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The effects of board gender quotas: A meta-analysis

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ABSTRACT

We use a meta-analysis to summarize the recent literature evaluating effects of the introduction of gender quotas on company boards. We collect data from 51 studies on policies implemented in 11 countries from which we extract 496 estimates. The literature considers the effects of quota policies on a wide range of outcome variables which we group in four categories. The findings of the meta-analysis contribute to the discussion of boardroom quota policies by mitigating some concerns of negative impacts and pointing out areas where more policy action is needed.

1. Introduction

Gender gaps have been shrinking along several dimensions. Female labor market participation has more or less caught up with male and in many countries younger generations of women are overtaking men in terms of educational attainment. The picture is different, however, if we look at the top of the income distribution where women are heavily under-represented (Atkinson et al., 2018) or at corporate leadership where a persistent glass ceiling seems to hinder women's career progression (Bertrand, 2018). Over the last decade, an increasing number of countries introduced gender quotas on corporate boards as remedy for existing inequalities. Gender quotas have proven effective in increasing female representation on company boards (European Commission and Directorate-General for Justice and Consumers, 2024) and country-level analyses causally link increases in female board representation to the introduction of quotas.[1]

Nevertheless, gender quotas remain a controversial policy instrument. The proposal of an EU-wide gender boardroom quota was discussed for 10 years, before it was finally approved in 2022 (European Parliament, 2022). In the same year, the boardroom quota policy in California was revoked only 4 years after its implementation. Even among leading economists, the consequences of gender quotas are not undisputed. While the majority of economists (68%) would expect net benefits from gender board quotas, 50% state that the effect on shareholder value of affected firms is unclear (Clark Center for Global Markets, 2017).

The debate about economic implications of gender quota policies originates in their potential implications beyond a mechanical increase in female board representation. To capture the structure of this debate, we list three main theoretical arguments regarding the channels through which these impacts can manifest. First, gender quotas change the board structure and activities. By replacing male directors with females to fulfill the quota, firms tap into broader pools of talent and change their search strategies for board members. The literature on board diversity has established that firms choose directors for their characteristics, CEOs and top managers prefer directors who are similar to themselves, and search via social networks affects board composition and its dynamic (Ferreira, 2015). Consequently, a larger number of female members is likely to change the board's activities. Adams and Ferreira (2009) have shown that boards with more independent members who do not belong to the "old boys' club" tend to monitor the top management more closely.

Second, unless boards are merely cosmetic and lack the power to influence firm outcomes, the quota-induced change in board structure could impact firm value and firm performance. The direction of this effect is theoretically ambiguous. If the firm chooses the board to maximize shareholder value, the legal constraint imposed by a quota regulation should lead to a reduction in firm value and negative changes in performance. If firms discriminate against candidates outside their social network and are willing to give up profits to maximize

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[1] See, for instance Bertrand et al. (2019) on Norway, Maida and Weber (2022) on Italy, Ferreira et al. (2017) on France, or Fedorets et al. (2019) on Germany.

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the private value of management, the quota-induced change in board structure could benefit shareholder value.

Third, a major argument for quota policies imposed on boards of large firms is that they should act as signals that have the potential to spill over to other domains and thus help reducing gender inequality in a broader sense. These spillovers can be of a vertical nature affecting gender differences at lower ranks of the company or horizontally spilling over to governance decisions of smaller companies who are not subject to the quota law (Guiso et al., 2024). Generally, the theoretical discussion suggests that the effects of quota policies are heterogeneous across firms and vary by the type of policy. In addition time dynamics might play a role as the restructuring of boards implies adjustment processes.

The sharp introduction of quota policy measures along with the availability of high quality firm level data provide a unique opportunity for empirical evaluations to inform this debate and learn about the relevance of the various channels. A lively literature has developed which provides high quality evidence on the impact of the introduction of quota policies in a range of countries and for a large set of outcome variables.[2] In this paper, our aim is to synthesize the lessons from this literature in a meta-analysis framework. We collected 51 studies that conduct empirical evaluations of the effects of government mandated gender quota policies that address a specified group of companies in 11 countries. From these studies we extracted 496 effect estimates.

The studies consider a wide range of outcomes that can be potentially affected by the policy. We categorize the outcome measures according to the three theoretical channels introduced above: (i) *board characteristics* which reflect changes in board composition, (ii) *firm performance* and (iii) *stock market performance*, which measure the impact of board changes on firm outcomes, and (iv) *female representation* within the firm which informs about vertical spillovers of the board composition. To compare findings across the different outcome categories we simplify the meta-analysis and classify effect estimates by sign and significance in three groups of significantly positive, statistically insignificant, and significantly negative estimates.

First descriptive results reveal a lot of variation in quota effects which might reflect heterogeneity in policy effects by the different outcome categories as well as policy and firm characteristics. Across outcome categories, the share of significantly positive estimates is higher than the share of significantly negative ones in all categories except stock market performance where the share of significantly negative estimate dominates. This result indicates that quota policies have the potential to improve board characteristics and firm outcomes. In the category measuring female representation we observe a majority of insignificant estimates which suggest that the impact on vertical spillovers is limited.

To account for all observed characteristics we estimate detailed meta-regression models from which we derive the following messages. First, the country context is not important for the policy effects. Our meta-analytic results suggest that given the outcome category and study characteristics, quota policies have similar effects across countries. But in line with the descriptive comparison of shares of significantly positive and negative estimates, policy effects differ across outcome categories.

Second, policy types, estimation methods and the author gender matter in determining quota effects. Soft policies that do not impose sanctions for non-compliance appear to be less powerful and less likely to generate significant effects than hard quota policies. Estimates based on matching methods are more likely to be positive and studies authored exclusively by males produce more negative results. Third, papers reporting negative quota effects are more highly cited.

[2] For an earlier overview of the literature on gender quotas on board composition and firm outcomes see Smith (2018).

The rest of the paper is organized as follows. Section 2 discusses gender quota policies introduced in different countries. Section 3 describes our data collection procedures and shows descriptive statistics. Section 4 presents the meta-analysis framework and estimation results and Section 5 concludes.

2. Quota policies and compliance

Norway led the way by setting a target quota of 40% of female directors on boards of publicly listed companies in 2004. Due to low compliance with the recommendation, the quota policy became mandatory in 2006 and was enforced in 2008. Since then, many other countries have followed Norway's example. The specific policies differ in the target quota, term limits, and potential sanctions for non-compliance. While some countries implemented a strict quota, typically in the range or 30 to 40% or a minimum number of board seats occupied by women (California), others introduced "soft" measures such as recommendations or policies with a comply-or-explain character (Denmark). The target group of firms are often companies publicly listed at the local stock exchange or other companies that are large in terms of employment or sales volume. While these companies typically cover a substantial share of overall employment, their numbers are limited, typically a few hundred per country. This means that while the quota require additional positions for women in leadership positions, the number of positions is limited. Appendix Table A.1 presents a full list of policies implemented in countries in our meta-sample.

After the initial resistance, compliance with quota policies has substantially increased the share of females on boards of target companies. European Commission and Directorate-General for Justice and Consumers (2024) reports that the share of female directors on boards of the largest listed companies in EU Members States has more than tripled from around 10% in 2003 to 33.8% in 2023. Thereby the existence and the type of quota policy seems to play a role. The female share on boards varies between 39.1% in EU countries with strict policies, 33.5% in EU countries with soft policies, and 16.6% in EU countries without policies (see European Commission and Directorate-General for Justice and Consumers, 2024).

Fig. 1 gives an overview of the female share of board members and the quota targets in the countries considered in our analysis. Except for Egypt, the graph shows that all of them fulfill or even surpass the quota mandates. For this reason, the meta-analysis will not focus on the female share of board members as an outcome variable. But we will focus on the impact of the increase in female board members on other outcomes.

3. Data and descriptive statistics

3.1. Data collection

To a assemble our sample of studies, we conducted a non-systematic search of articles evaluating policies that implement a gender quota on corporate boards for a specified group of firms and use quasi experimental evaluation strategies. The starting point of our search were seminal papers on gender quotas published in the field of economics as well as overview articles on the impact of gender quotas.[3] We assemble the database of studies from the references and citations of these seminal articles and literature reviews. Following this procedure, we collect 144 articles.

In the meta-data sample we include both studies published in refereed journals and working papers, and papers from all fields. But we also apply a list of restrictions. First, we only consider studies based

[3] As seminal studies published in the field of economics, we identified Ahern and Dittmar (2012), Bertrand et al. (2019) and Matsa and Miller (2013); a list of all overview articles we consider can be found in Appendix B.

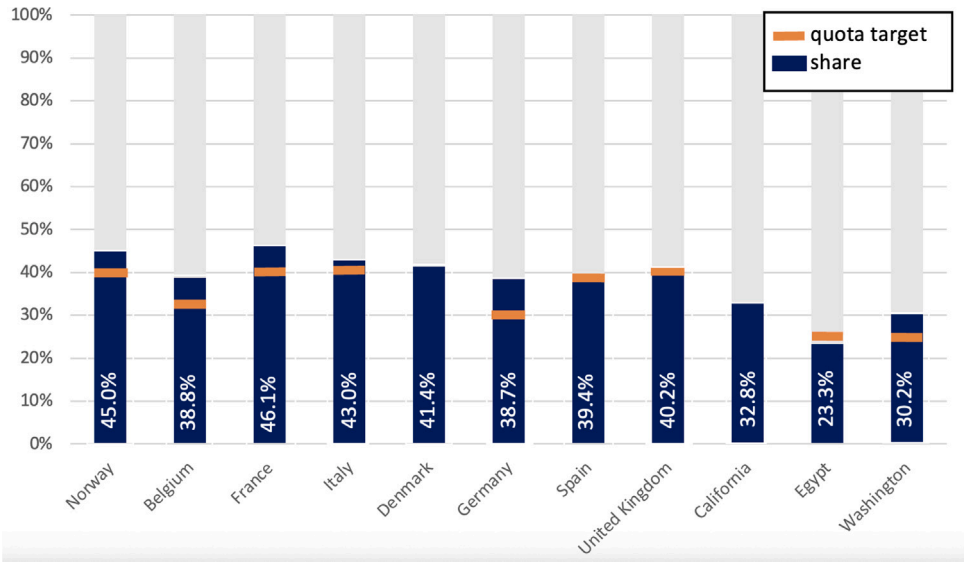

Fig. 1. Shares of females on corporate boards in largest listed companies.
Notes: Fig. 1 shows the 2023 shares of females on corporate boards in large listed companies for countries in the studies included in our sample. The dark blue bars indicate female shares and the orange markers show the latest target quota. (For interpretation of the references to color in this figure legend, the reader is referred to the web version of this article.)
Data sources: European Commission and Directorate-General for Justice and Consumers (2024) for EU, SpencerStuard for Norway, GOV.UK for the UK, Forbes for California, AUC School of Business (2023) for Egypt, and Equilar for Washington (Q1 2023).

on micro data that conduct empirical evaluations and apply quasi-experimental identification designs. Second, we restrict the sample to papers evaluating policies that affect clearly defined groups of firms and apply a fixed gender quota — evaluations of gender policies, where firms can set their own targets are excluded.

After applying the restrictions we are left with a sample 51 studies; a full list of the selected articles can be found in Appendix C. Fig. 2 shows the distribution of publication years in our sample of studies.[4] The earliest studies were published in 2012 and 2013 and evaluated the Norwegian quota policy. Over the subsequent decade more and more countries joined with similar policies and we see a strong increase in the number of studies evaluating these policies in the early 2020's. In 2023 a record of 19 studies being written or published.

Our sample includes policy evaluations from 11 countries, including two US states, and a number of studies with cross country comparisons. Fig. 3 shows the number of studies by country along with the implementation years of the quota policy in each country. The sample includes high numbers of studies from countries which implemented the policy relatively early such as Norway, Italy and France and generally lower numbers of studies implementing quota policies later. But we also found a high number of 10 studies evaluating the quota in California which was only implemented in 2018. Studies comparing the effects of quota policies across countries also contribute substantially to our sample.

3.2. Variable definitions

For each study we first coded the publication status and year of the most recent working paper version or the publication year and then match the number of citations on google scholar as of March 27, 2024.

What is striking in our sample of studies is the large number of different outcome variables considered by the authors. Our aim is to capture this variety in outcomes and still present a comprehensive picture of effects of the quota policies. For this reason we designed the following strategy. Fist, we exclude the target variable of the policy – the share women on the boards of directors – from the set outcome variables. In Section 2 we document that compliance with quota policies is extremely high across countries. Second, we define a set of four mutually exclusive outcome categories which capture different aspects of quota policy effects. The full list of outcome variables and the detailed categorization can be found in Appendix D. Here we present an abbreviated list:

- **Board characteristics:** outcomes related to characteristics of board members or board composition, such as the average age, education level, experience of board members. Note that the share of women on boards - i.e. quota compliance - is not included
- **Female representation:** outcomes of women in the company beyond board representation, such as share of female CEO's, females in high earnings positions, share of female part time workers, gender wage gaps at different hierarchy levels, measures of gender awareness in company reports and job advertisements.
- **Firm performance:** measures profitably, returns on assets, Tobin's Q, environmental and social responsibility scores.
- **Stock market response:** stock prices and firm value; stock market responses to policy announcements or implementation are included in this category.

Outcome measures in the category of board characteristics do not necessarily reflect board *quality*. In robustness checks, we differentiate between board characteristics reflecting changes in board quality - i.e. education, network size, experience - and neutral board characteristics, such as board size or the frequency of board meetings.

3.3. Coding of estimates

In terms of estimates we select one main estimate per outcome variable, country and study.[5] Most studies report one table with main outcomes or they specify their preferred specifications in the text,

[4] The publication year refers to the year of the latest version for working papers.

[5] Only 4 studies separate effect estimates for 2 or 3 different countries. The remaining studies either focus on one specific country or report results of cross-country analyses.

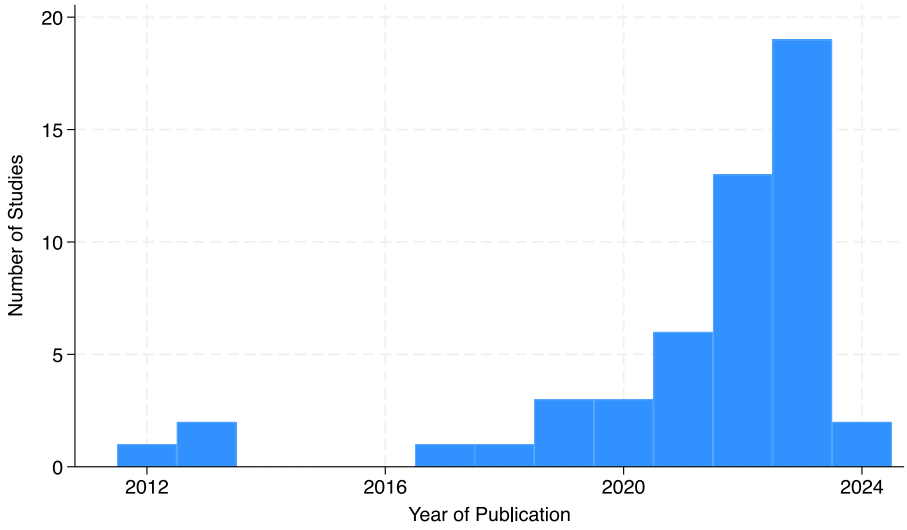

Fig. 2. Distribution of Publication Years.
Notes: Fig. 2 shows the year of publication for the studies included in our sample. For unpublished studies, year of publication refers to the year stated on the working paper.

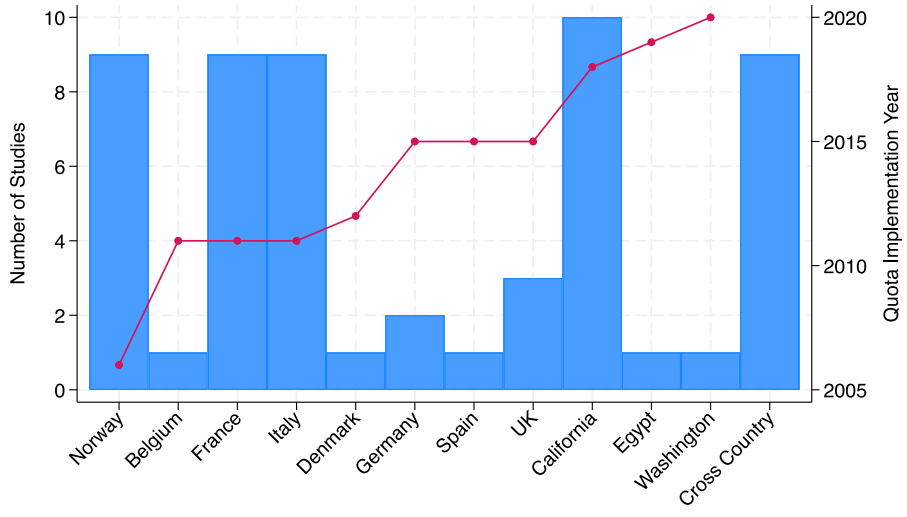

Fig. 3. Countries and Implementation Years of Quota Policies.
Notes: In Fig. 3, the blue bars correspond to the vertical axis on the left and show the number of studies providing evidence on each country. If studies provide evidence for multiple countries *separately*, they are counted for each country. Cross country studies refer to studies exploiting temporal variation in the implementation of quotas across multiple countries in their identification. The red line in Fig. 3 corresponds to the vertical axis on the right and indicates the year of implementation of a boardroom gender quota in each country.

which we use for selecting the main estimate. We collect a total sample of 496 estimates.

As many studies report effect estimates in multiple outcome categories, for example board characteristics and firm performance, we group the estimates in 87 $study \times country \times outcome\ category$ groups. To deal with the substantial variation in the number of outcome variables reported by outcome category across studies, we report summary statistics and regression results, with estimates weighted by study-country-outcome category group. This means that we give equal weight to studies irrespective of the number of outcome variables they report per country-outcome group.

The grouping by outcome categories results in a fairly even distribution of our data. Fig. 4 shows that the majority of groups report outcomes on board characteristics closely followed by groups reporting outcomes related to firm performance. The smallest number of groups report estimates related to stock market responses.

Instead of coding the estimation coefficient and standard error, we follow Card et al. (2010) and Card et al. (2018) and code the sign and significance of the estimation results, as positive significant, insignificant, and negative significant.[6] This allows us to draw comparisons across different outcome categories and outcome variables.

Fig. 5 shows the shares of positive, negative, and insignificant estimates by outcome categories, weighted by study-country-outcome category. In this figure we order the outcome categories from the highest to the lowest average shares of significantly positive estimates. The figure reveals important differences across outcome categories.

[6] To determine the sign, we do not necessarily use the sign of the estimated coefficient. In some cases we use the sign that implies a positive effect on the outcome variable. For example, a reduction in the mean age of board members is coded as a positive effect, likewise a reduction in credit risks is coded as a positive effect.

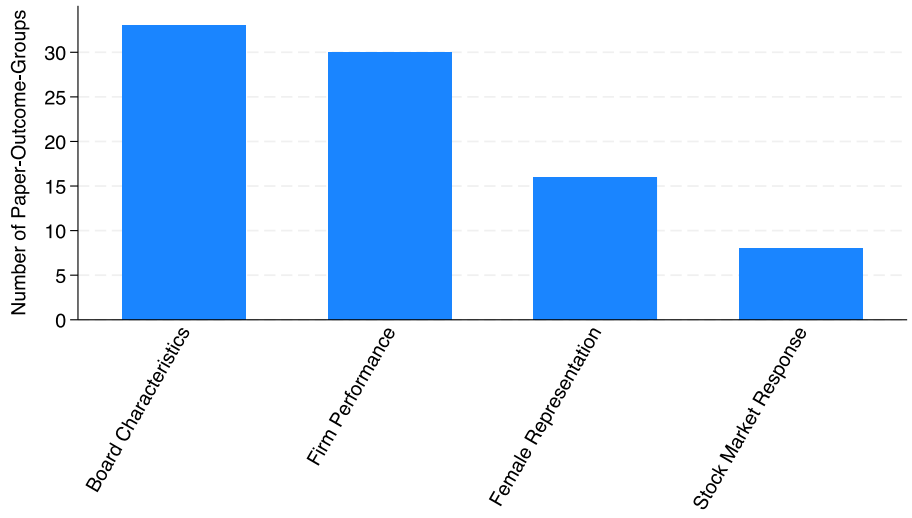

Fig. 4. Outcome Categories.
Notes: Fig. 4 shows the number of study-country-outcome groups for each outcome category. The total number of study-country-outcome groups is 87.

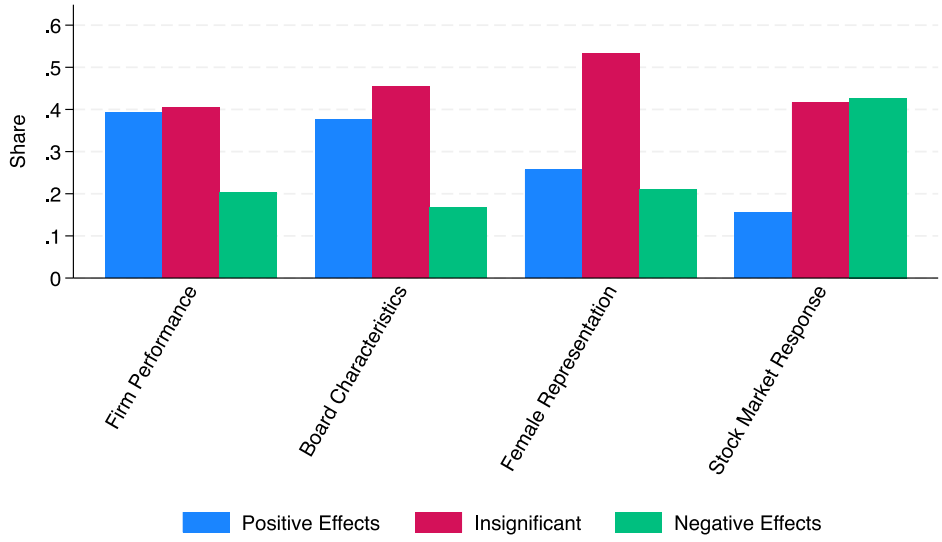

Fig. 5. Sign and Significance by Outcome Categories.
Notes: Fig. 5 shows the share of positive, negative, and statistically insignificant estimates studies find for each outcome category. Estimates are weighted by study-country-outcome category group.

Studies examining firm performance are most likely to find that the quota policy has significantly positive effects with a weighted share of close to 40%. Board characteristics tend to improve with the introduction of a gender quota to a similar extent.[7] Studies estimating effects on female representation in companies that adopt the quota policy mostly find results that are statistically insignificant. Like in the first two outcome categories, the share of significantly positive estimates dominates the significantly negative ones. The relationship of significantly positive to negative estimates is reversed once we turn to outcomes measuring stock market responses. Here the weighted share of significantly negative estimates dominates with 43% while only 16% or estimates are significantly positive.

[7] The weighted shares of significantly positive, insignificant, and significantly negative estimates are almost the same if we restrict the sample to outcomes reflecting board quality.

3.4. Descriptive statistics

Table 1 shows a summary of variable means in our data by country groups. We separate studies for Norway from those in other European countries and the US (California and Washington). The fourth column shows the mean characteristics for the full sample which includes studies with cross country analyses. As before, we present statistics weighted by study-country-outcome category groups.

Panel A reports basic characteristics of the quota policy and the study. In terms of policies differentiate between hard and soft quota regulations and a residual group of cross-country studies with no clear policy type. As we exclude studies evaluating voluntary quota set at the firm level, about 80% of the estimates in our sample refer to hard quota rules which impose financial sanctions for noncompliance. There is some variation across country groups. In Norway it took several years before sanctions were implemented so we see the highest share evaluations of soft measures in this country.

Studies in our sample have on average three authors. But there is an uneven distribution of authors by gender, with a clear majority of

female authors. Out of the 51 studies 7 have only male authors while 21 studies were exclusively written by female authors. Overall, the share of male authors increases with the number of coauthors.

The share of working papers is strongly related to the implementation year of the quota policy and our data includes a larger number of articles on Norway that are published. In total, about half of our studies had been published by March 2024. The interest in studies evaluating gender quota policies is reflected in the frequency of citations. Not surprisingly, we find the highest number of citations for studies evaluating the quota introduction in Norway, both when comparing mean numbers of citations in 2023 and the mean number of citations in all years. The distribution of citations has a long right tail. But the median of overall citations reflects the ranking in the mean across country groups.

Panel B compares outcome categories that have been studied across country groups. Board characteristics are the most frequently studied outcome group in all country groups, except Norway. With 78%, the majority of estimates measuring quota effects on board characteristics actually measure board quality, while the remaining estimates refer to outcomes such as board size with no clear quality interpretation. Studies from Norway, similar to those from other European countries, have a strong interest in the effects of quota policies on firm performance. The effects on female representation within firms have been investigated mostly in other European countries. US studies focus on outcomes that can be measured in the short term, such as board characteristics and stock market performance.

Panel C summarizes methodological characteristics of the studies in our sample. In terms of research design, the majority of estimates in the full sample is based on difference-in-difference designs comparing a sample of treated firms with an untreated control group around the implementation date of the quota policy. The remaining studies rely on event study or regression discontinuity designs without comparison group, or they implement IV strategies exploiting variation in exposure to the quota policy (Bertrand et al., 2019). About a quarter of estimates are based on matching for covariate adjustment. The prevalence of matching is strongly related to the use of difference-in-difference designs across country groups.

We would like to emphasize that the most recent studies tend to apply more sophisticated research designs. For example Kuzmina and Melentyeva (2021) exploit rounding errors at the quota cutoff for small boards in a regression discontinuity designs, or Maghin (2022) uses the quota reform as an instrument to estimate the impacts of board characteristics on firm performance in a structural framework.

The implementation year we recorded refers to the year around which effects of policy changes are evaluated in the study. It can thus vary within country depending on the outcome measure and research design. Not surprisingly, the mean implementation year is earlier in Norway than in the other European countries or the US where quota policies were passed later. The estimation window refers to the time around the implementation date which is used for estimation. Typically a window of 8 to 10 years is used, except for most recently implemented policies. The data used for estimation are constructed at the firm level in most studies. A smaller number of studies evaluate policy effects at the level of the board, at the level of individual board members, or at higher levels of aggregation. The number of treated firms affected by the quota policy is typically small, even if the data are drawn from the full population of firms. Quota policies focus on large listed firms, which are few in terms of numbers but they potentially cover a large fraction of employment.

Panel D shows the distribution of sign and significance categories also varies somewhat across country groups, with Norway showing the highest share of significantly negative estimates and other European countries finding the highest shares of significantly positive ones.

In the next section, we use regression analyses to examine whether these differences across country groups are related to study and policy characteristics or if there are genuine differences in policy implementation across groups of countries.

Table 1
Descriptive statistics by country groups.

	Norway	Other European Countries	US	Full Sample
A. Policy and Study Characteristics				
Hard Policy	0.78	0.88	0.95	0.80
Soft Policy	0.22	0.10	0.05	0.10
Implementation Year	2006	2012	2018	2013
Nb of Authors	2.87	2.88	2.42	2.83
Only Male Authors	0.20	0.07	0.16	0.10
Only Female Authors	0.20	0.51	0.42	0.44
Year of Publication	2018	2022	2022	2021
Published before 2020	0.53	0.07	0.00	0.16
Working Paper	0.13	0.41	0.68	0.45
Citations in 2023	96	10	19	26
Citations in all Years	667	29	55	142
Citations Median	207	19	4	8
B. Outcome Categories				
Board Characteristics	0.33	0.41	0.47	0.38
share measuring Board Quality	0.72	0.84	1.00	0.78
Firm Performance	0.47	0.32	0.11	0.34
Stock Market Response	0.13	0.02	0.26	0.09
Female Representation	0.07	0.24	0.16	0.18
C. Methodological Characteristics				
Unit of Obs.: Firm	1.00	0.90	0.63	0.85
Diff-in-Diff	0.60	0.80	0.84	0.79
Matching	0.20	0.29	0.31	0.25
Estimation Window (years)	8	10	3	9
Number of Treated Observations	269	581	361	491
Number of All Observations (Mean)	5725	3872	20 319	7485
Number of All Observations (SD)	12,677	6,193	165,160	76,268
D. Estimates Sign and Significance				
Positive Significant	0.23	0.35	0.30	0.34
Insignificant	0.40	0.53	0.46	0.45
Negative Significant	0.38	0.12	0.24	0.21
Number of Estimates	52	243	155	496
Nb. Study-country-outcome Groups	15	41	19	87

Notes: Sample means are weighted by study-country-outcome category groups.

4. Meta regression estimation

4.1. Meta analytic model

Our meta-analytic model follows the conceptual framework introduced in Card et al. (2018). We assume that the true policy effect β is a linear combination of observed characteristics of the study and the estimation method plus a sampling error. The estimate of the policy effect b is normally distributed with mean β. Based on these assumptions, we can derive a linear model for the estimated effect given by

$$b = X\alpha + u \tag{1}$$

where X captures observed heterogeneity by outcome categories, research designs, or estimation methods and u is given by the sum of the sampling error in the data and a fundamental unobserved heterogeneity due to policy implementation in the country and time period context or the definition of outcome variables.

Eq. (1) implies that the t-statistic of the estimates also follows a linear equation in X with coefficients that are strictly proportional to α. This suggests using an ordered probit model for the classification of the sign and significance of the quota policy effects in significantly positive, insignificant and significantly negative.[8]

The standard approach in the meta-analysis literature (Stanley and Doucouliagos, 2012) compares point estimates and standard errors of

[8] Card et al. (2018) compare the estimation results from the ordered probit model with linear regression models for the program effect estimates in a subset of their data and confirm this proportionality. Due to the much smaller sample size we cannot do this here.

policy parameters. The concern with using signs and significance is that the significance of the estimates might be systematically related to the number of observations in the data with larger samples leading to more significant effects, while the magnitude of the estimate is not directly related to the number of observations. We show in Table 1 that in our sample of studies the group of treated firms is typically small but most studies include large numbers observations in the control group. To check whether there are significant differences in the sign and significance based on the sample size we include the square root of the sample size in the regression models. In addition to ordered probit estimates, we also show estimates from two bivariate probit models for the probability of finding a significantly positive or a significantly negative effect in the Appendix as robustness checks.

4.2. Estimation results

Table 2 presents estimates from a series of ordered probit regression models where we weight observations at the study-country-outcome group level. Standard errors are clustered at the level of the study. We begin by separately considering groups of covariates in Columns (1) to (4) and then estimate a model that includes all covariates simultaneously in column (5).

Panel A of Table 2 investigates heterogeneity in quota effects by country groups, where the reference group is Norway. The point estimates in column (1) indicate that estimates from other countries that implemented quota policies later than Norway as well as cross country studies are more likely to find positive effects. There are, however, many other aspects that differ across studies from different countries which are related to the type of policy, or to the estimation methods and outcome variables that are considered. Once we control for all observed covariates in the full specification in column (5), country group coefficients become much smaller and some of them even flip the sign. We conclude that conditional on study and policy characteristics there are no detectable differences in quota effects across countries.

Panel B compares estimates across different outcome categories with board characteristics as the reference group. The estimates in column (1) confirm the pattern shown in Fig. 5. Quota effects for outcomes related to firm performance have a similarly high share of significantly positive estimates as those studying board characteristics, while the majority of outcomes related to female representation in firms or to stock market performance result in insignificant estimates and estimates of quota effects related to stock market returns are mostly negative. The pattern of coefficients across different outcome categories persists once we control for all observed characteristics.[9] Specifically the strong negative coefficient for outcomes related to stock market performance remains significant. While the coefficient is not statistically different from the other categories, we conclude that estimates of stock market responses are more likely to find negative quota effects.

Panel C examines policy and study characteristics. On the policy side, we control for a soft quota dummy. The coefficient on this variable is negative and of similar magnitude both in columns (4) and (5). This suggests that soft policies which do not impose sanctions for noncompliance are less powerful than hard quota policies. Although this result is statistically insignificant, we compare the direction of the point estimate with the results from probit models in Appendix Tables A.2 and A.3 which confirm our interpretation that evaluations of soft policies are more likely to result in insignificant quota effects.

Interestingly, studies reporting significantly negative quota effects are cited more often as is shown by the coefficients in Table 2 and in Appendix Table A.3. Note that the relationships holds conditional on controls for other study characteristics that might be correlated with the number of citations, such as the publication status or the publication date. Neither the publication status of the study nor the publication date appear to have a clear relationship with the estimated quota effect.

We also investigate if the gender of the authors is related to the reported quota effects. In this literature dominated by females, male authors might have different opinions regarding quota policies. To see whether gender specific opinions are reflected in reported estimates we control in the regressions for dummy equal to one if the study is coauthored by only men and for the number of coauthors. The coefficient on the male author dummy in the ordered probit model is negative, irrespective of whether we control for the full set of covariates or not. According to the probit model in Appendix Table A.3 only male authors have a higher likelihood to report significantly negative quota effects. But none of our estimates is significant.

In Panel D, we control for methodological and estimation characteristics. We do not find evidence that diff-in-diff designs lead to systematically different findings than other designs, such IV, RD or simple event studies without comparison. But there is some evidence indicating that estimates based on matching procedures are more likely to result in significantly positive quota effects. The coefficient in the full specification in column (5) is significant at the 10% level. Comfortingly, we do not see a relationship between the square root of the sample size and the likelihood of finding different magnitudes of t-values. This suggests that the main variation in sign and significance is not driven by the sampling error but rather by differences in policy implementation and heterogeneity in detailed outcome measures.

5. Conclusion

While the positive effect of (mandatory) quota policies on board gender diversity of affected firms is well established, there is still a debate how these policies affect other firm outcomes. In this paper, we preform a meta-analysis to synthesize the findings from the active literature studying the effects of gender boardroom quota policies. To this end we have collected a sample of 51 studies from 11 countries and extracted 496 estimates of quota policy effects. The literature is dominated by female authors and investigates quota effects on a large number of different firm outcomes. The synthesis of our meta-analysis confirms many of the conclusions drawn by single studies in a wider context and allows us to derive some important lessons and policy recommendations and an outlook on potential areas of future research.

First, we document substantial variation in the estimated quota effects. In our sample 34% of the estimates are significantly positive, 21% are significantly negative, while almost half of the estimated effects are insignificant. Conditional outcome categories, policy and study characteristics, the country context plays a minor role in explaining heterogeneity across policy effects. This implies that it is possible to extrapolate findings across countries and we can learn about policy effects from other countries.

Second, compared to other outcome categories, stock market returns are most negatively affected by quota policies. The literature reports relatively high shares of significantly positive quota effects on board characteristics and board quality as well as firm performance measures. These findings put concerns that imposed gender quota might reduce the quality of decision making bodies or deteriorate firm performance into perspective. However, clear evidence that more gender diversity in the boardroom spills over to gender diversity at lower levels of the company hierarchy and reduces gender gaps is limited. Additional policy efforts to achieve this goal might be necessary.

Third, soft policies that do not impose sanctions for non-compliance appear to be less powerful and less likely to generate significant

[9] We also estimate a model for a sample of estimates that excludes board characteristics that cannot be interpreted as board quality such as board size. The results are very similar to those reported in Table 2 and available on request.

Table 2
Ordered Probit Estimate.

	(1)	(2)	(3)	(4)	(5)
A. Country Group (reference Norway)					
Other Europe	0.584				−0.014
	(0.381)				(0.394)
US	0.318				−0.218
	(0.411)				(0.399)
Cross Country	0.630				0.087
	(0.518)				(0.536)
B. Outcome Category (ref. Board Characteristics)					
Firm Performance		−0.029			−0.070
		(0.206)			(0.230)
Stock Market Response		−0.741			−0.718
		(0.383)			(0.366)
Female Representation		−0.251			−0.375
		(0.294)			(0.314)
C. Policy and Study Characteristics					
Soft Policy			−0.162		−0.166
			(0.284)		(0.338)
Citations All (in 100)			−0.101		−0.094
			(0.036)		(0.039)
Working Paper			−0.016		0.136
			(0.283)		(0.299)
Publication date before 2020			0.318		0.079
			(0.311)		(0.363)
Only Male Authors			−0.220		−0.189
			(0.302)		(0.321)
Nb of Authors			−0.078		−0.085
			(0.135)		(0.136)
D. Estimation Details					
Diff-in-Diff Design				0.238	−0.298
				(0.353)	(0.344)
Matching				0.220	0.452
				(0.276)	(0.268)
Square Root Sample Size				0.002	0.001
				(0.003)	(0.003)
Number of Estimates	496	496	496	471	471

Notes: Estimates are weighted by pager outcome category groups. Standard errors clustered by study in parenthesizes.

effects than hard quota policies. Fourth, papers reporting negative quota effects are more highly cited.

Fifth, there is some evidence that the estimation method matters as estimates generated with matching methods are more likely to be positive. Moreover, studies authored exclusively by males produce more negative results. Beyond these irregularities, we do not find evidence of publication bias in this literature. The high variation in estimates appears to be driven by heterogeneity in implementation and outcome measurement rather than by sampling bias.

Our meta-analysis also reveals some areas with open questions. Given the small number of studies evaluating soft policies, it would be interesting to know under which conditions soft quota policies can work. More research is also need to examine the reasons for and consequences of negative quota effects on stock market returns. The findings of low spillover effects from quota policies on gender gaps are disappointing and research should focus on alternative policy approaches. Finally, given that citations favor negative estimates there seem to be obstacles to generating more optimistic publicity for gender quota policies.

CRediT authorship contribution statement

Costanza De Acutis: Writing – original draft, Formal analysis, Data curation. **Andrea Weber:** Writing – original draft, Formal analysis, Data curation, Conceptualization. **Elisabeth Wurm:** Writing – original draft, Formal analysis, Data curation.

Data availability

Data will be made available on request.

Appendix A. Supplementary data

Supplementary material related to this article can be found online at https://doi.org/10.1016/j.labeco.2024.102634.

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