.63	47.06	17.88	-0.03	1.36	5416.50
ROA	27448	2.43	76.01	31.32	-11150	5.75	591.67
Firm Age	27486	16.83	12.93	0.77	0	14	54
log(Total Assets)	27486	5.46	2.36	0.43	-6.21	5.30	13.01
Country characteristics:							
GDP per Capital	27486	42737.75	9495.99	0.22	22615.96	41269.35	116622.24
Employment Rate	27486	70.50	5.68	0.08	48.80	71.60	80.10
Women Labor Force Rate	27486	46.40	1.28	0.03	39.15	46.52	49.78

Notes: This table reports descriptive statistics of our dependent and independent variables of interest for our supervisory and executive board analyses. The statistics of the control variables are categorized according to their aggregation levels, board, firm, and country. For each variable, we report the number of non-missing observations, the mean, the standard deviation, the coefficient of variation, the minimum, median, and maximum value.

Table 2: Predicting Female Supervisory Director Appointments

	(1) Main Predictors	(2) Independence Indicator	(3) Board-Level Predictors	(4) Triple Interaction
WomenShare in SB	0.989***	0.990***	0.981***	0.997
	(0.002)	(0.003)	(0.004)	(0.005)
WomenShare in SB × WomenShare in SB	1.000	1.000	1.000	1.000
	(0.000)	(0.000)	(0.000)	(0.000)
WomenShare in SB × WomenShare in SB × WomenShare in SB				1.000
				(0.000)
DummyWomenRes from SB	4.083***	4.154***	6.304***	4.050***
	(0.338)	(0.366)	(0.801)	(0.336)
DummyMenRes from SB	2.387***	2.451***	3.058***	2.374***
	(0.137)	(0.152)	(0.292)	(0.137)
Chairwoman			1.002	
			(0.001)	
Director Tenure			1.021	
			(0.012)	
Share Independent Directors			1.003	
			(0.001)	
Share Foreign Directors			0.993***	
			(0.002)	
Share Multidirectors			1.001	
			(0.001)	
Director Age			0.999	
			(0.007)	
Independence Indicator		0.976***		
		(0.007)		
Board Size	0.984**	0.984*	0.970**	0.983**
	(0.006)	(0.007)	(0.010)	(0.006)
Firm Age	1.001	1.001	0.998	1.001
	(0.002)	(0.002)	(0.003)	(0.002)
log(Total Assets)	1.352***	1.352***	1.459***	1.351***
	(0.017)	(0.018)	(0.032)	(0.017)
Tobin's Q	1.001*	1.001*	1.001***	1.001*
	(0.000)	(0.000)	(0.000)	(0.000)
GDP per Capital	1.000	1.000	1.000	1.000
	(0.000)	(0.000)	(0.000)	(0.000)
Employment Rate	1.028	1.027	1.029	1.027
	(0.021)	(0.023)	(0.041)	(0.021)
Women Labor Force Rate	1.105	1.006	1.220	1.104
	(0.078)	(0.097)	(0.172)	(0.078)
Constant	0.000**	0.000	0.000*	0.000**
	(0.000)	(0.002)	(0.000)	(0.000)
Fixed Effects	Y C S	Y C S	Y C S	Y C S
Joint sig. Year (χ^2)	141.44	107.66	56.45	142.14
Joint sig. Country (χ^2)	429	403	245	435
Joint sig. SIC-2 (χ^2)	774.62	708.54	530.15	775.88
N	27486	22244	10616	27486

Notes: This table reports the results of the impact of supervisory board composition in terms of director gender and supervisory board dynamics in terms of director resignation on the probability of female supervisory director appointments in logit models. Specification (2) adds the Independent Indicator, Specification (3) adds additional board-level variables as controls. Specification (4) tests the *critical-mass* theory with a triple interaction term of the board composition.
Fixed effects on the Year (Y), Country (C), and two-digit SIC-industry (S) level.
Exponentiated coefficients (odds ratios) and standard errors in parentheses presented; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

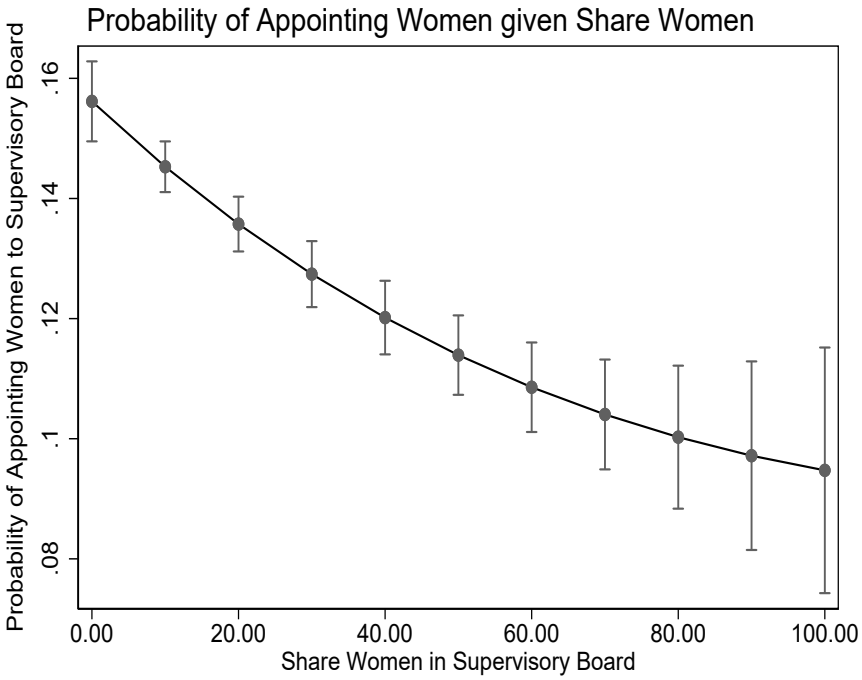


Figure 3: Marginal Female Representation Effect on Female Supervisory Director Appointments

Table 3: Cross-Sectionals for Predicting Female Supervisory Director Appointments

	(1)	(2)	(3)	(4)	(5)	(6)
	Post 2014	Pre 2014	High Share Women	Low Share Women	Quota Treated	No Quotas
WomenShare in SB	0.992**	0.981***	0.988***	0.989**	1.009	0.984***
	(0.003)	(0.004)	(0.003)	(0.004)	(0.005)	(0.003)
WomenShare in SB × WomenShare in SB	1.000	1.000**	1.000	1.000	1.000*	1.000*
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
DummyWomenRes from SB	4.776***	3.307***	3.975***	4.409***	12.837***	3.126***
	(0.507)	(0.463)	(0.409)	(0.603)	(3.308)	(0.302)
DummyMenRes from SB	2.789***	1.974***	2.192***	2.781***	4.765***	2.047***
	(0.217)	(0.159)	(0.161)	(0.259)	(0.984)	(0.124)
Board Size	0.968***	0.978	0.991	0.971**	0.968*	0.991
	(0.008)	(0.012)	(0.008)	(0.011)	(0.013)	(0.008)
Firm Age	0.999	1.004	1.002	0.999	1.002	1.001
	(0.002)	(0.003)	(0.002)	(0.003)	(0.005)	(0.002)
log(Total Assets)	1.405***	1.348***	1.327***	1.405***	1.387***	1.357***
	(0.023)	(0.027)	(0.020)	(0.030)	(0.043)	(0.019)
Tobin's Q	1.011	1.000	1.000	1.001***	0.989	1.001**
	(0.006)	(0.000)	(0.000)	(0.000)	(0.050)	(0.000)
GDP per Capital	1.000	1.000	1.000	1.000	1.000	1.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Employment Rate	1.121	1.078*	1.031	1.023	0.740	1.025
	(0.073)	(0.038)	(0.027)	(0.033)	(0.176)	(0.022)
Women Labor Force Rate	1.525	1.261*	1.238*	0.863	9.658***	1.101
	(0.346)	(0.131)	(0.108)	(0.105)	(6.509)	(0.083)
Constant	0.000**	0.000***	0.000***	0.297	0.000**	0.000**
	(0.000)	(0.000)	(0.000)	(1.844)	(0.000)	(0.000)
Fixed Effects	Y C S	Y C S	Y C S	Y C S	Y C S	Y C S
N	11995	15491	15335	12147	3629	23800

Notes: This table reports cross-sectional results of our main *tokenism* effect. Specifications (1) and (2) compare the data consistency across time, with Orbis changing their data collection method after 2014. Specifications (3) and (4) compare industries with high and low female director representation. Specifications (5) and (6) compare observations in years and countries after mandatory board gender quota implementation with observations without mandatory quotas.
Fixed effects on the Year (Y), Country (C), and two-digit SIC-industry (S) level.
Exponentiated coefficients (odds ratios) and standard errors in parentheses presented; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Robustness Checks Supervisory Board

	(1) Appointments Sample	(2) Resignation Sample	(3) NM: EarlyWomen/NoEarlyWomen	(4) NM: Res/no Res
WomenShare in SB	0.987***	0.977***	0.973***	0.945***
	(0.003)	(0.007)	(0.005)	(0.010)
WomenShare in SB × WomenShare in SB	1.000	1.000	1.000	1.000
	(0.000)	(0.000)	(0.000)	(0.000)
DummyWomenRes from SB	2.921***	3.146***	4.396***	3.405***
	(0.265)	(0.310)	(0.752)	(0.674)
DummyWomenRes from SB=1 × WomenShare in SB				1.050**
				(0.016)
DummyWomenRes from SB=1 × (WomenShare in SB)2				1.000
				(0.000)
DummyMenRes from SB	0.907		2.125***	2.832***
	(0.056)		(0.252)	(0.403)
EarlyWomen=1			1.256*	
			(0.119)	
EarlyWomen=1 × WomenShare in SB			0.995	
			(0.007)	
EarlyWomen=1 × (WomenShare in SB)2			1.000	
			(0.000)	
Board Size	0.987	0.970*	0.988	0.961*
	(0.008)	(0.013)	(0.012)	(0.019)
Firm Age	1.002	1.002	1.001	1.010*
	(0.002)	(0.002)	(0.003)	(0.005)
log(Total Assets)	1.264***	1.378***	1.389***	1.360***
	(0.018)	(0.035)	(0.037)	(0.060)
Tobin's Q	1.000	1.000	1.002	1.043
	(0.000)	(0.000)	(0.001)	(0.024)
GDP per Capital	1.000	1.000	1.000	1.000
	(0.000)	(0.000)	(0.000)	(0.000)
Employment Rate	1.020	1.014	0.990	1.061
	(0.025)	(0.048)	(0.056)	(0.103)
Women Labor Force Rate	1.321**	0.998	0.766	1.226
	(0.123)	(0.191)	(0.227)	(0.468)
Constant	0.000***	0.003	1981.275	0.000
	(0.000)	(0.029)	(27814.837)	(0.000)
Fixed Effects	Y C S	Y C S	Y C S	Y C S
N	11164	6837	7216	1997

Notes: This table reports robustness checks on our main Specification (1) from Table 2. We test the impact of supervisory board composition in terms of director gender and supervisory board dynamics in terms of director resignation on the probability of female supervisory director appointments in logit models in different sub-samples. Specification (1) includes firm-year observations with at least one supervisory director appointment. Specification (2) includes firm-year observations with at least one supervisory director resignation. Specification (3) compares similar firms that had a female supervisory director before increasing external demand in 2010 to firms that did not with the Mahalanobis Distance-based Neighborhood method. Specification (4) uses the same method to match firm-year observations of firms that had a female supervisory director resignations with firm-years without supervisory director resignations.
Fixed effects on the Year (Y), Country (C), and two-digit SIC-industry (S) level.
Exponentiated coefficients (odds ratios) and standard errors in parentheses presented; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: Alternative Specifications Supervisory Board

	(1) DummyWomenApp	(2) DeltaWomenShare	(3) FirmFixedEffects	(4) Dynamic	(5) IV: Heteroscedasticity-Based
WomenShare in SB	-0.100***	-0.118***	-0.909***	-0.035	-0.256***
	(0.025)	(0.010)	(0.043)	(0.029)	(0.068)
WomenShare in SB × WomenShare in SB	0.045	-0.047*	0.601***	-0.003	0.205**
	(0.031)	(0.019)	(0.057)	(0.035)	(0.070)
DummyWomenRes from SB	0.266***		0.274***	0.261***	0.302***
	(0.016)		(0.016)	(0.016)	(0.017)
DummyMenRes from SB	0.083***		0.086***	0.088***	0.090***
	(0.006)		(0.006)	(0.006)	(0.006)
Lagged.DummyWomenApp to SB				-0.036***	
				(0.008)	
Lagged.2.DummyWomenApp to SB				-0.031***	
				(0.008)	
Board Size	0.001	-0.001***	-0.006***	0.001	0.001
	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)
Firm Age	0.000	0.000	0.017***	0.000	0.000
	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)
log(Total Assets)	0.029***	0.005***	0.009	0.030***	0.030***
	(0.001)	(0.000)	(0.005)	(0.001)	(0.001)
Tobin's Q	0.000***	0.000***	0.000***	0.000*	0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
GDP per Capital	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Employment Rate	0.089	0.075	0.030	0.039	0.088
	(0.152)	(0.045)	(0.204)	(0.164)	(0.154)
Women Labor Force Rate	0.609	0.259	1.746*	0.778	0.489
	(0.535)	(0.177)	(0.709)	(0.625)	(0.545)
Constant	-0.517	-0.196*	-0.876*	-0.558	-2.689**
	(0.272)	(0.088)	(0.352)	(0.314)	(0.858)
Weak Instrument Test					56.90
Fixed Effects	Y C S	Y C S	Y F	Y C S	Y C S
N	27486	27445	27486	25300	27486

Notes: This table reports the results of linear models estimated with OLS, where female supervisory director appointments are regressed on the supervisory board composition in terms of director gender and supervisory board dynamics in terms of director resignation. Specification (1) reports OLS estimation results for our main dependent variable. Specification (2) uses an alternative dependent variable that captures the dynamics, including appointments and resignations. Specifications (3) to (5) use our main dependent variable of at least one woman supervisory director appointment. Specification (3) estimates the linear model with firm fixed effects. Specification (4) is an auto-regressive model of order two (AR(2)) which controls for the persistence of the dependent variable. Specification (5) uses heteroscedasticity-based exogenous instruments for our main endogenous variables of interest (board composition and dynamics).
Fixed effects on the Year (Y), Country (C), and two-digit SIC-industry (S), or firm (F) level.
Standard errors in parentheses presented; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Predicting Female Executive Director Appointments

	(1) Main Predictors	(2) Independence Indicator	(3) Board-Level Predictors	(4) Triple Interaction
WomenShare in EB	1.015**	1.015**	1.015	1.053***
	(0.005)	(0.005)	(0.009)	(0.013)
WomenShare in SB	1.009	1.010*	1.001	1.005
	(0.005)	(0.005)	(0.010)	(0.010)
WomenShare in EB × WomenShare in EB	1.000*	1.000*	1.000	0.999***
	(0.000)	(0.000)	(0.000)	(0.000)
WomenShare in SB × WomenShare in SB	1.000	1.000	1.000	1.000
	(0.000)	(0.000)	(0.000)	(0.000)
WomenShare in EB × WomenShare in EB × WomenShare in EB				1.000**
				(0.000)
WomenShare in SB × WomenShare in SB × WomenShare in SB				1.000
				(0.000)
DummyWomenRes from EB	2.705***	2.774***	3.106*	2.667***
	(0.657)	(0.728)	(1.474)	(0.654)
DummyMenRes from EB	2.578***	2.691***	2.794***	2.554***
	(0.290)	(0.327)	(0.615)	(0.288)
Chairwoman			0.998	
			(0.003)	
CEO is a Woman			0.994	
			(0.005)	
Director Tenure			0.907**	
			(0.032)	
Share Independent Directors			1.001	
			(0.004)	
Share Foreign Directors			1.002	
			(0.004)	
Share Multidirectors			1.007*	
			(0.004)	
Director Age			0.979	
			(0.018)	
Independence Indicator		0.975		
		(0.014)		
Board Size	1.032**	1.030**	1.025	1.026*
	(0.010)	(0.010)	(0.018)	(0.011)
Firm Age	1.002	1.001	1.005	1.001
	(0.003)	(0.003)	(0.005)	(0.003)
log(Total Assets)	1.304***	1.314***	1.371***	1.302***
	(0.034)	(0.036)	(0.069)	(0.034)
Tobin's Q	1.001*	1.001	1.001	1.001*
	(0.001)	(0.001)	(0.001)	(0.001)
GDP per Capital	1.000	1.000	1.000	1.000
	(0.000)	(0.000)	(0.000)	(0.000)
Employment Rate	1.013	1.037	1.130	1.013
	(0.050)	(0.055)	(0.138)	(0.049)
Women Labor Force Rate	1.371*	1.151	1.005	1.362*
	(0.207)	(0.219)	(0.435)	(0.206)
Constant	0.000**	0.000	0.000	0.000**
	(0.000)	(0.000)	(0.000)	(0.000)
Fixed Effects	Y C S	Y C S	Y C S	Y C S
Joint sig. Year (χ^2)	38.37	27.57	17.35	38.08
Joint sig. Country (χ^2)	64	59	39	62
Joint sig. SIC-2 (χ^2)	71.96	81.69	68.22	72.88
N	20378	17074	5495	20378

Notes: This table reports the results of the impact of executive and supervisory board composition in terms of director gender and executive board dynamics in terms of director resignation on the probability of female executive director appointments in logit models. Specification (2) adds the Independent Indicator, Specification (3) adds additional board-level variables as controls. Specification (4) tests the *critical-mass* theory with a triple interaction term of the board composition.
Fixed effects on the Year (Y), Country (C), and two-digit SIC-industry (S) level.
Exponentiated coefficients (odds ratios) and standard errors in parentheses presented; * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

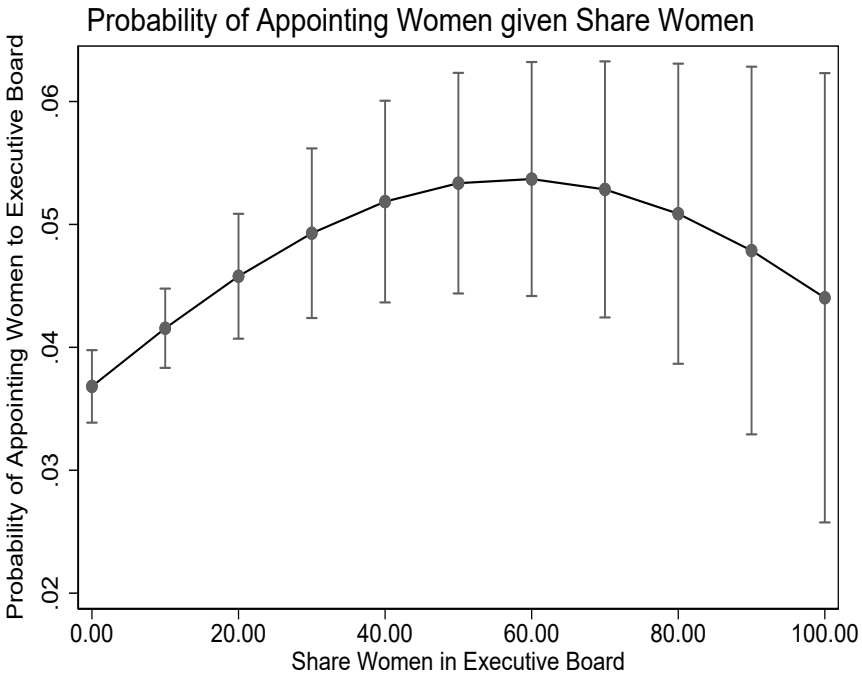


Figure 4: Marginal Female Representation Effect on Female Executive Director Appointments

Appendix

A.

Table A.1: Variable Definitions

Variable	Definition	Source
Country-Level		
GDP per Capita	Gross domestic product per capita	OECD
Women Labor Force Rate	Women's share of labor force	OECD
Employment Rate	Total share of labor force	OECD
Firm-Level		
Tobin's Q	Sum of total assets and market equity less common book equity divided by total assets	Worldscope
Total Assets	Total assets	Worldscope
Firm Age	Years since first accounts	Worldscope
Independence Indicator	Numeric A+ to D independence indicator	Orbis
Board-Level		
WomenShare in SB	Share women directors in supervisory board	Orbis
WomenShare in EB	Share women directors in executive board	Orbis
WomenApp to SB	Women appointments to supervisory board (Absolute and Dummy=1 if at least one new woman)	Orbis
WomenApp to EB	Women appointments to executive board (Absolute and Dummy=1 if at least one new woman)	Orbis
WomenRes from SB	Women resignations from supervisory board (Absolute and Dummy=1 if at least one woman leaves)	Orbis
WomenRes from EB	Women resignations from supervisory board (Absolute and Dummy=1 if at least one woman leaves)	Orbis
MenRes from SB	Men resignations from supervisory board (Absolute and Dummy=1 if at least one man leaves)	Orbis
MenRes from EB	Men resignations from supervisory board (Absolute and Dummy=1 if at least one man leaves)	Orbis
Board Size	Absolute number of directors in supervisory and executive board	Orbis
Share Foreign Directors	Share foreign directors in supervisory and executive board	Orbis
Director Age	Average director age in supervisory and executive board	Orbis
Share Multi-directors	Share multi-directors in supervisory and executive board	Orbis
Director Tenure	Average director tenure in supervisory and executive board	Orbis
Share Independent Directors	Share independent directors in supervisory and executive board	Orbis
Chairwoman	Share women in chair positions	Orbis
CEO is a Woman	Share women in CEO position	Orbis

Notes: This table describes how we compute our variables.