Centre for Economic Performance

Discussion Paper ISSN 2042-2695

No. 2029
September 2024

Learning about women's competence: The dynamic response of political parties to gender quotas in South Korea

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Abstract
We study the dynamic responses of political parties to gender quotas in South Korean municipal councils, a setting with nearly zero women pre-quota. We exploit two unique institutional features: the quota intensity is discontinuous in council size; the quota regulates only one of two election arms. Political parties initially counteract the quota by nominating fewer women in the unregulated arm, but gradually reverse this response over time. Guided by a dynamic model of discrimination, we uncover statistical discrimination with incorrect beliefs about women's competence as the main mechanism driving party behavior. The quota triggers learning through exposure to competent women.

Keywords: gender quota, political parties, discrimination, biased beliefs, learning

This paper was produced as part of the Centre's Labour Markets Programme. The Centre for Economic Performance is financed by the Economic and Social Research Council.

This research is supported by the STICERD Research Grant and a grant of the French National Re-search Agency (ANR), "Investissements d'Avenir" (LabEx Ecodec/ ANR-11-LABX-0047). We are grateful to Oriana Bandiera, Manuel Bagues, Pamela Campa, Katherine Casey, Rachel Cassidy, Luca Citino, Nicola Fontana, Martina Kirchberger, Alan Manning, Nicola Mastrorocco, Guy Michaels, Torsten Persson, Steve Pischke, Anna Raute, Viola Salvestrini, Vincenzo Scrutinio, Horng Chern Wong, and numerous seminar and conference participants, for their extremely helpful comments. The use of the data was approved by the LSE Ethics Committee in December 2018.

Jay Euijung Lee, Stockholm University and Centre for Economic Performance at London School of Economics. Martina Zanella, Trinity College Dublin, TRiSS and TIME.

Published by
Centre for Economic Performance
London School of Economic and Political Science
Houghton Street
London WC2A 2AE

J.E. Lee and M. Zanella, submitted 2024.

I INTRODUCTION

Gender quotas in politics are currently used by 130 countries. Proponents view quotas as a tool to dismantle negative biases against female politicians.[1] However, it is precisely where these biases are the greatest, and therefore quotas are most needed, that quotas also run the highest risk of being ineffective. The critical risk is strategic counteraction by political parties. Voters, too, may resist quotas (Clayton, 2015), but political parties as a first step act as gatekeepers who control the set of candidates available for voter selection (Norris and Lovenduski, 1995; Dahlerup, 1998; Fujiwara et al., 2024; Esteve-Volart and Bagues, 2012).

Strategic counteraction against quotas by parties has been documented, as part of a large literature evaluating the effect of gender quotas on female representation and policy outcomes. Although quotas increase the total number of female candidates, their ability to increase elected female councilors has been hampered by parties placing women far down the party list or in less-winnable constituencies (Murray, 2008; Casas-Arce and Saiz, 2015; Lippmann, 2021; Bagues and Campa, 2021).[2] Lippmann (2021) also shows that the extent of counteraction can decrease over time. However, little is known about why parties want to subvert quotas and, in particular, why they might change such behavior.

In this paper, we study how highly male-dominated political parties react to quotas in their nomination of candidates for municipal councils in South Korea, where the share of women as politicians was as low as 2%. Our key contribution is to distinguish between taste-based and statistical discrimination by parties, which typically exhibit observably similar static outcomes (Bohren et al., 2019). We do so by studying parties' *dynamic* strategies, leveraging a novel dataset containing information on the universe of candidates and elected councilors over 7 election cycles.

We find statistical discrimination with downward-biased priors about women's competence to be the main barrier against female nomination. In such a context, a quota design that restricts parties' counteraction enough to ensure the initial election of competent women can kickstart a process of belief updating. Then, as beliefs on women's competence evolve, female representation in politics snowballs.

[1] For example, Beaman et al. (2009) and De Paola et al. (2010) provide direct and suggestive evidence that female representation reduces voters' negative attitudes towards women in politics.

[2] Krook (2016) reviews various tactics of counteraction employed by parties.

In our empirical analysis, we take advantage of the fact that the gender quota regulates only one of two separate arms through which councilors get elected. In South Korea's mixed electoral system, 80-90% of councilors are elected by plurality vote in the municipality's constituent wards ("ward arm") while the rest are elected by party-list proportional representation ("PR arm"). The gender quota regulates only the PR arm, stipulating that all odd-number candidates in the party list be female.[3] By studying the rich set of endogenous party responses in the unregulated ward arm, we can characterize what is typically unobservable: the nature of political parties' attitudes toward female candidates. We track these responses over four election cycles post-quota. It is the evolution of parties' responses over time, coupled with the extensive information on candidates and councilors, that helps us uncover the reasons behind the initial under-representation of women.

Our identification strategy is a regression discontinuity design that exploits the cross-sectional variation in the intensity of the quota. The number of PR seats increases as a step function of a municipality's council size, creating discontinuities in the intensity of the quota at certain cutoffs of council size. We study the effect of quotas on political parties' candidate nomination strategy by comparing councils on either side of the cutoffs.

In the first cycle after the introduction of the quota, we find that parties counter the quota by nominating fewer female candidates in the unregulated ward arm. The reduction in the number of female candidates is especially pronounced when the probability of winning is higher – in favorable ballot positions and among the two largest parties. Hence, although the quota successfully increases the number of women elected through the regulated PR arm, its effect is diluted as fewer women get elected in the ward arm.

This pattern gradually reverses over time. Over the following three election cycles, parties in the treated municipalities gradually increase the number of female candidates in the ward arm. By the last election, these parties had entirely reversed their initial reaction and, in fact, had a *greater* number of female ward candidates than parties in control municipalities. These patterns are echoed in the election outcomes. Treated municipalities elect significantly more female ward councilors from election cycle 6 onward.

What is driving the initial counteraction and gradual change in the response to quotas? These results may stem from any of the three groups of agents involved: potential candidates, voters, and parties. We first rule out non-party drivers. We show that the estimated

[3]Parties determine the set of candidates running for election. The case is obvious for the PR arm, in which parties compete for seats. Also in the ward arm, it is rare for a candidate to have no party affiliation.

patterns cannot be reconciled with parties responding to a faster change in voter preferences for women, or with a faster growth in the supply of qualified female candidates, in treated relative to control municipalities. We find no evidence that the gender gaps in candidate vote shares or background characteristics evolve differently between treated and control.

Rather, we find that the quota affects party nomination strategies. The women elected directly through the quota gain incumbency advantage, and are nominated again in the next election in the ward arm. Critically, however, the quota's effect extends beyond incumbent women. The gradual increase in female ward candidates is also evident among *rookie* women with zero councilor experience.

We argue that the positive spillovers for rookie females is due to the quota leading parties to appraise women in general differently. To show this, we build and test a dynamic model of discrimination that incorporates both taste-based and statistical discrimination. We merge models of electoral competition (Galasso and Nannicini, 2011; Le Barbanchon and Sauvagnat, 2022) with standard models of statistical discrimination (Aigner and Cain, 1977) to describe how parties select candidates and allocate them to different candidate positions. The novelty of our model is to formalize a dynamic process of updating of incorrect beliefs where the learning occurs about the group of women, as opposed to individuals. We check that the key assumptions of the model are met in the data and use the model predictions to guide our empirical analysis.

Our evidence shows that parties statistically discriminate against women due to a lack of information and downward biased beliefs about their competence. Parties therefore initially counter the quota to bring the number of women down to their preferred level. However, they gradually increase female ward candidates as they update their beliefs after the quota forces them to be exposed to new female councilors.

First, we show that the gradual increase in female candidates is driven by weakening statistical discrimination rather than taste-based discrimination. While the two sources of discrimination deliver observationally equivalent predictions on the parties' nomination strategy immediately after the quota, we can distinguish them from how strategies *evolve* across election cycles. Specifically, the increase in female candidates is observed solely in competitive wards, where candidate quality matters more. This points towards an increase in the perceived competence of women. With weakening distaste for women, in contrast, the additional women would have been concentrated in non-competitive wards,

as they would have lower competence than incumbent women. Moreover, in line with statistical discrimination, the change in candidates' selection is related to the acquisition of new information about women as politicians. We find that the quota effectively promotes the election of a higher number of rookie female councilors in the PR arm in treated municipalities, exposing parties to new information about women's competence as politicians. Furthermore, the initial counteraction and the subsequent reversal occur primarily in municipalities where female councilors were entirely absent before the quota, i.e. with a greater lack of information on women.

We next investigate the source of the statistical discrimination. New information on female politicians can correct downward-biased beliefs about their competence. New information can also reduce statistical discrimination by decreasing the *uncertainty* around the competence of women, even when beliefs are accurate, as formalized in Beaman et al. (2009).[4] We find evidence supporting the presence of biased beliefs. The shift towards female candidates is stronger when the first female PR councilors have above-median levels of education.[5] This is not consistent with new information merely reducing the uncertainty around the competence of women, which should happen irrespective of ability.

From a policy perspective, our findings imply that quotas can be effective in the long run when designed appropriately, even in the prevalence of biased beliefs against female politicians. With nearly zero females before the quota and over 60% agreeing that men make better political leaders than women (Figure A.1), South Korea would have been such a context. We do observe parties and their leaders counteracting the quota initially. Yet, by requiring the first candidate in parties' PR lists to be women, the quota design i) incentivized parties to nominate competent women, and ii) ensured those women got elected, thereby paving the path for learning to take place.[6]

We contribute to a large literature on gender quotas and their role in enhancing female representation. This work has studied when quotas are effective, how they should be designed, and how they impact policy.[7] The question of how quotas influence perceptions or beliefs much less explored (Dahlerup, 2021), with existing studies primarily focusing

[4]NBER Working Paper (14198) version.

[5]Education is often used as a proxy for competence (Baltrunaite et al., 2014; Bagues and Campa, 2021).

[6]Downward-biased beliefs likely would have persisted if the quota had instead brought in unqualified females, such as female family members of incumbent males – a widespread tactic observed in Argentina, India, and Mexico (Krook, 2016).

[7]Example review papers: Hessami and da Fonseca (2020) and Dahlerup and Freidenvall (2022).

on the constituents.[8] In contrast, we focus on political parties – the gatekeepers – and show that quotas can correct informational failures that lead parties to select a suboptimally low number of women. Our results complement Beaman et al. (2009)'s finding of exposure to female politicians reducing statistical discrimination among voters, and Bhavnani (2009)'s suggestive evidence of similar effects among parties. We add by delving deeper into whether the statistical discrimination is rooted in accurate or inaccurate beliefs.

We also contribute to the literature on discrimination, studied both theoretically and empirically in various contexts. Theoretical frameworks on the dynamics of discrimination have focused on how the degree of discrimination changes over time in response to a series of signals about the ability of an individual (Fryer, 2007; Bohren et al., 2019). Our model contributes by taking this to the group level. Instead of multiple signals about an individual's ability, the revealed abilities of elected females act as multiple signals that are aggregated to update beliefs on the mean ability of women. Empirically, we connect to the set of papers that demonstrate the difficulty of disentangling different sources of discrimination, namely taste-based discrimination and statistical discrimination with accurate and inaccurate beliefs (Hull, 2021; Bohren et al., 2023). We find evidence supporting the presence of biased beliefs.

Lastly, our paper contributes to the literature on women in South Korean municipal councils. We provide causal evidence that quantitatively supports arguments in qualitative studies (Shin, 2014; Yoon and Shin, 2017): i) parties, not voters, dictate electoral success; ii) the quota was resisted by parties; iii) the PR women who demonstrated their caliber during their term allowed parties and voters to revise their perceptions on women's capabilities and were renominated in the ward arm. Joo and Lee (2018) do causally estimate the effect of electing women on female candidate nomination, using an instrumental variables strategy based on an arbitrary name-order advantage on the ballot. Their finding of null spillover effects on other females in the following election cycles contrasts to ours. This highlights two points we make: the importance of electing *competent* women to propel the process of learning,[9] and the importance of examining effects over the long term.

The remainder of the paper is organized as follows. Section II describes the institutional

[8] E.g. De Paola et al. (2010); Alexander (2012); Clayton (2015); Allen and Cutts (2018); Fernández and Valiente (2021); Kim and Fallon (2023); and a review chapter in Franceschet et al. (2012).

[9] The compliers in their IV method are females who only got elected thanks to the name-order advantage, and therefore would not be of high competence.

setting and data. Section III lays out our empirical strategy, and Section IV discusses the results. In Section V, we present a model and we discuss the pieces of evidence that point towards learning as an explanation for the results. Finally, Section VI concludes.

II INSTITUTIONAL SETTING AND DATA

II.A The role of municipal councils, electoral rules, and gender quotas

There are 226 municipal councils in South Korea. Municipal councils represent the legislative branch that works with municipal governments – the executive branch – to oversee local matters. Councils have several legally defined responsibilities, which include reviewing and approving the spending of municipal governments, adopting and revising local bills, monitoring municipal governments, and addressing petitions submitted by residents. Municipal governments administer around a third of South Korea's total public expenditure.

Municipal councils were established in the mid-1990s, and since then, elections have taken place every four years. Our sample covers seven elections, with 2018 as the last election year. Up to the third election in 2002, all councilors were directly elected through plurality vote in single-member constituent wards. It was extremely rare to find candidates affiliated with a political party.

However, major reforms were made to the electoral rules from the fourth election in 2006. We describe below the two main reforms of interest for our analysis. While there were other reforms introduced simultaneously, described in Appendix C.1, none conflicts with our identification strategy.

First, a double-arm voting system was introduced. Candidates could be elected through two alternative arms[10]: a party-list proportional representation arm ("PR arm") and a multi-member plurality vote arm in constituent wards ("ward arm"). Each ward elected between 2 and 4 councilors, and therefore multiple candidates from the same party could run in the same ward.[11] Figure A.2 illustrates what the ballot papers look like for the two arms.

Second, a gender quota was put in place: all odd-number candidates in the party list for the PR arm needed to be female. As the number of PR seats is small, such as 1 out of 10

[10]The same person could run only on one arm.

[11]A party could nominate candidates for a ward up to the preset number of seats allotted for that ward.

total seats in the council, most elected PR councilors turned out to be the first candidates on the lists and therefore female. As a consequence, the introduction of quotas sharply increased the proportion of female councilors.

Municipal councils were severely male-dominated prior to the reform, with only 2% of councilors being female. Since the introduction of quotas in 2006, however, the female share of councilors sharply increased to 15% and continued to grow to 30% by 2018 (Table I). The female share also rose beyond the stipulations of the quota. Table I shows that it rose among ward candidates, whose gender is not regulated, and even among the "rank 1" ward candidates in the highest ballot positions, with higher likelihoods of election.

Table I - Descriptive Statistics on Councilors and Candidates

				Quota on PR arm ↓			
Election cycle:	1 (1995)	2 (1998)	3 (2002)	4 (2006)	5 (2010)	6 (2014)	7 (2018)
Number of...							
councilors	19.3	14.9	14.9	12.4	12.4	12.6	12.7
PR councilors	-	-	-	1.61	1.61	1.65	1.68
Female share of...							
councilors	0.01	0.01	0.02	0.15	0.21	0.25	0.30
PR councilors	-	-	-	0.87	0.96	0.97	0.98
ward candidates	0.01	0.01	0.02	0.04	0.08	0.13	0.18
ward candidates, rank 1	-	-	-	0.04	0.13	0.18	0.23

Note: The table reports the average number and female share of councilors or candidates in each municipality, by election cycle. The PR arm was introduced in cycle 4. "Rank 1" ward candidates refer to the first or only candidate of a party in a ward, relevant from cycle 4 when party affiliation started. The sample includes only the municipalities in the analysis, excluding 5 municipalities that merged after elections or had discrepancies between the two arms. Statistics including all municipalities are extremely similar.

Background behind the adoption of gender quotas If some parties had pro-female ideology and led the movement for the reform against opposition from other parties, then we might expect parties' strategic responses to the quota to be very heterogeneous in nature. Yet, both major parties led the passage of the gender quota in the National Assembly. It has also been argued that the quota was merely a political tactic to expand the number of politicians (Jeon, 2013) and to strengthen the power of parties[12] (Kim, 2005), unrelated to any genuine interest in female representation. Appendix C.2 elaborates on the background of the quota's adoption. Parties were not very divided in their support of the quota.

[12]The quota was tied to party-list proportional representation, after all.

II.B Data

Two sources of data are used. First, data related to the execution of the elections are collected by scraping the website of the National Election Commission. The website posts detailed data on all past elections, including population, candidate information, and vote outcomes. Second, we use the data on municipal government budgets from the Local Finance Disclosure System of the Ministry of the Interior and Safety.

Population Because ward divisions are centrally determined based on population size, population data is published. The data includes the number of residents by ward, voting eligibility, gender, and citizenship status, as well as the number of households by ward.

Candidates The candidate characteristics available are election arm (ward or PR) classification, ward name, candidate number, party affiliation, name, gender, date of birth, age, occupation, education, and pertinent work experience. Whether a candidate is favored by his or her party is revealed by the election arm and candidate number. Typically, candidates deemed less competitive are placed on the PR arm, and the candidate numbers directly translate to the position on the ballot paper, in which higher positions attract more votes.

Votes Vote counts are available by ward. For each party, we categorize wards into stronghold, competitive, and weakhold wards, based on the vote count the party previously obtained in the PR arm. Moreover, the gap in vote shares of male and female ward candidates informs us of voter preferences for women.

Municipal budget The budget of a municipal government reflects the economic prosperity of the municipality, as around half is sourced from local tax and non-tax revenue. In addition, data is available on the share of the municipality's expenditures spent on running the municipal council, which we use as a measure of council performance.[13] These data are used to perform balance checks to validate our identification strategy.

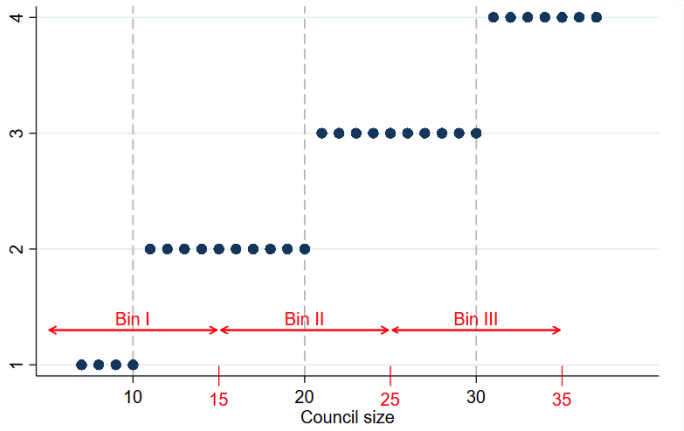
[13]There have been numerous accusations in the past of councilors misappropriating large sums of the municipal budget for their private use (Local Decentralization Bureau – Election and Local Council Division, 2019). For instance, some councilors have been reported for making international policy-research trips where the itinerary largely consisted of sightseeing. Another example is councilors ordering member pins made of pure gold. Consequently, a measure of council performance is the frugality of its operating costs. Newspapers have traditionally included it in their assessments of councils (Jang, 2008).

III EMPIRICAL STRATEGY

III.A Regression discontinuity design around the number of PR seats

To get at the causal effect of the gender quota, we use the fact that the gender quota affects municipalities at different intensities depending on the number of PR seats in the council. The number of PR seats is important as the gender quota only applies to the PR arm, and the quota stipulates that all odd-number candidates in the party list be female. The number of PR seats increases as a step function of the total council size, which is pre-determined centrally by the National Election Commission based on population size and regional representativeness. The step function, depicted by the dots in Figure I, provides discontinuities in the number of PR seats at given thresholds of council size. For all councils with up to 10 total seats, one councilor must be elected through PR. For councils with 11-20 total seats, two councilors must be elected through PR, etc.

Figure I - The Number of PR Councilors by Council Size



Note: This figure depicts how the number of seats reserved for the PR arm increases as a step function of the total number of councilors in a municipality. Each council is categorized into a bin based on its most proximate threshold. Councils within the same bin above and below the threshold are assigned to treatment and control groups respectively. A few municipalities, that are formed by the merging of multiple municipalities *after* the election, are excluded from the estimation sample and are not shown in this figure.

We exploit this discontinuous change in the number of PR seats in a regression discontinuity design that compares the characteristics of candidates in municipalities on each side of the thresholds while controlling for council size. In order to account for the fact that there are multiple thresholds (11, 21, 31), we categorize councils into bins based on the

proximity to thresholds, as illustrated in Figure I. We compare treated municipalities above the thresholds to control municipalities below them.[14]

We define treatment status based on council size in election cycle 4, instead of contemporaneous council size. This way, we can compare the estimated treatment effects across election cycles and identify the long-term effect of quotas. As the composition of treated municipalities across election cycles is held fixed, differences in treatment effects over time can be attributed to differences between immediate and follow-up effects for the same councils, not to councils switching treatment status.[15]

The regression discontinuity specification is given by:

$$Y_{cbt} = \alpha_b + \alpha_t + \sum_{s=4}^{7} \beta_s \times (\textit{Treat in cycle } 4)_{cb} + f(x_{cb}) + X'_{cbt}\gamma + \epsilon_{cbt} \tag{1}$$

where Y_{cbt} denotes the outcome variable for municipal council c belonging to bin b in election cycle t. As we are interested in characterizing parties' candidate nomination strategies, the outcomes we consider are the number of ward and PR candidates and councilors by gender. The running variable is $x_{cb} \equiv (\text{council size})_{cb} - \text{threshold}_b$ in cycle 4, with $\text{threshold}_b \in \{11, 21, 31\}$.[16] When the outcome variable relates to ward elections, we change the running variable to $\tilde{x}_{cb} \equiv (\text{N. of ward councilors})_{cb} - (\text{N. of ward councilors at the threshold})_b$ in cycle 4 for ease of interpretation.[17] $(\textit{Treat in cycle 4})_{cb} \equiv \mathbb{1}(x_{cb} \geq 0)$, signifies an additional PR councilor. Therefore, β_s estimates the effect of having an additional PR councilor, pooling all the bins together, in election cycle s. Moreover, the baseline function form of f is linear, and we do not allow for the effect of x_{cb} to differ to the left and right of the threshold. Making f quadratic or allowing for differential trends on either side of the threshold barely makes a difference, as shown in Appendix Tables B.5- B.7. X_{cbt} denotes control variables such as council size or the number of ward seats.

The standard errors are clustered by municipality for two reasons. First, treatment assignment varies at the level of the municipality. Second, parties formulate strategies chiefly within a municipality and very rarely move candidates across municipalities. Sev-

[14]The estimated treatment effect is robust to different bandwidths around the bins (See Table B.2).

[15]In practice, it barely makes any difference to use contemporaneous council size because council sizes are extremely stable. Treatment status would change after cycle 4 for only 3.7% of the councils.

[16]Note that the running variable is discrete (low degree of variability), so equation (1) is not suitable for the RD estimation method using optimal bandwidths (Calonico et al., 2014) that is common in regression discontinuity designs. We use optimal bandwidths and graph the accompanying RD plots in another regression specification we introduce later, where the method is suitable (Table X, Figure A.4).

[17]See Appendix D.3 for an explanation.

eral factors bind a candidate to a municipality, such as a legal residency requirement for nomination, and the electoral advantages of familiarity with local matters and voters.[18]

III.B Did the quota bite?

Our strategy identifies the effect of an additional PR councilor, rather than an additional *female* PR councilor. However, an additional PR councilor strongly implies an increase in the number of female PR councilors. While the gender quota does not regulate the gender of the second PR candidate, in practice almost all PR councilors end up being female.[19] This is because PR candidates even in even-number positions are frequently female, and elected PR councilors are mostly the number-1 candidates of different parties.

Table II - Treatment Effect on the Number of Female PR Councilors

	Bin 1	Bin 2	Bin 3
	(1)	(2)	(3)
Treat in cycle 4 × Cycle 4	0.83***	0.52***	0.14
	(0.09)	(0.18)	(0.43)
Treat in cycle 4 × Cycle 5	0.84***	0.32*	0.38
	(0.07)	(0.19)	(0.42)
Treat in cycle 4 × Cycle 6	0.77***	0.58***	-0.15
	(0.08)	(0.18)	(0.33)
Treat in cycle 4 × Cycle 7	0.77***	0.57***	0.09
	(0.08)	(0.16)	(0.44)
Running variable form	council	council	council
N	667	198	30

Note: This table displays the effect of having an additional PR seat (treatment) on the number of female councilors elected through the PR arm. It reports the results of regressing equation (1), separately for each bin. The sample includes all bins and all parties participating in municipal elections. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$ $^{***}p < 0.01$

Table II reports the results of equation (1) with the number of female PR councilors as the outcome variable, separately for each bin. Indeed, having an additional PR councilor in cycle 4 significantly increases the number of female PR councilors over all the cycles in bins 1 and 2. There is no such effect in bin 3 though, where we also have very few observations. The results of Table II are echoed in Figure A.3, which shows that the average number of female PR councilors sharply increases at the thresholds of bins 1 and 2, but not

[18] Appendix D.1 elaborates on these factors.

[19] Table I shows that 87-98% of PR councilors are female each election.

in bin 3. Therefore, in the reduced-form results that follow, we restrict the sample to bins 1 and 2.[20]

Furthermore, for both bins 1 and 2 (columns 1 and 2 of Table II), the effect of getting treated in cycle 4 on the number of female PR councilors remains constant across election cycles. The constancy in the direct effect of the treatment confirms that the nature and magnitude of the treatment, as well as the composition of the treatment municipalities, are stable. Thus, any change in the treatment effect on other outcomes over time can be safely attributed to the initial treatment leading treatment and control groups on different paths.

As a way to buttress the validity of the regression discontinuity design, Appendix Section D.2 formally tests and confirms that as council size increases, there is a change in the number of female PR councilors only at the thresholds and at no other point.

III.C Validity of the regression discontinuity design

The critical identifying assumption behind the identification strategy is the smoothness of the relationship between the outcome variable and council size, apart from the discontinuity of interest. This section provides evidence supporting this assumption.

Balance Tests We first show that there are no discontinuities in *pre-determined* characteristics at the threshold in cycle 4. Table III shows that the treatment effect on these, from estimating equation (1), is null.

Panels A, B, and C confirm that the population characteristics are indeed balanced. In particular, the voting age population by gender is no different, alleviating the concern that the preference for female councilors among voters may be different between the treated and control municipalities. Furthermore, education and labor force participation by gender are not systematically different.[21] In Panel D, we confirm that ideological leaning, economic prosperity, and council performance are balanced between treated and control municipalities (columns 1-4). These are measured by the vote shares of the two main parties in the PR arm of the 2004 National Assembly Election, the municipal government budget size, and the share of municipal spending on council operations, respectively. The structure of the

[20] We additionally restrict our sample to include municipalities for which we can observe a univocal link between ward arm and PR arm for all election cycles. This is not a balanced panel of municipalities. Our results are robust to alternative sample criteria, as shown in Appendix Tables B.3 and B.4.

[21] The data for panels B and C are at the province level (16 provinces), so the results there should be taken with more caution.

Table III - Balance Tests on Pre-Determined Characteristics

***Panel A*: Population characteristics**

	Total population		Voting age population			Households	
	Total	Foreign	Total	Male	Female	Total	Foreign
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treat in cycle 4 × Cycle 4	-22.19	0.01	-15.95	-7.25	-8.70	-4.96	0.01
	(31.09)	(0.02)	(22.68)	(11.27)	(11.44)	(11.15)	(0.02)
Running variable form	council	council	council	council	council	council	council
N	218	218	218	218	218	218	218

***Panel B*: Time use and labor force participation**

	House work (hours)		Employed		Unemployed	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Treat in cycle 4 × Cycle 4	1.40	0.07	103370.28	52328.44	26749.18	71163.52
	(1.40)	(3.22)	(243246.00)	(141937.32)	(125655.19)	(247753.96)
Running variable form	council	council	council	council	council	council
N	218	218	218	218	218	218

***Panel C*: Education**

	Elementary School or less		Middle School		High School	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Treat in cycle 4 × Cycle 4	9532.19	5355.82	6315.52	3684.63	41508.33	28108.85
	(10558.07)	(15279.58)	(15129.15)	(11913.87)	(93539.57)	(59757.91)
Running variable form	council	council	council	council	council	council
N	218	218	218	218	218	218

	Tech. University		University		Graduate Studies	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Treat in cycle 4 × Cycle 4	12223.74	5095.18	26221.99	8318.17	7568.52	1765.81
	(30554.47)	(21671.92)	(82508.35)	(40433.63)	(20521.64)	(7691.38)
Running variable form	council	council	council	council	council	council
N	218	218	218	218	218	218

***Panel D*: Political leaning, economic, and ward division characteristics**

	Past vote share by party		Budget		Ward characteristics	
	Conservative	Progressive	Total	Council expenses	Num of wards	Seats per ward
	(1)	(2)	(3)	(4)	(5)	(6)
Treat in cycle 4 × Cycle 4	0.00	-0.00	50.75	0.02	-0.24	0.17
	(0.07)	(0.07)	(86.78)	(0.05)	(0.18)	(0.11)
Running variable form	council	council	council	council	ward	ward
N	218	218	218	218	218	218

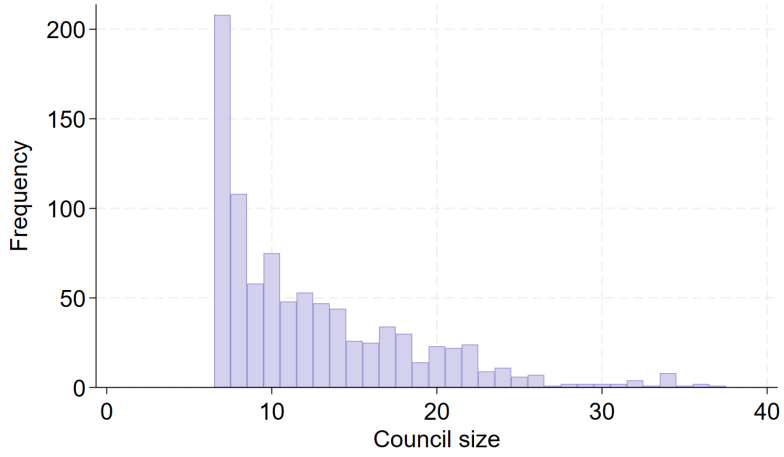
Note: This table shows the absence of discontinuities in pre-determined characteristics at the threshold in cycle 4. The regression specification follows equation (1). The sample consists of bins 1 and 2 in election cycle 4. Panel A: residents, residents of voting age, and number of households by gender/citizenship status (source: National Election Commission). Panel B: province-level information on hours spent on unpaid domestic or care-giving services (2004 Statistics of Korea Time Use Survey), and number of employed/unemployed individuals (2005 Census) by gender. Panel C: province-level information on education attainment by gender (2005 Census). Panel D: vote share of main parties in the PR arm of the National Assembly Election of 2004, municipal government expenditure (Local Finance Disclosure System of the Ministry of the Interior and Safety), and number and size of wards in each municipality (National Election Commission). Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

ward election arm, i.e. the number and size of wards, are balanced as well (columns 5-6).

Bunching Secondly, we check for the presence of bunching at the council size threshold. The concern here is that councils might be able to manipulate their constituent areas to affect their council's size and, therefore, influence their treatment status.

Figure II displays the histogram of the frequency of municipalities by council size. Visually, it is hard to say there is bunching around the thresholds of 11 and 21. Formally, due to the coarseness of the council size variable, even the discrete version of the McCrary (2008) density test proposed by Frandsen (2017) does not perform well; while no bunching is rejected at the threshold of 11, it is also rejected with similar p-values for randomly selected cutoffs of council size.[22]

Figure II - Histogram of Council Size



Note: The figure displays the distribution of council size in election cycles 4, 5, 6, and 7. The number of councils (vertical axis) for each size (horizontal axis) is displayed.

Nonetheless, the evidence from the previous balance tests and the electoral rules support the hypothesis that municipalities do not manipulate their council size around the threshold. Municipalities are not found to be systematically different above and below the threshold, which we would expect if manipulation were possible. Additionally, strict electoral rules make gerrymandering difficult. The division of election constituencies is determined by the Municipal Council Election Committee, which municipal councilors or party members

[22]The p-value is 0.000 in the Frandsen (2017) test for the thresholds of 9, 10, 11, 18, 19, 22, 23, 25, 26, 27, for all values of the bound coefficient $k \in \{0, 0.01, 0.02, 0.05\}$.

are not allowed to join.[23] The committee determines the council size based on population, administrative districts, topography, transportation, and other conditions. It also cannot split the smallest administrative district and make it a part of another ward.

Placebo Test In order to check that the discontinuity thresholds are meaningful only after and not before the electoral reform, we run a placebo test where we estimate equation (1) on the gender composition of candidates and elected councilors in the three election cycles before the introduction of the quota.[24]

Table IV - Placebo Test – The Effect of Being Past the Threshold Before the Reform

	Number of ward candidates			
	Male	Female	Male	Female
	(1)	(2)	(3)	(4)
Treat × Cycle 1	1.10	0.07	0.10	0.11
	(1.30)	(0.26)	(1.32)	(0.31)
Treat × Cycle 2	0.51	-0.03	-0.48	0.02
	(1.13)	(0.23)	(1.01)	(0.30)
Treat × Cycle 3	1.27	0.08	0.23	0.14
	(1.04)	(0.27)	(0.91)	(0.32)
Treat × Cycle 4	3.39***	0.75***	3.12***	0.60**
	(1.21)	(0.28)	(1.15)	(0.27)
Treat × Cycle 5			-0.85	1.34***
			(0.83)	(0.31)
Treat × Cycle 6			-2.31***	1.60***
			(0.81)	(0.42)
Treat × Cycle 7			-2.84***	1.62***
			(0.99)	(0.44)
Running variable form	ward	ward	ward	ward
N	906	906	1579	1579

Note: This table reports a placebo check estimating the effect of being above the threshold on the number of candidates in the pre-quota period (cycles 1-3). The outcome variable is the number of candidates elected through the ward arm in each election cycle by gender. The regression specification is given by equation (1). We do a number of things to ensure comparability before and after the reform. First, we define the running variable and treatment status contemporaneously. Since municipality size and divisions changed dramatically during the first three cycles, using cycle 4 municipality characteristics to define treatment for earlier cycles would be inaccurate. Second, the sample includes all bins. As council size is larger in cycles 1-3, restricting the sample only to bins 1 and 2 would imply selecting different municipalities before and after the reform. Third, the sample includes all parties (including "no party") because almost all candidates did not have any party affiliation before cycle 4. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

[23]The committee consists of up to 11 members appointed by the provincial mayor among individuals nominated by the media, legal and academic communities, civic groups, the provincial council, and the Provincial Election Committee.

[24]Before the introduction of the quota in 2006, there was no proportional representation (PR) arm and all the candidates were elected through a plurality vote (the ward arm).

If the probability of getting an additional PR seat upon the reform is correlated with other underlying factors that affect the number of male and female candidates, then we would see a non-zero treatment effect in election cycles 1-3, even before the quota. Table IV shows that up to cycle 3, the treatment effect is not statistically significantly distinguishable from zero. It is in election cycle 4 that the treatment effect emerges, as expected. This additionally validates that we are estimating the effect of the introduction of the quota, and not capturing ex-ante differences between treatment and control municipalities.

IV MAIN RESULTS

IV.A The evolution of councils' gender composition

Did the reform have the intended effect? Table V reports the results of equation (1) on the number of male and female councilors elected in each municipality, by election arm. To get at the effect on the female share, columns 3, 6, and 9 additionally control for the total number (male+female) of councilors in each arm.

Two interesting patterns emerge. In the first cycle after the introduction of the quota (cycle 4), treated municipalities display an overall higher number of elected female councilors (columns 8-9), but the effect is not significantly different from zero. Columns 5-6 of Table V show that a higher number of women – 0.76 women for every additional PR seat – do get elected in treated councils through the PR arm. However, the overall effect is diluted by fewer women and significantly more men getting elected in cycle 4 through the ward arm, the arm unregulated by the quota (columns 1-3).

The initial treatment effect does not persist across election cycles. From election cycle 5 onward, treated municipalities display significantly more female councilors and significantly fewer male councilors (columns 7-9). As columns 5-6 confirm that a constant number of additional women is elected through the PR arm, this reversal cannot be due to the intensity of the quota effect changing over time. On the contrary, it can be traced back to fewer men and more women getting elected through the unregulated ward arm starting from cycle 5, and increasingly so over time (columns 1-3).

Table V - Treatment Effect on the Number of Councilors

	All political parties								
Election arm:	Ward			PR			All		
	Male	Female	Female	Male	Female	Female	Male	Female	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treat in cycle 4 × Cycle 4	0.45*	-0.33	-0.35	0.09	0.76***	0.76***	-0.29	0.29	0.29
	(0.26)	(0.22)	(0.22)	(0.08)	(0.09)	(0.09)	(0.33)	(0.28)	(0.28)
Treat in cycle 4 × Cycle 5	-0.13	0.32	0.29	0.10	0.70***	0.70***	-0.87**	0.88***	0.88***
	(0.29)	(0.23)	(0.23)	(0.06)	(0.08)	(0.08)	(0.35)	(0.29)	(0.28)
Treat in cycle 4 × Cycle 6	-0.23	0.53*	0.48*	0.09	0.70***	0.69***	-0.98**	1.10***	1.07***
	(0.33)	(0.27)	(0.27)	(0.06)	(0.09)	(0.08)	(0.38)	(0.32)	(0.31)
Treat in cycle 4 × Cycle 7	-0.28	0.82***	0.73**	0.04	0.72***	0.69***	-1.08***	1.41***	1.33***
	(0.36)	(0.29)	(0.29)	(0.06)	(0.08)	(0.08)	(0.41)	(0.35)	(0.33)
Running variable form	ward	ward	ward	council	council	council	council	council	council
N	865	865	865	865	865	865	865	865	865
N. relevant councilors	No	No	Yes	No	No	Yes	No	No	Yes

Note: This table reports the effect of being above the threshold on the gender composition of councilors across election cycles. The regression specification is given by equation (1). The sample includes bins 1 and 2, and all parties participating in municipal elections. The outcome variable is the number of councilors elected overall and separately through the two arms – ward and PR – by gender in each municipality. We control for the number of ward councilors (column 3) or total councilors (columns 6 and 9) to get at the effect on the female share and to control for the change in council size across election cycles. We maintain these as controls in all following tables. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

IV.B Party strategies and candidate selection

As these are election outcomes, the above results could arise either from the voter's side or the party's side. They may be driven by voters expressing their gender preferences among a given set of candidates or by parties expressing gender preferences in their selection of candidates. Given the strong tendency of voters to vote for the candidates of their preferred party,[25] we delve into parties' candidate selection. We return to the discussion of voter preferences in Section V.A.

Table VI displays the results of equation (1) on the gender composition of candidates in each municipality in each arm. Similarly to Table V, in columns 3, 6, and 9 we control for the total number (male+female) of candidates of the relevant category in each arm, to get at the effect on the female share.[26]

[25]The predicted vote share of a candidate in the ward arm, based on i) the popularity of their party – measured by the party's vote share in the PR arm – and ii) the historical tendency of voters to vote more for candidates higher up on the ballot paper, has a correlation coefficient of 0.90 with the actual vote share.

[26]One may wonder whether the total number of candidates is a "bad control" in the regression because it

The results on candidates mirror the previous results on elected councilors. The most interesting finding is captured in columns 1 and 2. In response to the treatment in cycle 4, parties initially nominate more male ward candidates but gradually reduce the number across election cycles. Eventually, by the last election cycle, the parties in the treated municipalities nominate fewer male candidates than in control municipalities. As for female ward candidates, the opposite pattern holds: the coefficient sign changes from negative (albeit statistically insignificant) in cycle 4 to positive from cycle 5 onward.

Parties initially counteract the quota by placing fewer female candidates in the unregulated arm, but they gradually reverse their candidate selection strategy over time.

Table VI - Treatment Effect on the Number of Candidates

	All political parties								
Election arm:	Ward			PR			All		
	Male	Female	Female	Male	Female	Female	Male	Female	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treat in cycle 4 × Cycle 4	3.78***	-0.21	-0.14	0.95***	0.97***	-0.32*	1.92***	0.55	0.42
	(1.17)	(0.35)	(0.35)	(0.22)	(0.22)	(0.18)	(0.28)	(0.49)	(0.49)
Treat in cycle 4 × Cycle 5	0.41	0.52	0.54	0.66***	1.21***	-0.04	1.87***	1.55***	1.51***
	(0.91)	(0.36)	(0.36)	(0.17)	(0.23)	(0.15)	(0.28)	(0.49)	(0.49)
Treat in cycle 4 × Cycle 6	-1.43*	0.94**	0.93**	0.27*	1.03***	0.16	1.30***	1.79***	1.82***
	(0.84)	(0.42)	(0.42)	(0.15)	(0.22)	(0.14)	(0.25)	(0.54)	(0.54)
Treat in cycle 4 × Cycle 7	-2.24**	1.11**	1.09**	0.22	1.28***	0.27*	1.50***	2.24***	2.28***
	(1.00)	(0.44)	(0.44)	(0.16)	(0.22)	(0.15)	(0.24)	(0.58)	(0.59)
Running variable form	ward	ward	ward	council	council	council	council	council	council
N	865	865	865	865	865	865	865	865	865
N. relevant candidates	No	No	Yes	No	No	Yes	No	No	Yes

Note: This table reports the effect of being above the threshold on the gender composition of candidates across election cycles. The regression specification is given by equation (1). The sample includes bins 1 and 2, and all parties participating in municipal elections. The outcome variable is the number of candidates overall and separately in the two arms – ward and PR – by gender in each municipality. In columns 3, 6, and 9, we control for the total number (male+female) of relevant candidates (either ward, PR, or all) to get at the effect on the female share. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

IV.C Focusing on candidates likely to get elected

Table VI provides evidence on the composition of the overall pool of ward candidates in each municipality in each election cycle. Pooling all participating parties obstructs the

is an outcome of the treatment (Angrist and Pischke, 2009), but we view it as an accounting exercise. When we fix the male+female total, the treatment effects on the number of male and female candidates are clearly opposite in sign and equal in magnitude, reflecting the direction of the effect on the female share.

study of dynamic changes in party strategies when many small parties emerge and soon disappear. Therefore, our empirical analysis focuses on the two main parties from now. The two main parties – the Conservative Party and the Progressive Party – dominate South Korean municipal elections, producing at least 74% of ward councilors and 82% of PR councilors every election (Appendix Table B.1).

Moreover, changes in the composition of ward candidates may not be meaningful if they are driven by candidates in positions that have no hope of getting elected. Hence we next turn our attention to candidates in ballot positions characterized by a high probability of election: "useful" positions – position 1 if the ward elects 1-2 councilors and positions 1 and 2 if the ward elects 3-4 councilors; and "rank 1" positions – the first candidate of the party in the ward.

Table VII - Treatment Effect on Ward Candidates Likely To Be Elected

	Main political parties								
Position on ballot:	All ward candidates			Useful positions			Rank 1		
	Male	Female	Female	Male	Female	Female	Male	Female	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treat in cycle 4 × Cycle 4	1.31*	-0.27	-0.41*	1.76***	-0.31	-0.60***	0.77	-0.39**	-0.46***
	(0.76)	(0.23)	(0.22)	(0.61)	(0.21)	(0.19)	(0.47)	(0.18)	(0.17)
Treat in cycle 4 × Cycle 5	0.26	0.49*	0.39*	0.69	0.50**	0.26	-0.31	0.44**	0.41**
	(0.65)	(0.25)	(0.22)	(0.61)	(0.22)	(0.18)	(0.48)	(0.18)	(0.17)
Treat in cycle 4 × Cycle 6	0.45	0.78***	0.62**	0.91	0.71**	0.38*	0.02	0.46*	0.37*
	(0.63)	(0.29)	(0.27)	(0.61)	(0.28)	(0.22)	(0.45)	(0.24)	(0.21)
Treat in cycle 4 × Cycle 7	-0.59	1.17***	1.10***	0.19	0.93***	0.71***	-0.15	0.69***	0.58**
	(0.65)	(0.32)	(0.31)	(0.57)	(0.30)	(0.27)	(0.46)	(0.25)	(0.23)
Running variable form	ward	ward	ward	ward	ward	ward	ward	ward	ward
N	864	864	864	864	864	864	864	864	864
N. relevant ward candidates	No	No	Yes	No	No	Yes	No	No	Yes

Note: This table reports the effect of being above the threshold on the gender composition of ward candidates likely to be elected. The regression specification is given by equation (1). The sample includes bins 1 and 2 and is restricted to the two main parties. The outcome variable is the number of ward candidates by gender in each municipality. "Useful positions" refer to candidates in high-up positions on the ballot for the party in a ward (position 1 if the ward elects 1-2 councilors, and positions 1 and 2 if the ward elects 3-4 councilors). "Rank 1" candidates refer to the first or only candidate for the party in each ward. The number of observations is 864 instead of 865 since in one municipality main parties only have PR candidates. In columns 3, 6, and 9, we control for the total number (male+female) of ward candidates in the relevant positions (either all, useful, or rank 1), to get at the effect on the female share. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table VII shows that when we restrict our attention to candidates from the main parties, the pattern is even stronger. Main parties in treated municipalities nominate a higher

number of male candidates and a smaller number of female candidates in cycle 4 (columns 1-3), especially in pivotal positions in the ballot (columns 4-9). However, the initial counteraction in the ward arm is reversed already from cycle 5.

V MECHANISMS

The evidence provided so far indicates that parties react to more stringent quota requirements in the PR arm by reducing the number of female ward candidates immediately after the reform, particularly in ballot positions with higher chances of election. From cycle 5, however, parties in treatment municipalities increase the number of female ward candidates until they nominate *more* of them by the last cycle than parties in control municipalities.

These results may stem from any of the three groups of agents involved: potential candidates, voters, and parties. First, this pattern might be driven by a change in the pool of potential candidates available to parties. Second, parties might be responding to a shift in voter preferences. Exposure to female politicians might diminish anti-female voter bias, inducing parties to nominate more female candidates. Third, being exposed to women might change parties' nomination strategy in favor of women.

We argue in this section that the most plausible explanation is the third. Table VIII provides an overview of our reasoning.

We start by excluding non-party drivers, as we do not find evidence that more or better women are newly available or that voter preferences for women increase. We do find that the treatment offers an incumbency advantage to more women among those already in the candidate pool. Moreover, we show that the effect spillovers also to rookie women with no councilor experience. Guided by the predictions of a dynamic model of statistical discrimination, we show that this is consistent with parties initially selecting a sub-optimally low number of women due to a lack of information and biased beliefs about women's competence. In this context, the quota forces parties to experience women, improving their expectations about the competence of female candidates, even those never experienced before. We conclude this section by exploring alternative mechanisms that would have generated a similar pattern of initial counteraction and reversal, such as a lack of available women initially and an increase in women's power within the party.

Table VIII - Paper Summary

Main Results	
• Direct effect of quota	
⇑ female PR cand. & councilors	Tab V, VI
• Initial counteraction followed by gradual reversal	
⇓ female ward cand. & councilors → ⇑ female ward cand. & councilors	Tab V, VI
(cycle 4) (from cycle 5 onwards)	
Mechanisms	
① Supply of women: more or better women newly available for nomination? ✘	
- Gender gap in cand. background characteristics unaffected	Sec V.A
② Voters: voter preference for women ⇑? ✘	
- Gender gap in vote shares unaffected	Sec V.A
③ Parties: change in candidate nomination strategy	
• More females with incumbency advantage? ✔	
- Strong ⇑ in incumbent female ward candidates	Tab IX
- Female winners in close PR elections get renominated in ward arm in next election	Tab X
• Beyond incumbent women: weakening discrimination against women as a group? ✔	
- ⇑ rookies female ward candidates, not only incumbents	Tab IX
- Parties that won a quota woman nominate more female rookies in later elections	Tab X
- Overall trend: women's selection threshold higher than men's. Gap ⇓ over time	Fig III
Sources	
▶ Taste-based discrimination ✘	
- ⇑ female cand. in competitive wards, contrary to model prediction for ⇓ distaste	Tab XI
▶ Statistical discrimination: information matters ✔	
- Quota women are rookies, who bring new info about quality of women	Tab XII
- Counteraction & reversal stronger where info is scarce (no women pre-quota)	Tab XIII
▶ Statistical discrimination: biased beliefs on women's competence ✔	
- ⇑ in female ward cand. stronger where first women are more educated	Tab XIV
• Women's power within party ⇑? ✘	
- Possible but limited, because female cand. do not ⇑ in stronghold wards	Tab XI

Note: Summary of the main messages of the current paper. The check (cross) marks a mechanism that we find (do not find) support for. We provide brief explanations and indicate where the evidence can be found.

V.A Non-party drivers: supply of women and voter preferences

Change in the supply of women As a result of the quota, more women might have decided to come forward as potential candidates. Indeed, the female councilors introduced by the quota might have served as role models, affecting women's political ambition, risk aversion, or expectations on the probability of success or the cost of entering the profession.

A change in the pool of women relative to the pool of men may trigger parties to select a different gender composition of candidates.

While role modeling might take place overall, it does not appear to be occurring differently *above and below the threshold*. We do not observe the entire pool of potential candidates, so we cannot test this directly. Yet, if there is a change in the pool we would also detect a change among the characteristics of nominated candidates. Whether the pool of women saw an increase in quality on average or merely expanded while maintaining average quality, parties would be able to choose a larger number of qualified females from the top distribution of the pool. Empirically, however, we do not see a differential change in the characteristics of female candidates in treated compared to control municipalities. Table B.8 presents the results of an individual-level version of equation (1) with various measures of education and political experience as dependent variables.[27] Treatment status does not affect the gender gap in candidates' education or political experience; the coefficient of the interaction between the treatment dummy and the female dummy is never statistically significantly different from zero. Hence, the gender gap in characteristics directly related to the quality of candidates does not evolve in a systematically different way between treatment and control municipalities.

Change in voter preferences for women The observed gradual increase in the number of female candidates could be explained by parties responding to a change in voter preferences for women. Voters might be the ones learning about women's competence, or they might increase their taste for women after experiencing female councilors. Then parties could adapt their nomination strategy towards females to trail voter preferences, for electoral success.

To test this hypothesis, we follow Esteve-Volart and Bagues (2012) and compare the gender gap in votes received by ward candidates in treated and control municipalities over time. Ward candidates run as individuals, unlike PR candidates. Therefore, voter preferences for women would manifest as higher vote shares won by female ward candidates relative to comparable male contenders.

We estimate an individual-level version of equation (1) with the vote share a ward candidate obtained as the outcome variable. Columns 1-5 of Table B.9 show that coefficients on the treatment dummy interacted with the female dummy are statistically insignificant,

[27] The regression specification is in Appendix Section D.4.

even as we gradually add controls for individual characteristics (age, education, political experience, incumbency status) and electoral conditions (position on ballot, number of competitors). There is no evidence of a treatment effect on the gender gap in vote share both immediately after the quota and over time. The only scenario where voter preferences drive our main results but do not show up in vote shares is if parties can align their nomination strategy with voter preferences *perfectly* – nominate just the right number of females in the right positions. However, we negate this possibility as there *is* a gender gap in vote shares on the whole, from the statistically significant coefficients on the female dummy.

V.B Parties' strategies: beyond incumbency advantage

Having rejected the non-party drivers, we next turn to the nomination strategy of political parties. We find more women gaining incumbency advantage – a direct effect of the treatment – to be an important channel driving the increase in female candidates in the ward arm. The quota gets PR women elected, which, combined with a no-re-election norm in the PR arm (Shin, 2014), grants them access to the ward arm. When we divide ward candidates

Table IX - Treatment Effect on Incumbent and Rookie Ward Candidates

	Main political parties					
	Incumbent ward candidates			Rookie ward candidates		
	Male	Female	Female	Male	Female	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Treat in cycle 4 × Cycle 4	0.63	-0.00	-0.09	0.67	-0.27	-0.32**
	(0.40)	(0.13)	(0.12)	(0.62)	(0.17)	(0.15)
Treat in cycle 4 × Cycle 5	1.06***	0.47***	0.25	-0.80	0.02	0.11
	(0.38)	(0.17)	(0.16)	(0.59)	(0.16)	(0.14)
Treat in cycle 4 × Cycle 6	0.84**	0.62***	0.41**	-0.38	0.16	0.19
	(0.38)	(0.21)	(0.19)	(0.49)	(0.18)	(0.16)
Treat in cycle 4 × Cycle 7	-0.08	0.79***	0.69***	-0.50	0.38*	0.40*
	(0.40)	(0.20)	(0.19)	(0.52)	(0.21)	(0.20)
Running variable form	ward	ward	ward	ward	ward	ward
N	864	864	864	864	864	864
N. relevant ward candidates	No	No	Yes	No	No	Yes

Note: This table reports the effect of being above the threshold on the gender composition of ward candidates. The sample includes bins 1 and 2 and is restricted to the two main parties. The outcome variable is the number of ward candidates in each municipality, by gender and incumbency status – whether they were elected in at least one previous election. In columns 3 and 6, we control for the total number of incumbent and rookie ward candidates, respectively, to get at the effect on the female share. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

by incumbency status (Table IX), parties do nominate more incumbent women in the ward arm over time (columns 1-3).[28]

However, the treatment effects go beyond incumbent women. Parties also start nominating more rookie women over time in the ward arm (columns 4-6), and statistically significantly so by the last election cycle (p-value=0.053 for cycle 7 in column 6).

These aggregate patterns at the municipality level can be traced back to parties experiencing more "quota" women in action in treatment municipalities. To demonstrate this, we conduct a complementary analysis of close electoral races at the *party* level. We compare the nomination strategies of parties that marginally won or lost the election of their first – and therefore female – PR candidate in the previous election cycle. This comparison gives us the causal effect of having a "quota" woman from your own party elected.[29]

The results are reported in Table X. Column 2 shows that the probability the number-1 PR candidate in cycle $t-1$ is renominated as a ward candidate in cycle t is significantly higher if she gets elected in $t-1$. The renomination of the elected PR woman contributes to the higher female share of ward candidates of the winning party (column 1). It is evident that parties factor in incumbency advantage during ward candidate selection.

However, when we look at the dynamic cumulative effects of marginally winning the first PR candidate in cycle 4, we can see that the incumbency effect does not persist (columns 6-8). The probability of her renomination decreases and becomes statistically insignificant in cycle 6, and drops to zero in cycle 7.[30] Instead, the positive cumulative effect on the female share of ward candidates in cycle 7 (column 5) is driven by a gradually increasing female share among rookies (columns 9-11). Parties that randomly experience a quota woman in action gradually nominate more female rookies.

Recall that these positive spillovers on rookie females cannot be explained with more and better women becoming newly available, given the evidence in Section V.A. In the following sections, we argue that they are better explained by an improvement in parties' perception of the competence of women in general, after exposure to women.

[28] A candidate or councilor is an incumbent if they have been elected in at least one previous election.

[29] In close electoral races, the outcome is typically determined by factors beyond the control of parties and candidates, making the result effectively random (Lee, 2008). Details on the estimation strategy can be found in appendix F.

[30] This aligns with the limited re-candidacy pattern in the overall sample. 85% of individuals run in a maximum of three elections, three-quarters of whom run only once or twice. There is no gender difference.

Table X - The Effect of a Party's First PR Candidate Winning in Close Elections on the Party's Future Female Share of Ward Candidates

	Effect of PR1 candidate at t-1 winning on...		**Effect of PR1 candidate in cycle 4 winning on...**								
	Female share of ward candidates, t	𝟙(PR1 candidate at t-1 is renominated in ward arm, t)	Female share of ward candidates, t			𝟙(PR1 candidate in cycle 4 is renominated in ward arm, t)			Female share of rookie ward candidates, t		
	t=5,6,7	t=5,6,7	t=5	t=6	t=7	t=5	t=6	t=7	t=5	t=6	t=7
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Winner$_{t-1}$	0.16**	0.44***									
	(0.06)	(0.09)									
Winner$_{t=4}$			0.36***	0.11	0.19***	0.43***	0.18	-0.02	-0.02	0.12**	0.24***
			(0.12)	(0.07)	(0.06)	(0.11)	(0.18)	(0.06)	(0.02)	(0.06)	(0.08)
Running var.	Margin of victory at t-1		Margin of victory in cycle 4								
Bandwidth	0.088	0.185	0.069	0.140	0.125	0.282	0.191	0.140	0.092	0.133	0.123
N	145	286	41	96	102	142	120	111	52	90	98

Note: This table reports the effect of the first PR ("PR1") candidate – a woman – of a party marginally winning in close PR elections on the party's future candidate composition. The regression specification and estimation details are in Appendix F Columns 1-2 report the one-period-ahead effects, pooling all cycles. Columns 3-11 report the cumulative effects of winning in cycle 4 for each future cycle separately. Here we use the mean-squared-error-optimal bandwidth proposed by Calonico et al. (2014), but we get quantitatively similar results with the bandwidths of 0.10 and 0.15. The 0.15 bandwidth ensures a sample size of at least 92 for all columns. The regression discontinuity plots of the binned sample means of the outcome variable for columns 2 and 11 are in Figure A.4. The standard errors (in parenthesis) are clustered by municipality×party. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

V.C Parties' strategies: a dynamic model of discrimination

Our empirical evidence is guided by the predictions of a model of electoral competition featuring discrimination. We innovate from Le Barbanchon and Sauvagnat (2022)'s model of electoral competition by enriching the candidate selection process and adding in the aspect of candidate allocation to different election wards. Moreover, we allow for two types of discrimination, taste-based discrimination and statistical discrimination. There is no room for statistical discrimination in Le Barbanchon and Sauvagnat (2022), as they assume perfect information about the ability of potential candidates. In modeling statistical discrimination, we extend standard models (Aigner and Cain, 1977) with a dynamic process of belief updating. Dynamic models of statistical discrimination with biased beliefs have been proposed by e.g. Bohren et al. (2019) and Fryer (2007). However, differently from these models, in our model belief updating occurs not just about the individual but also about the group.

Setup Consider party $p \in \{L, R\}$ in a municipality with constituent wards $1, ..., W$. Party ideology I_p is fixed. The two parties participate in the ward and the PR election arms in election cycle t. For simplicity, we assume that each party has only one ward candidate position in each ward and one PR candidate position on the PR party list. A party selects candidates from a group of potential candidates and allocates them to different candidate positions. Potential candidate i is characterized by their gender $g \in \{m, f\}$ and their competence a_i:

$$a_i \sim N(\mu_g, \sigma^2)$$

where μ_g is the mean ability of gender g.

Parties have imperfect information regarding the competence of a new potential candidate. Their true competence is only revealed if they get elected and serve as councilors. However, at the time of candidate selection, parties observe a signal of competence:

$$s_i = a_i - \mu_g + \epsilon_i, \quad \epsilon_i \sim N(0, \sigma_s^2)$$

$E(s_i) = 0$, so the signal is informative about the *relative* competence of i within gender g.

Party's beliefs at candidate selection Parties have imperfect information not only on the ability of individual candidates but also on the group mean ability, μ_g.[31] A party's prior belief about the value of μ_g, before the election in election cycle t, follows a normal distribution with mean $\tilde{\mu}_{g,t}$, variance $\tilde{\sigma}^2_{g,t}$.

For a potential candidate i with signal s_i, the party expects i's ability to be

$$\tilde{E}(a_i|s_i, g, t) = \tilde{\mu}_{g,t} + \frac{\sigma^2}{\sigma_s^2 + \sigma^2} s_i$$

where $\tilde{E}$ indicates expectation taken over the prior distribution. Statistical discrimination against women implies that for a man and a woman with the same signal s_i, his perceived ability is higher than hers: $\tilde{E}(a_i|s_i, m, t) > \tilde{E}(a_i|s_i, f, t)$.

Party's problem In election cycle t, party p nominates candidates to win as many seats as possible, but it also cares about the gender ratio among its candidates. From what follows, we denote the PR arm as ward "0" for notational convenience. Party p maximizes[32]

$$U_p = \mathbb{E}\left(\sum_{w=0}^{W} V_{p,w}\right) - b\left|\frac{1}{W+1}\sum_{w=0}^{W} F_{p,w} - f_p^*\right|$$

where $V_{p,w}$ is an indicator for party p winning the seat in ward w, $F_{p,w}$ is an indicator for party p's candidate in ward w being female, f_p^* is party p's desired female share among its candidates, and b regulates how much the gender ratio matters for the party relative to winning seats. Taste-based discrimination against women implies a low f_p^*. If $b = 0$, then gender does not factor into the candidate nomination strategy.

Voters vote according to party ideology and councilor quality. We assume that voters have single-peaked preferences for candidates such that the Median Voter Theorem holds. To fix ideas, consider party R. The median voter in ward w with ideology I^w gets the following utility if party R's candidate with ability a_i wins:

$$U_{R,w} = a_i - |I^w - I_R| - \delta_w$$

[31] Note that the signals are not informative about the value of μ_g because they provide information on only the *relative* ability within gender. Hence, the party cannot find out about the average ability of each gender g from the set of signals of the potential candidates.

[32] Subscript t is omitted for notational convenience because candidate nomination is a static problem.

where $\delta_w \sim N(0,1)$ is the relative voter preference shock for party L, unforeseen at the time of candidate nomination. For the PR arm, I^0 is the ideology of the median voter in the whole municipality.

We assume party R takes the probability of winning in ward w with candidate i to be[33,34]

$$\mathbb{E}(V_{R,w}) = \Phi\left(\tilde{E}(a_i|s_i,g,t) - A_{L,w}\underbrace{-|I^w - I_R| + |I^w - I_L|}_{\equiv R_w\text{(popularity of party } R)}\right)$$

where Φ denotes the cumulative distribution function of the standard normal distribution, and $A_{L,w}$ is party R's expectation of the ability of the party-L candidate in ward w. High R_w indicates that w is party R's stronghold.

Note here that $\frac{\partial^2 \mathbb{E}(V_{R,w})}{\partial \tilde{E}(a_i|s_i,g,t)\partial|R_w|} < 0$. Candidate competence increases the likelihood of victory, but more so in competitive wards and less so in strongholds or weakholds.

Party learning Once candidate i is elected and serves as councilor, the party learns about their competence. We assume for simplicity that learning is complete and the true competence of the candidate $\mathbf{a} = \{a_i\}$ is revealed.[35]

Given the observed abilities, the party also learns about the average ability of each gender μ_g. The party makes an inference about the value of μ_g via maximum likelihood, considering that these councilors were positively selected with signals $\mathbf{s} = \{s_i\}$. Put simply, the party solves, "What must μ_f be for females with signals $\mathbf{s}$ to have true abilities $\mathbf{a}$?"

The maximum likelihood estimator, derived in Appendix E.1, is

$$\hat{\mu}_g = \frac{1}{n}\sum_{i=1}^{n}\left(a_i - \frac{\sigma^2}{\sigma_s^2+\sigma^2}s_i\right) \sim N\left(\mu_g, \frac{1}{n}\left(\frac{\sigma^2\sigma_s^2}{\sigma_s^2+\sigma^2}\right)^2\right) \tag{2}$$

[33]We assume the party believes that voters assess the expected competence of candidate i in the same way as it does. However, it suffices for all our model implications that the party believes that voter beliefs on the competence of candidates are *increasing* in party beliefs.

[34]For simplicity we assume that the party assesses the likelihood of winning by taking the perceived ability of candidate i as fixed. Model predictions are qualitatively the same if we instead had $\mathbb{E}(V_{R,w}) = \tilde{E}\left[\Phi\left(a_i - A_{L,w} - |I^w - I_R| + |I^w - I_L|\right)|s_i,g,t\right]$.

[35]This assumption could be relaxed. An extension of the model with imperfect belief updating regarding a councilor's competence can be found in Appendix E.2. In this extension, learning about women's mean ability is faster if a new female councilor is from your own party. This extension explains the result in Table X where parties that marginally won a quota woman nominate more rookie females in later elections than parties that marginally lost.

Call $V = Var(\hat{\mu}_g)$. Then, the posterior distribution about the value of μ_g is normal with mean $\tilde{\mu}_{g,t+1}$ and variance $\tilde{\sigma}_{g,t+1}$, which are weighted averages of the prior and the maximum likelihood estimator:

$$\tilde{\mu}_{g,t+1} = \frac{V\tilde{\mu}_{g,t} + \tilde{\sigma}^2_{g,t}\hat{\mu}_g}{V + \tilde{\sigma}^2_{g,t}}, \quad \tilde{\sigma}^2_{g,t+1} = \frac{V\tilde{\sigma}^2_{g,t}}{V + \tilde{\sigma}^2_{g,t}}$$

The updating speed of party beliefs about the value of μ_g is given by

$$\tilde{\mu}_{g,t+1} - \tilde{\mu}_{g,t} = \frac{\tilde{\sigma}^2_{g,t}}{V + \tilde{\sigma}^2_{g,t}}(\hat{\mu}_g - \tilde{\mu}_{g,t})$$

Timing in election cycle t, nature first determines the group of potential candidates available to each party, and parties only know about their own groups. Then the two parties play a simultaneous game: to select candidates, based on their beliefs on the mean ability by gender ($\tilde{\mu}_{g,t}$) and the within-gender competence signals ($\{s_i\}$), and to allocate them to wards $1, ..., W$ and the PR arm. Next, the relative voter preference shock δ_w is realized, and voters vote. The true competence of each elected councilor ($\{a_i\}$) is revealed during their term. Based on this, the parties update their beliefs on the mean group ability to $\tilde{\mu}_{g,t+1}$.

Party's selection of candidates The party nominates candidates taking into account the value of $\tilde{E}(a_i|s_i, g, t)$. Within gender, it chooses the potential candidate with the highest value of s_i first, then moves on to the one with the next highest value of s_i, etc.

For simplicity of exposition, we consider the scenario where the Nash equilibrium allocation of candidates is for each party to place the most competent candidate in the most competitive ward, the second-most competent candidate in the second-most competitive ward, etc.[36] The intuition is that candidate competence increases the likelihood of victory disproportionately more in more competitive wards.

To describe the candidate selection strategy more clearly, we make an innocuous tweak that circumvents the randomness of the draws of potential candidates. Instead of selecting $W + 1$ candidates from the group of potential candidates already drawn, parties choose the minimum signal threshold for each gender $\bar{s}_g$, and $W + 1$ candidates are drawn randomly

[36]The conditions underlying this Nash equilibrium are formally described in Appendix E.3.

from the parts of the signal distribution above $\bar{s}_g$. The female share of candidates is then $\frac{1-\Phi\left(\bar{s}_f/(\sigma^2+\sigma_s^2)\right)}{2-\Phi\left(\bar{s}_f/(\sigma^2+\sigma_s^2)\right)-\Phi(\bar{s}_m/(\sigma^2+\sigma_s^2))}$.[37]

Here we formalize how parties select candidates, and illustrate it diagrammatically in Appendix E.5:

- [**Only statistical discrimination**] If $b = 0$, a party selects the most competent $W+1$ individuals, regardless of gender. Hence, the marginal male and marginal female candidates have the same perceived ability: $\tilde{E}(a_i|\bar{s}_m, m, t) = \tilde{E}(a_i|\bar{s}_f, f, t)$. If men are perceived to have a higher mean ability than women, i.e. $\tilde{\mu}_{m,t} > \tilde{\mu}_{f,t}$, then the marginal female candidate has a higher signal than the marginal male candidate: $\bar{s}_f > \bar{s}_m$. Call the female share in this benchmark case $f^{benchmark}$.

- [**Both taste-based and statistical discrimination**] If $b > 0$ and $f^{benchmark} > f_p^*$, a party selects a smaller female share than $f^{benchmark}$. There is a trade-off between gender preference and candidate competence. A party nominates some male candidates even if they have a lower perceived ability than the marginal female candidate: $\tilde{E}(a_i|\bar{s}_m, m, t) < \tilde{E}(a_i|\bar{s}_f, f, t)$. The gap in the signals of the marginal female and male candidates ($\bar{s}_f - \bar{s}_m$) is higher than in the benchmark case.

Evidence on model assumptions Two features of the model are critical. The first is that voters care about councilor competence. This assumption is important because parties do not have an incentive to select competent candidates otherwise. We show in Appendix Table E.1 that indeed, candidates with high education levels and prior political experience get higher vote shares in practice. The second is that parties place competent candidates in more competitive wards – a model implication that follows from parties caring about winning seats as opposed to, say, ensuring that competent candidates get elected. It is important as it allows us to reject taste-based discrimination as a driver of party responses to the quota. Appendix Figure E.1 confirms that candidate education level exhibits an inverted V-shaped relationship with party popularity in the ward, peaking in the most competitive wards, for both main parties. For more details, see Appendix section E.4.

Implications – Taste-based vs. statistical discrimination Both sources of discrimination decrease the share of female candidates and raise the minimum signal of women compared

[37]The probability a potential female candidate's signal exceeds $\bar{s}_f$ is $\Pr(s_i > \bar{s}_f) = 1-\Phi(\bar{s}_f/(\sigma^2+\sigma_s^2))$.

to men's. Taste-based discrimination does this by raising the lowest perceived ability of women a party would accept above that of men's, i.e. $\tilde{E}(a_i|\bar{s}_f, f, t) > \tilde{E}(a_i|\bar{s}_m, m, t)$. So even if the group mean abilities were perceived to be the same, $\bar{s}_f > \bar{s}_m$. Statistical discrimination does this by raising the female signal required to equate the perceived ability of the marginal man and woman; $\bar{s}_f > \bar{s}_m$ when $\tilde{E}(a_i|\bar{s}_f, f, t) = \tilde{E}(a_i|\bar{s}_m, m, t)$.

However, they do have different implications for how a party *allocates* candidates. If taste-based discrimination weakens – f_p^* increases – then the additional women will be of lower ability than the existing women and therefore would get placed in stronghold wards. On the other hand, if the quota leads parties' statistical discrimination to weaken – $\tilde{E}(a_i|s_i, F, t)$ increases – then all women (existing and additional) would get increasingly placed in more competitive wards.

Comparative statistics – Speed of belief updating When the prior belief about the group mean ability is biased down ($\tilde{\mu}_{g,t} < \mu_g$), updating toward the truth is faster

1. The larger the number of female councilors:

$$\frac{\partial(\tilde{\mu}_{g,t+1} - \tilde{\mu}_{g,t})}{\partial n} > 0$$

2. The higher the ability of female councilors encountered:

$$\frac{\partial(\tilde{\mu}_{g,t+1} - \tilde{\mu}_{g,t})}{\partial a_i} = \frac{\partial(\tilde{\mu}_{g,t+1} - \tilde{\mu}_{g,t})}{\partial \hat{\mu}_g}\frac{\partial \hat{\mu}_g}{\partial a_i} > 0$$

3. The larger the bias in the prior belief:

$$\frac{\partial(\tilde{\mu}_{g,t+1} - \tilde{\mu}_{g,t})}{\partial \tilde{\mu}_{g,t}} < 0$$

V.D Empirical corroboration: parties statistically discriminate based on biased beliefs about women's competence

The model formalizes the idea that the change in candidate selection could be explained by parties updating their expectations about women's competence as the quota forces them to experience female councilors. With so few female councilors before the quota and over 60% agreeing that men make better political leaders than women do (see Figure A.1), it

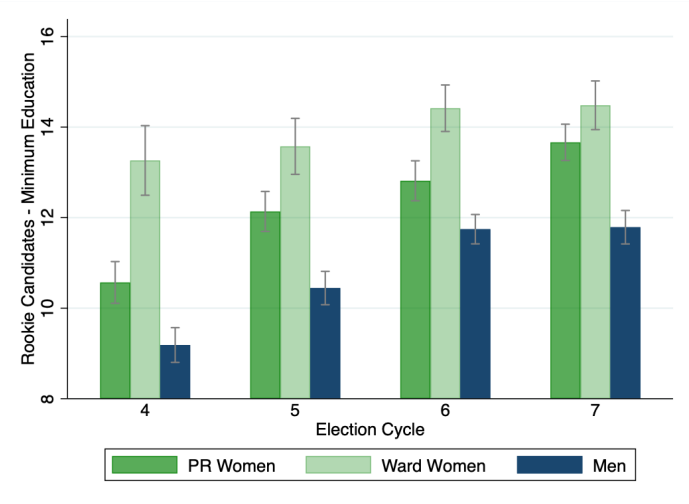
is quite likely that party leaders might have started with imperfect information and biased beliefs regarding the competence of women as politicians.

This section presents the empirical evidence that supports this hypothesis. We rule out alternative mechanisms at the end.

The discrimination framework Before we jump into interpreting the treatment effects of quotas through the model, we establish through a descriptive exercise that the discrimination framework is appropriate for studying party strategies.

The model predicts that if parties discriminate, either due to distaste or statistical discrimination, the lowest signal observed among female candidates is higher than the lowest signal among men. Following an approach widely used in the literature, we test this prediction using candidates' education as a proxy for competence.[38] Education can be seen as part of the information that composes the signal the party observes about candidates during selection.

Figure III - Minimum Education of Rookie Female and Male Candidates Across Election Cycles



Note: This figure illustrates the evolution of the education of the "marginal" (meaning last to be selected, in the lens of the model) female and male candidates over time. It plots, for each election cycle, the average years of schooling of the least educated female rookie PR candidate, female rookie ward candidate, and male rookie candidate in each municipality. The years of schooling variable is residualized for age and municipality fixed effects. The figure includes only bins 1 and 2 and candidates from the two main parties.

Figure III shows that this prediction is empirically met in the data. We plot, for each

[38]For example, Bagues and Campa (2021) and Baltrunaite et al. (2014).

election cycle, the average years of schooling of the least educated female PR candidate, female ward candidate, and male candidate in each municipality. As we want to get at parties' candidate selection strategy based on signals of quality and not incumbency advantage, we restrict the sample to rookies.[39] The years of schooling variable is residualized for age, to account for the tendency of increasing educational attainment over time, and for municipality fixed effects, to control for local culture, norms, etc, that might affect educational disparities between men and women.

In the first cycle after the introduction of the quota, the marginal woman clearly has a higher education than the marginal man ($\bar{s}_f > \bar{s}_m$). Furthermore, the education of the marginal female *ward* candidate is the highest, in line with the observed initial counteraction of the quota in the ward arm. The model predicts that when parties remove women from the ward arm, the lowest-ability ones would be removed first. Lastly, the gender gap narrows over time. Interpreted through the lens of the model, it suggests that discrimination against women is decreasing in municipal councils.

Taste-based vs. statistical discrimination We now return to the treatment effects of quotas. What is the source of the discrimination explaining our main results? Distinguishing between statistical discrimination and taste-based discrimination is challenging because both deliver observationally equivalent predictions regarding the selection of candidates in the first cycle after the introduction of the quota. Both lead to a reduction in the share of female ward candidates and an increase in the minimum signal of women compared to men. It is the dynamic response of parties across election cycles that allows us to shed light on which mechanism prevails.

The model predicts that if the quota leads parties' taste-based discrimination to weaken, the additional women will be of lower ability than the existing women and therefore would get placed in strongholds or the opposition's strongholds – where the electoral outcome is virtually determined regardless of candidate quality. On the other hand, if the quota leads parties' statistical discrimination to weaken, i.e. women's perceived ability rises, then women would get increasingly placed in competitive wards. These are wards marked by tight elections and hence, withholding the best candidates is more costly (Esteve-Volart and Bagues, 2012; Folke and Rickne, 2016). The latter is exactly what we see happening.

Table XI displays the evolution in the gender composition of candidates across different

[39]Incumbents are on average older, less educated, and mostly male.

Table XI - Treatment Effect on the Number of Female Ward Candidates by Competitiveness of Ward

	Main political parties											
Ward type:	Stronghold			Competitive			Weakhold			Non-competitive (Stronghold + Weakhold)		
Position on ballot:	All Female	Useful Female	Rank 1 Female	All Female	Useful Female	Rank 1 Female	All Female	Useful Female	Rank 1 Female	All Female	Useful Female	Rank 1 Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Treat in cycle 4 × Cycle 4	-0.01	-0.08	-0.05	-0.02	-0.05	-0.03	-0.06	-0.09	-0.10*	-0.08	-0.16**	-0.14**
	(0.06)	(0.05)	(0.04)	(0.07)	(0.07)	(0.06)	(0.06)	(0.06)	(0.05)	(0.08)	(0.07)	(0.06)
Treat in cycle 4 × Cycle 5	0.03	0.01	0.04	0.18**	0.13*	0.12*	0.04	0.04	0.06	0.07	0.05	0.10
	(0.05)	(0.04)	(0.04)	(0.09)	(0.08)	(0.07)	(0.05)	(0.05)	(0.05)	(0.08)	(0.07)	(0.07)
Treat in cycle 4 × Cycle 6	0.05	-0.00	0.00	0.24**	0.21**	0.17**	0.03	0.03	0.02	0.08	0.03	0.02
	(0.05)	(0.04)	(0.03)	(0.10)	(0.09)	(0.08)	(0.05)	(0.05)	(0.04)	(0.07)	(0.07)	(0.06)
Treat in cycle 4 × Cycle 7	0.08	0.02	0.01	0.42***	0.36***	0.32***	0.03	0.00	-0.02	0.11	0.02	-0.01
	(0.05)	(0.04)	(0.04)	(0.12)	(0.11)	(0.10)	(0.07)	(0.06)	(0.05)	(0.09)	(0.07)	(0.07)
Running variable form	ward	ward	ward	ward	ward	ward	ward	ward	ward	ward	ward	ward
N	1551	1551	1551	1551	1551	1551	1551	1551	1551	1551	1551	1551
N. relevant ward candidates	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the effect of being above the threshold on the female share of ward candidates in different wards. The regression specification is given by equation (1). Wards are divided into stronghold, competitive, and weakhold wards based on the party's margin of victory in the PR arm of the latest election (see notes under Figure E.1 for how it is calculated). Stronghold, competitive, and weakhold wards correspond to margins of victory of ≥ 0.05, $[-0.05, 0.05)$, and < -0.05, respectively, closely approximating the top quarter, middle half, and the bottom quarter. The results are qualitatively similar when we use the cutoffs of ± 0.10. The sample includes bins 1 and 2 and is restricted to the two main parties. The level of observation is municipality×party. The outcome variable is the number of female ward candidates in each type of ward, and we control for the total number (male+female) of relevant ward candidates to get at the effect on the female share. The columns for "Useful" and "Rank 1" (defined under Table VII) represent increasingly high-up positions on the ballot paper, implying higher likelihoods of winning. We control for the number of wards of each type for the party in the municipality, the municipality-average margin of victory for the party, and party dummies. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

types of wards – stronghold, competitive, and weakhold – based on the party's margin of victory in the PR arm of the latest election (the National Assembly election, 2 years before each municipal council election). The three ward types closely approximate the top quarter, middle half, and bottom quarter of the margin of victory.[40] As the ward categorization depends on the party at hand, we estimate equation (1) at the municipality×party level. We also control for variables relevant to the party when allocating candidates across wards: the number of wards of each type, and the average margin of victory for the party in the municipality.[41]

We confirm that the party's counteraction to the quota in cycle 4 conforms with the model prediction that the women removed from the ward arm are of low competence and tend to be placed in non-competitive wards (columns 10-12).[42] Moreover, we can clearly see that the increase in the number of women in cycles 5-7 is concentrated in competitive wards (columns 4-6). This suggests that a reduction in taste-based discrimination is not able to reconcile the reversal in party strategies across election cycles. They are consistent with a reduction in statistical discrimination instead.[43] In the following sections we present additional evidence supporting this hypothesis.

Statistical discrimination: lack of information Statistical discrimination is directly tied to information; there would be no statistical discrimination with perfect information on ability. We show in this section that the reversal of parties' strategies in treated municipalities can be traced back to quotas bringing in new information on women's competence. This idea corresponds to the model prediction that the reversal in strategies happens faster the greater the number of newly elected female councilors (comparative static 1).

First, we show that the quota is effective in promoting the election of a higher number of rookie female councilors in treated municipalities, exposing parties to new information about women's competence as political leaders. Table XII looks at the effect of being

[40] Stronghold, competitive, and weakhold wards correspond to margins of victory of ≥ 0.05, $[-0.05; 0.05)$, and < -0.05, respectively.

[41] The results are similar when these controls are removed.

[42] This model prediction is also consistent with the initial counteraction being concentrated among rookie females, a result reported in Table IX (column 6). If parties have downward-biased beliefs regarding women's ability, the expected ability of rookie females would tend to be lower than the revealed true ability of previously elected incumbent females.

[43] Beaman et al. (2009) find a similar lack of change in (dis)taste for women as a result of reserving seats for women in India. Deep preferences and social norms remain difficult to erode, while beliefs on effectiveness are much more malleable.

above the threshold on the number of elected rookie and incumbent female councilors in the two arms. We can see that the additional women elected through the PR arm in treated municipalities are predominantly rookie women. In fact, up until cycle 5, these additional women are solely rookie women. As a consequence, despite parties' counteraction of the quota resulting in a lower number of female rookie ward councilors (column 4) in cycle 4, the *total* number of female rookie councilors in treated municipalities is higher overall (column 6), even if not significantly so. Hence, the quota exposed parties to new female politicians in action.

Table XII - Treatment Effect on Incumbent and Rookie Female Councilors

	Main political parties					
	Incumbent councilors			Rookie councilors		
Election arm:	Ward Female	PR Female	All Female	Ward Female	PR Female	All Female
	(1)	(2)	(3)	(4)	(5)	(6)
Treat in cycle 4 × Cycle 4	-0.10	0.00	-0.16	-0.23*	0.43***	0.18
	(0.11)	(0.02)	(0.13)	(0.12)	(0.11)	(0.20)
Treat in cycle 4 × Cycle 5	0.13	0.02	0.08	0.12	0.40***	0.49**
	(0.14)	(0.02)	(0.16)	(0.13)	(0.10)	(0.20)
Treat in cycle 4 × Cycle 6	0.41**	-0.00	0.34*	0.08	0.68***	0.74***
	(0.18)	(0.02)	(0.19)	(0.14)	(0.10)	(0.20)
Treat in cycle 4 × Cycle 7	0.39**	-0.00	0.31*	0.38**	0.62***	1.00***
	(0.17)	(0.02)	(0.18)	(0.18)	(0.10)	(0.23)
Running variable form	ward	council	council	ward	council	council
N	864	862	865	864	862	865
N. relevant councilors	Yes	Yes	Yes	Yes	Yes	Yes

Note: This table reports the effect of being above the threshold on the female share of incumbent and rookie councilors. The regression specification is given by equation (1). The sample includes bins 1 and 2 and is restricted to the two main parties. The outcome variable is the number of female ward and PR councilors in each municipality, by incumbency status – whether they were elected in at least one previous election. We control for the total number (male+female) of relevant councilors to get at the effect on the female share. The number of observations is lower in some columns because in some municipalities parties participate in only one arm. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Second, we document that the municipalities with a greater scarcity of information about women are those that display the initial counteraction and a stronger subsequent update in strategies. In Table XIII, we look at heterogeneous treatment effects by whether female councilors were ever present before the quota. Comparing columns 1-2 to columns 3-4, we see that parties substitute away from females in the unregulated arm in cycle 4 only in municipalities with no female councilors before the quota. The counteraction is not present, even among rookies, in municipalities that already had female councilors pre-

quota. Furthermore, only these municipalities display a significant and steady change in candidate selection from cycle 5 onward.

Table XIII - Treatment Effect on the Number of Female Ward Candidates by Presence of Women Before the Quota

	Main political parties			
Had female councilors before quota?	No		Yes	
Incumbency status:	All Female	Rookie Female	All Female	Rookie Female
	(1)	(2)	(3)	(4)
Treat in cycle 4	-0.44*	-0.33*	0.59	0.11
	(0.23)	(0.17)	(0.58)	(0.33)
Treat in cycle 4 × Cycle 5	0.81***	0.39**	0.57	0.48
	(0.20)	(0.15)	(0.34)	(0.32)
Treat in cycle 4 × Cycle 6	0.85***	0.42**	1.10**	0.57*
	(0.29)	(0.20)	(0.52)	(0.31)
Treat in cycle 4 × Cycle 7	1.79***	0.74***	0.27	0.31
	(0.39)	(0.25)	(0.55)	(0.45)
Running variable form	ward	ward	ward	ward
N	649	649	215	215
N. relevant ward candidates	Yes	Yes	Yes	Yes

Note: This table reports the effect of being above the threshold on the number of female ward candidates. The regression specification is given by equation (1), except that we replace (Treat in cycle 4)×(Cycle 4) with (Treat in cycle 4) to highlight the change in the treatment effect in cycles 5-7 relative to the effect in cycle 4. The sample includes bins 1 and 2 and is restricted to the two main parties. We divide municipalities into two groups depending on whether at least one woman was elected in the municipality before the introduction of the quota. We control for the number of relevant ward candidates (either all or rookie) to get at the effect on the female share. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Statistical discrimination: biased beliefs New information about women can reduce statistical discrimination in two ways. Firstly, it can correct downward-biased beliefs about women's competence. Secondly, even if beliefs are accurate and women are truly less competent than men on average, it can weaken statistical discrimination by reducing the noisiness of signals of ability. The perceived ability of candidate i is higher if σ_s^2 is lower.[44]

In this section, we present evidence demonstrating the existence of downward-biased beliefs, which are updated toward the truth in response to the quota. Once again, we use candidates' education as a proxy for competence, and it is the parties' follow-up, not initial, responses that shed light on the nature of the discrimination against women.

We show that not only the number of women but also the competence of the women

[44]Conditional on $s_i > 0$, which it will be since candidates are positively selected.

experienced matters. Table XIV displays the results of a heterogeneity analysis by the quality of the first female PR councilors. We divide municipalities into two groups by whether the average years of schooling of the cycle-4 PR women was above or below the median of all municipalities, and track the evolution of the treatment effect after cycle 4. We find that the shift towards female ward candidates takes off faster and is stronger when the first elected PR women are more educated (column 3). This is also confirmed when we add controls to ensure that differences in the treatment effect over time are not due to pre-existing disparities in the available pool of women (column 4).

This is a key piece of evidence supporting the presence of biased beliefs. Indeed, if experiencing new women solely reduces the noisiness of the signal, it would happen irrespective of ability. This contrasts with our result that the strength and speed of the shift toward female candidates depends on the competence of the first experienced women. The model prediction matching this result is comparative static 2: belief updating toward the truth is faster when more able women are encountered.

Table XIV - Treatment Effect on the Number of Female Ward Candidates by the Quality of the First Female PR Councilors

	Main political parties			
Education of the first PR women:	Below median		Above median	
	Female	Female	Female	Female
	(1)	(2)	(3)	(4)
Treat in cycle 4 × Cycle 5	-0.15	-0.01	0.77**	0.78**
	(0.43)	(0.42)	(0.33)	(0.32)
Treat in cycle 4 × Cycle 6	0.18	0.33	0.89**	0.90**
	(0.44)	(0.40)	(0.40)	(0.39)
Treat in cycle 4 × Cycle 7	0.73	0.87*	1.06**	1.06***
	(0.53)	(0.47)	(0.43)	(0.39)
Running variable form	ward	ward	ward	ward
N	273	273	266	266
N. ward candidates	Yes	Yes	Yes	Yes
Characteristics of cycle 4 female candidates	No	Yes	No	Yes

Note: This table reports the effect of being above the threshold on the female share of ward candidates. The regression specification is given by equation (1). We divide municipalities into two groups by whether the average years of schooling of the PR women elected in the municipality in cycle 4 are above or below the median. Columns 2 and 4 control for i) the number of, and ii) the average years of schooling of, all female candidates from the two main parties in cycle 4, to net out any pre-existing disparities in the available pool of women. The sample includes bins 1 and 2 and cycles 5-7 and is restricted to municipalities with female PR councilors from main parties in cycle 4 on whom we have education information. We control for the number of ward candidates to get at the effect on the female share. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

V.E Alternative mechanisms

Difficulty in finding qualified women An alternative explanation for the initial counteraction to quotas that is unrelated to statistical discrimination is a shortage of qualified women. A party that is short on women to choose candidates from might have to move women from the ward arm to the PR arm just to fulfill the quota requirements.

If this was true, we should find evidence that parties in treatment municipalities have greater trouble finding female candidates. To test this hypothesis, we define a party as "unconstrained" in female candidate choice if it nominates strictly more female candidates in the PR arm than the quota requirement.[45] The statistically insignificant coefficients in Table B.10 show that parties above the threshold are not more constrained in finding women, particularly in cycle 4.

Women becoming more powerful The faster growth of women in treatment municipalities may also be due to a compounding effect, where an initial (small) increase in women strengthens their power in the candidate nomination process and further brings in more women. This might occur in different ways. For example, a growing number of lab and field experiments provide evidence that group composition affects women's perceived expertise, influence, and willingness to take on leadership roles (Coffman, 2014; Bordalo et al., 2019; Born et al., 2020; Karpowitz and Stoddard, 2021; Dupas et al., 2021; Miller and Sutherland, 2021). Alternatively, gender quotas can expand the supply of qualified women available for leadership positions (O'Brien and Rickne, 2016).

Although we cannot completely rule out this mechanism, the evidence is not consistent with it being the *main* reason for the change in party strategies over time. Columns 6-8 of Table X reveal that the quota women of cycle 4 do not remain in councils for long; winning women of cycle 4 do not re-run any more than losing women, 3 cycles later. In fact, re-candidacy is limited to 1-2 times across the overall sample, regardless of gender.[46] It is therefore unlikely that these women rise through the ranks and consolidate female power.

Moreover, as discussed in Section IV.C, the increase in the number of women is concentrated in competitive wards where the chance of election is uncertain, rather than in strongholds. Hence, if women become more powerful across election cycles, they are not

[45] For example, the minimum number of women a party needs to include in the party list is 1 if the number of PR seats for the municipality is 1 or 2, and 2 if the number of PR seats is 3 or 4.

[46] After all, the average age of candidates is 51, and 2 terms is already 8 years.

powerful enough to alter the party objective to one that secures the election of more women.

To sum up, we argue that the initial counteraction to quotas and the subsequent reversal of political parties' nomination strategies are driven by statistical discrimination that weakens over time. This explanation matches interpretations provided by South Korean political scientists. According to Shin (2014) and Yoon and Shin (2017), parties viewed the quotas merely as a rule to comply, without any intention of making long-term commitments towards women. However, the quota managed to foster positive impacts on female representation in the long run. On top of offering women the incumbency advantage, confidence, and resources to run for election again, the quota allowed parties to revise their perceptions regarding women's capabilities as legislators. This is exemplified by the fact that only half of the women elected in the ward arm had been previously elected in PR seats by 2012.

VI Conclusion

This paper highlights that in countries where women are significantly underrepresented, a lack of information and biased beliefs about women's competence can lead parties to engage in statistical discrimination during candidate selection. This creates a vicious cycle that perpetuates the initial gender imbalance.

In such contexts, gender quotas are needed not only to ensure equal representation but also from an efficiency standpoint. If informational failures cause parties to nominate a suboptimally low number of female politicians, quotas can aid in rectifying this inefficiency. Provided that they are designed to successfully bring in qualified women, quotas offer parties an opportunity to acquire new information about women's abilities. Once the learning process takes off, the policy itself might not be needed.

The scenarios discussed in this paper are not unique. Although gender quotas in parliaments have been widely adopted globally, many countries – such as Egypt, Liberia, Mauritius, Sao Tome and Principe, Sierra Leone, and Sri Lanka – still do not have any measure in place and, unsurprisingly, have low levels of female representation in their national parliaments. The findings of this paper inform the design of quotas also in other settings such as company boards, where incumbents are similarly, if not more, male-dominated and attitudes are often male-biased (Figure A.5). Moreover, the implications of the paper are not

specific to women. On the contrary, they extend to other under-represented minorities who also suffer from a lack of information or biased beliefs.

What remains to be crystallized is exactly which aspect of women's competence parties are learning about. Is it campaigning skills, loyalty to the party, keenness as legislators, or their ability to meet the demands of the electorate? Further evidence is needed to clarify this. This paper is part of a broader research agenda aimed at understanding how gender quotas can initiate a gradual learning process in favor of women. Our future work will explore the mechanisms of this learning by examining the interactions among councilors as recorded in council meeting transcripts.

REFERENCES

Aigner, D. J. and G. G. Cain (1977). Statistical theories of discrimination in labor markets. *Industrial and Labor Relations Review 30*(2), 175–187.

Alexander, A. C. (2012). Change in women's descriptive representation and the belief in women's ability to govern: A virtuous cycle. *Politics 38; Gender 8*(4), 437–464.

Allen, P. and D. Cutts (2018). How do gender quotas affect public support for women as political leaders? *West European Politics 41*(1), 147–168.

Angrist, J. and J.-S. Pischke (2009). *Mostly Harmless Econometrics: An Empiricist's Companion* (1 ed.). Princeton University Press.

Bagues, M. and P. Campa (2021). Can gender quotas in candidate lists empower women? evidence from a regression discontinuity design. *Journal of Public Economics 194*, 104315.

Baltrunaite, A., P. Bello, A. Casarico, and P. Profeta (2014). Gender quotas and the quality of politicians. *Journal of Public Economics 118*(C), 62–74.

Beaman, L., R. Chattopadhyay, E. Duflo, R. Pande, and P. Topalova (2009). Powerful women: Does exposure reduce bias? *The Quarterly Journal of Economics 124*(4), 1497–1540.

Bhavnani, R. R. (2009). Do electoral quotas work after they are withdrawn? evidence from a natural experiment in india. *The American Political Science Review 103*(1), 23–35.

Bohren, J. A., K. Haggag, A. Imas, and D. G. Pope (2023, 09). Inaccurate Statistical Discrimination: An Identification Problem. *The Review of Economics and Statistics*, 1–45.

Bohren, J. A., A. Imas, and M. Rosenberg (2019, October). The dynamics of discrimination: Theory and evidence. *American Economic Review 109*(10), 3395–3436.

Bordalo, P., K. Coffman, N. Gennaioli, and A. Shleifer (2019). Beliefs about gender. *American Economic Review 109*(3), 739–73.

Born, A., E. Ranehill, and A. Sandberg (2020). Gender and willingness to lead: Does the gender composition of teams matter? *The Review of Economics and Statistics 0*(ja), 1–46.

Calonico, S., M. D. Cattaneo, and R. Titiunik (2014). Robust nonparametric confidence intervals for regression-discontinuity designs. *Econometrica 82*(6), 2295–2326.

Casas-Arce, P. and A. Saiz (2015). Women and power: Unpopular, unwilling, or held back? *Journal of Political Economy 123*(3), 641 – 669.

Clayton, A. (2015). Women's political engagement under quota-mandated female representation: Evidence from a randomized policy experiment. *Comparative Political Studies 48*(3), 333–369.

Coffman, K. B. (2014). Evidence on Self-Stereotyping and the Contribution of Ideas. *The Quarterly Journal of Economics 129*(4), 1625–1660.

Dahlerup, D. (1998). Using quotas to increase women's political representation. In A. Karam (Ed.), *Women in Politics: Beyond Numbers*. Stockholm: IDEA.

Dahlerup, D. (2021). Women in decision-making in public life: Types, usage, and effects of temporary special measures, including gender quotas. *Report for UN Women November, 2021*.

Dahlerup, D. and L. Freidenvall (2022, July). *Gender quotas in politics*, pp. 174–186. Routledge.

De Paola, M., V. Scoppa, and R. Lombardo (2010). Can gender quotas break down negative stereotypes? evidence from changes in electoral rules. *Journal of Public Economics 94*(5), 344 – 353.

Dupas, P., A. S. Modestino, M. Niederle, J. Wolfers, and T. S. D. Collective (2021, February). Gender and the dynamics of economics seminars. Working Paper 28494, National Bureau of Economic Research.

Esteve-Volart, B. and M. Bagues (2012). Are women pawns in the political game? evidence from elections to the spanish senate. *Journal of Public Economics 96*(3), 387–399.

Fernández, J. J. and C. Valiente (2021). Gender quotas and public demand for increasing women's representation in politics: an analysis of 28 european countries. *European Political Science Review 13*(3), 351–370.

Folke, O. and J. Rickne (2016). Electoral competition and gender differences in political careers. *Quarterly Journal of Political Science 11*(1), 59–102.

Franceschet, S., M. L. Krook, and J. M. Piscopo (2012, 03). *The Impact of Gender Quotas*. Oxford University Press.

Frandsen, B. R. (2017). *Party Bias in Union Representation Elections: Testing for Manipulation in the Regression Discontinuity Design when the Running Variable is Discrete*, Volume 38. Emerald Group Publishing Limited.

Fryer, R. (2007). Belief flipping in a dynamic model of statistical discrimination. *Journal of Public Economics*.

Fujiwara, T., H. Hilbig, and P. Raffler (2024). Biased party nominations as a source of women's electoral underperformance. Working Paper.

Galasso, V. and T. Nannicini (2011). Competing on good politicians. *The American Political Science Review 105*(1), 79–99.

Hessami, Z. and M. L. da Fonseca (2020). Female political representation and substantive effects on policies: A literature review. *European Journal of Political Economy 63*, 101896.

Hull, P. (2021, February). What marginal outcome tests can tell us about racially biased decision-making. Working Paper 28503, National Bureau of Economic Research.

Jang, G. S. (2008). Busan Provincial Council gets "Poor Report Card". *"No-cut" News*.

Jeon, J. Y. (2013). Political Dynamics of Adopting Gender Quota in Korea. *Journal of Korean Politics 22*(1), 29–52.

Joo, H. H. and J. Lee (2018). Encountering female politicians. *Journal of Economic Behavior Organization 151*, 88–122.

Karpowitz, Chris, J. P. and O. Stoddard (2021). Strength in numbers: A field experiment on gender, influence and group dynamics. IZA Discussion Paper No. 13741.

Kim, J. and K. Fallon (2023, 03). Making women visible: How gender quotas shape global attitudes toward women in politics. *Politics Gender 19*, 1–26.

Kim, S. H. (2005). Local Council Elections - "Reformed" or "Deformed"? *Pressian News*.

Krook, M. L. (2016). Contesting gender quotas: dynamics of resistance. *Politics, Groups, and Identities 4*(2), 268–283.

Le Barbanchon, T. and J. Sauvagnat (2022, 07). Electoral Competition, Voter Bias, and Women in Politics. *Journal of the European Economic Association 20*(1), 352–394.

Lee, D. S. (2008). Randomized experiments from non-random selection in u.s. house elections. *Journal of Econometrics 142*(2), 675 – 697. The regression discontinuity design: Theory and applications.

Lippmann, Q. (2021). Are gender quotas on candidates bound to be ineffective? *Journal of Economic Behavior Organization 191*, 661–678.

Local Decentralization Bureau – Election and Local Council Division (2019). Ministry of the Interior and Safety to Block “Self-Assessment" of Overseas Training for Local Councils and to Redeem Unjust Spending. Ministry of the Interior and Safety.

McCrary, J. (2008). Manipulation of the running variable in the regression discontinuity design: A density test. *Journal of Econometrics 142*(2), 698–714.

Miller, M. G. and J. L. Sutherland (2021). The effect of gender on interruptions at congressional hearings. Technical report.

Murray, R. (2008). The power of sex and incumbency: A longitudinal study of electoral performance in france. *Party Politics 14*(5), 539–554.

Norris, P. and J. Lovenduski (1995). *Political recruitment: Gender, race and class in the British Parliament*. Cambridge University Press.

O’Brien, D. Z. and J. Rickne (2016). Gender quotas and women’s political leadership. *American Political Science Review 110*(1), 112–126.

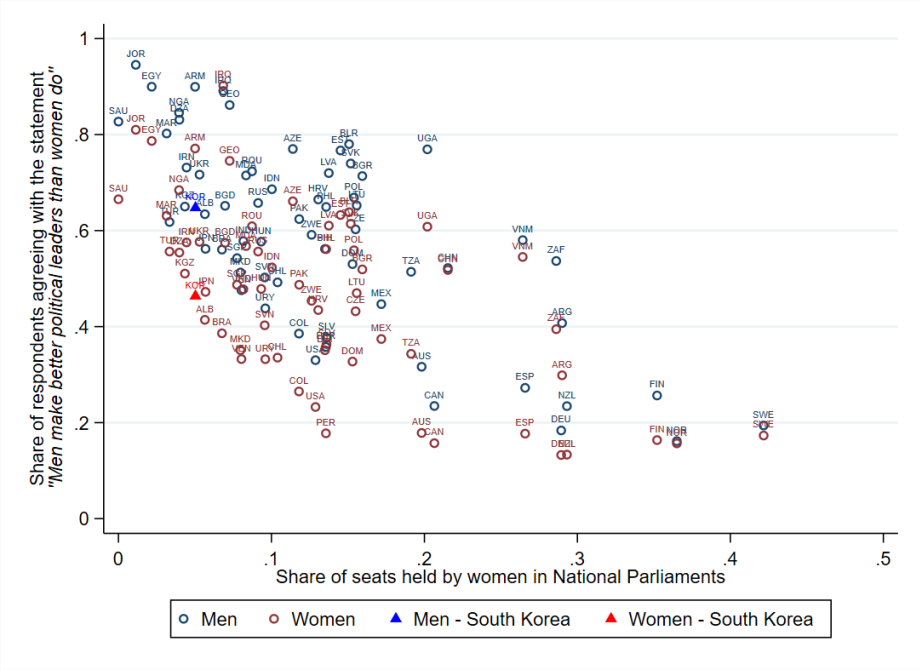
Shin, K. (2014). Women’s sustainable representation and the spillover effect of electoral gender quotas in south korea. *International Political Science Review 35*(1), 80–92.

Yoon, J. and K. Shin (2017). Opportunities and challenges to gender quotas in local politics: The case of municipal council elections in south korea. *Asian Journal of Women’s Studies 23*(3), 363–384.

Online Appendix

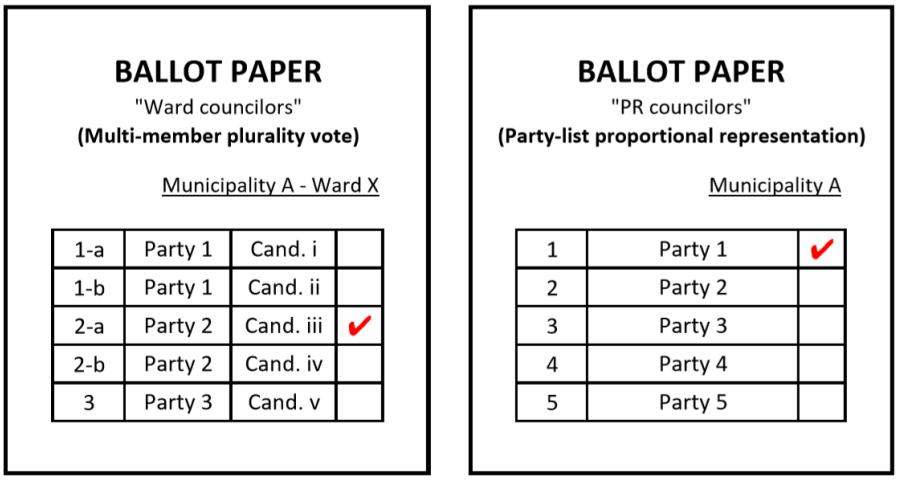
Appendix A ADDITIONAL FIGURES

Figure A.1 - Female Share in National Parliaments and Attitudes Towards Women (1995-2004)



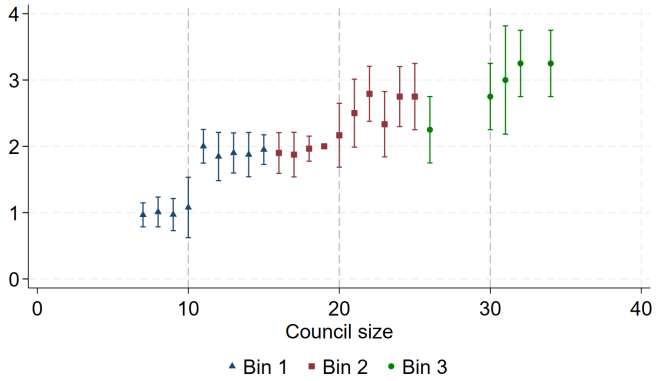
Note: The graph depicts the cross-country correlation between attitudes towards women as political leaders and female representation in National Parliaments in the period just before the introduction of the quota in South Korea (2005). On the y-axis, attitudes towards women are measured as the share of respondents (men in blue, women in red) that agree with the statement "Men make better political leaders than women do" in the World Values Survey waves 3 (1995-1998) and 4 (1999-2004). Higher values indicate attitudes more favorable towards men. The x-axis displays the share of seats held by women in National Parliaments (between 0 and 1) according to the World Bank Gender Statistics, average years 1995-2004. South Korean respondents are indicated with a triangle.

Figure A.2 - Ballot Papers in Municipal Council Elections



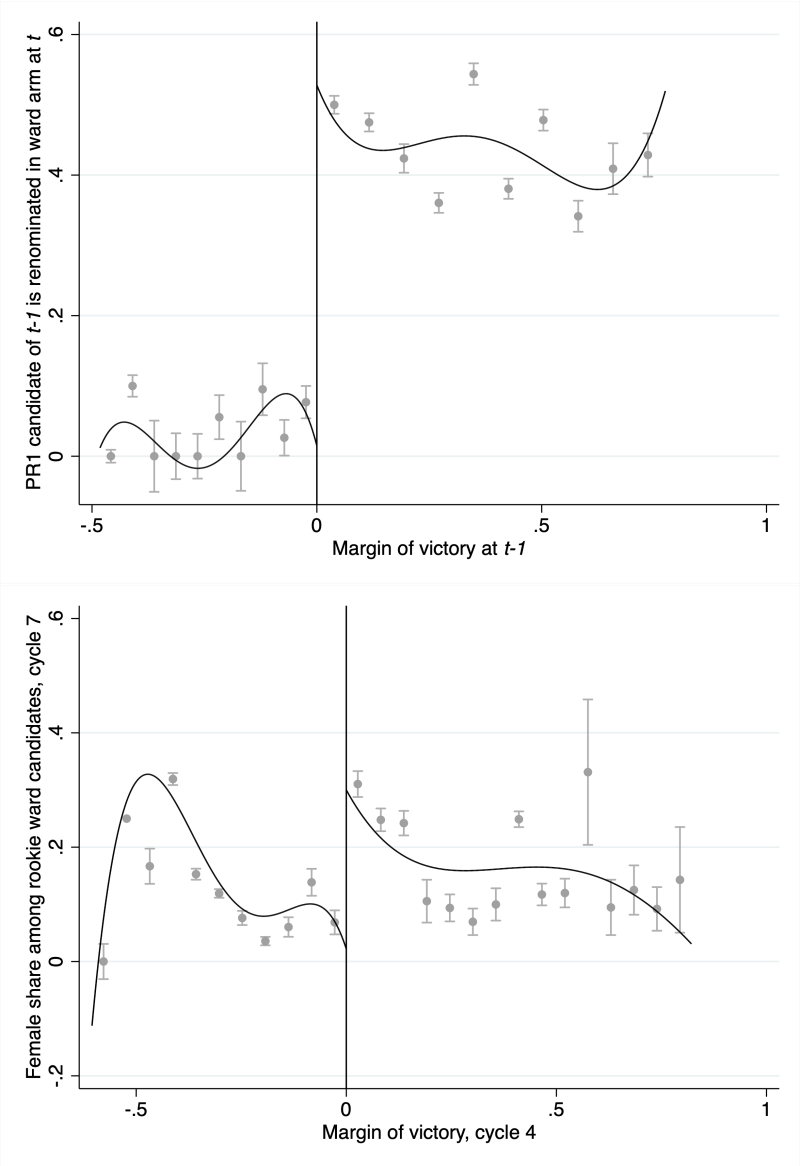
Note: This figure illustrates the ballot papers for a voter residing in ward X of municipality A. The left is used to vote for ward councilors and the right for PR councilors. The ticks indicate how a voter might vote.

Figure A.3 - The Average Number of Female PR Councilors by Council Size



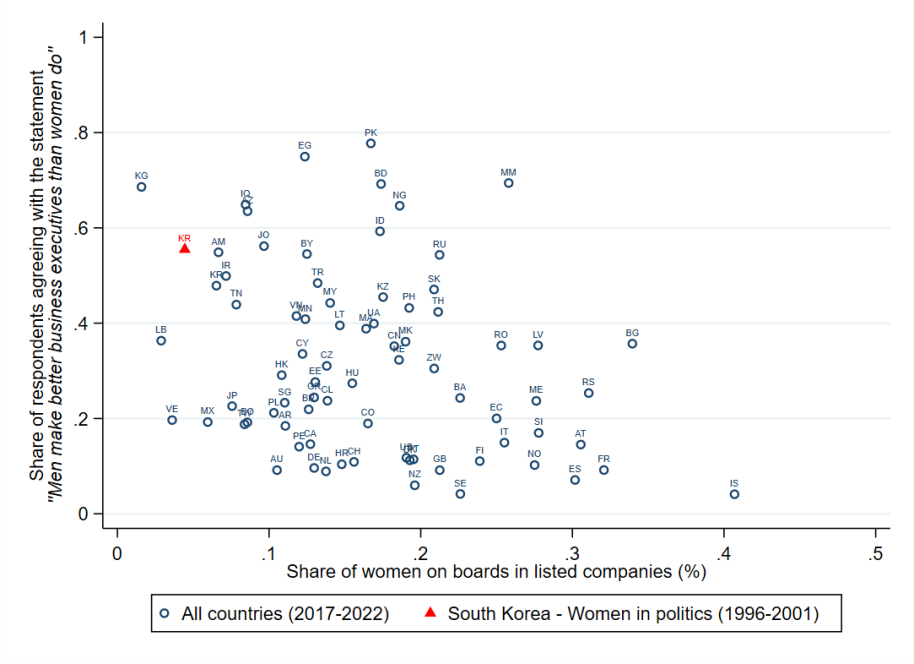
Note: This figure plots the average number of female PR councilors by council size. The error bars indicate the standard deviation in the number of female PR councilors by council size. Where the error bars are missing, there is only one municipality for that council size. Only a small number of municipal councils belong to bin 3.

Figure A.4 - The Effect of a Party's First PR Candidate Winning in Close Elections on the Party's Future Candidate Composition



Note: Regression discontinuity plots of binned sample means with 95% confidence intervals, corresponding to results in Columns (2) and (11) of Table X. The bins are selected to mimic the underlying variability of the data (Calonico et al., 2014), and the curves show the 4th-order global polynomial fit on each side of the cutoff.

Figure A.5 - Female Representation on Boards in Listed Companies and Attitudes Towards Women (2017-2022)



Note: The graph depicts the cross-country correlation between attitudes towards women as leaders and female representation in listed companies' boards. On the y-axis, attitudes towards women are measured as the share of respondents that agree with the statement "Men make better business executives than women do". Higher values indicate attitudes more favorable towards men in the World Values Survey, wave 7 (2017-2022). The x-axis displays the share of seats held by women in listed companies' boards (between 0 and 1) calculated using ORBIS, 2022. The status quo regarding women as business leaders is compared to the situation of women in political bodies in South Korea just before the introduction of the quota – red triangle. Attitudes towards women as politicians in South Korea are measured as the share of respondents that agree with the statement "Men make better political leaders than women do" in the World Values Survey, waves 3 (1996) and 4 (2001). Higher values indicate attitudes more favorable towards men. Female representation in politics is measures as the share of seats held by women in the South Korean National Parliament (between 0 and 1) according to World Bank Gender Statistics, average years 1997-2001.

Appendix B ADDITIONAL TABLES

Table B.1 - Candidates and Councilors by Party Affiliation

		Candidates				Councilors			
		Ward		PR		Ward		PR	
	N	Mean	Std	Mean	Std	Mean	Std	Mean	Std
Election Cycle 1									
Independent	227	1	0			1	0		
Election Cycle 2									
Independent	227	1	0			1	0		
Election Cycle 3									
Independent	227	1	0			1	0		
Election Cycle 4									
Independent	225	0.41	0.15	0	0	0.11	0.14	0	0
Progressive party	225	0.16	0.08	0.29	0.17	0.20	0.17	0.18	0.25
Conservative party	225	0.24	0.13	0.47	0.30	0.54	0.31	0.64	0.39
Election Cycle 5									
Independent	225	0.32	017	0	0	0.14	0.16	0	0
Progressive party	225	0.21	0.16	0.30	0.29	0.32	0.26	0.41	0.39
Conservative party	225	0.33	0.18	0.49	0.31	0.43	0.25	0.44	0.40
Election Cycle 6									
Independent	224	0.34	0.16	0	0	0.13	0.15	0	0
Progressive party	224	0.24	0.16	0.38	0.27	0.37	0.26	0.40	0.37
Conservative party	224	0.35	0.18	0.55	0.30	0.48	0.26	0.59	0.38
Election Cycle 7									
Independent	224	0.20	0.16	0	0	0.09	0.14	0	0
Progressive party	224	0.32	0.12	0.43	0.20	0.54	0.21	0.66	0.33
Conservative party	224	0.29	0.16	0.38	0.25	0.34	0.20	0.32	0.33

Note: This table illustrates the party affiliation of candidates and councilors in each municipal council and election cycle. The affiliation is reported separately for candidates/councilors nominated in the two different arms - ward and PR. Three affiliations are reported: the two main parties – Progressive and Conservative party (>70% of candidates) – and independent affiliation, i.e. candidates that run with no party affiliation. The residual category (omitted) includes all the other parties.

Table B.2 - Robustness: Treatment Effect on the Number of Candidates and Councilors, for Various Bandwidths

	Candidates				Councilors					
	Ward		PR		Ward		PR		All	
	Male (1)	Female (2)	Male (3)	Female (4)	Male (5)	Female (6)	Male (7)	Female (8)	Male (9)	Female (10)
***Panel A*: distance$^{\dagger} \leq 4$**										
Treat	0.33	0.33	0.59***	1.24***	-0.15	0.15	0.09**	0.91***	-0.06	1.06***
	(0.80)	(0.33)	(0.13)	(0.15)	(0.20)	(0.20)	(0.05)	(0.05)	(0.22)	(0.22)
N	865	865	865	865	865	865	865	865	865	865
***Panel B*: distance ≤ 3**										
Treat	0.10	0.35	0.52***	1.25***	-0.13	0.13	0.08	0.92***	-0.05	1.05***
	(0.84)	(0.34)	(0.13)	(0.16)	(0.21)	(0.21)	(0.05)	(0.05)	(0.23)	(0.23)
N	808	808	808	808	808	808	808	808	808	808
***Panel C*: distance ≤ 2**										
Treat	0.87	0.39	0.55***	1.29***	-0.14	0.14	0.08	0.92***	-0.06	1.06***
	(0.91)	(0.35)	(0.15)	(0.17)	(0.23)	(0.23)	(0.06)	(0.06)	(0.26)	(0.26)
N	511	511	511	511	511	511	511	511	511	511
***Panel D*: distance ≤ 1**										
Treat	0.34	0.44	0.62***	1.25***	-0.24	0.24	0.09	0.91***	-0.15	1.15***
	(1.02)	(0.38)	(0.17)	(0.19)	(0.26)	(0.26)	(0.07)	(0.07)	(0.29)	(0.29)
N	317	317	317	317	317	317	317	317	317	317
***Panel E*: distance $= 0$**										
Treat	0.38	0.42	0.58***	1.23***	-0.24	0.24	0.08	0.92***	-0.16	1.16***
	(1.03)	(0.38)	(0.18)	(0.19)	(0.26)	(0.26)	(0.06)	(0.06)	(0.29)	(0.29)
N	168	168	168	168	168	168	168	168	168	168

Note: This table tests the robustness of the estimated treatment effect using regression equation (1) for different bandwidths used to define bins. Councils that belong to the same bin are compared to each other. Councils with size above the threshold are considered treated, councils with size below the threshold belong to the control group. Bandwidths refer to the distance to the threshold (Distance †). To illustrate, the council sizes for which distance equals 0 are 10, 11, 20, and 21, while the council sizes for which distance equals 1 are 9, 12, 19, and 22. In the main specification, each bin includes councils with distance smaller or equal to 5 seats from the threshold. The sample includes bins 1 and 2 and includes all election cycles. t-statistics (in parenthesis) for standard errors clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table B.3 - Robustness: Treatment Effect (Balanced Panel)

	All political parties							
	Candidates				Councilors			
	Ward		PR		Ward		PR	
	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat in cycle 4 × Cycle 4	3.71***	-0.23	0.94***	0.96***	0.36	-0.36	0.09	0.76***
	(1.17)	(0.35)	(0.22)	(0.22)	(0.22)	(0.22)	(0.08)	(0.09)
Treat in cycle 4 × Cycle 5	0.42	0.51	0.65***	1.21***	-0.28	0.28	0.10	0.70***
	(0.91)	(0.37)	(0.17)	(0.23)	(0.23)	(0.23)	(0.07)	(0.08)
Treat in cycle 4 × Cycle 6	-1.45*	0.93**	0.26*	1.02***	-0.47*	0.47*	0.08	0.69***
	(0.85)	(0.42)	(0.15)	(0.22)	(0.27)	(0.27)	(0.06)	(0.08)
Treat in cycle 4 × Cycle 7	-2.26**	1.10**	0.21	1.27***	-0.73**	0.73**	0.04	0.69***
	(1.01)	(0.44)	(0.16)	(0.22)	(0.29)	(0.29)	(0.06)	(0.08)
Running variable form	ward	ward	council	council	ward	ward	council	council
N	863	863	863	863	863	863	863	863

Note: This table tests the robustness of the estimated treatment effect using regression equation (1) to the sample definition. We include here only municipalities for which we can observe all election cycles (balanced panel), excluding 1 municipality that becomes a provincial-level council in election cycle 6. The sample includes bins 1 and 2. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table B.4 - Robustness: Treatment Effect (All Municipalities)

	All political parties							
	Candidates				Councilors			
	Ward		PR		Ward		PR	
	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat in cycle 4 × Cycle 4	3.71***	-0.27	0.92***	0.95***	0.37*	-0.37*	0.08	0.77***
	(1.15)	(0.35)	(0.22)	(0.22)	(0.21)	(0.21)	(0.08)	(0.08)
Treat in cycle 4 × Cycle 5	0.54	0.45	0.60***	1.08***	-0.27	0.27	0.10	0.65***
	(0.90)	(0.36)	(0.17)	(0.23)	(0.22)	(0.22)	(0.06)	(0.08)
Treat in cycle 4 × Cycle 6	-1.42*	0.91**	0.26*	1.00***	-0.47*	0.47*	0.08	0.69***
	(0.84)	(0.42)	(0.15)	(0.22)	(0.26)	(0.26)	(0.06)	(0.08)
Treat in cycle 4 × Cycle 7	-2.26**	1.11**	0.21	1.24***	-0.74**	0.74**	0.04	0.68***
	(1.00)	(0.44)	(0.16)	(0.22)	(0.29)	(0.29)	(0.06)	(0.08)
Running variable form	ward	ward	council	council	ward	ward	council	council
N	873	873	873	873	873	873	873	873

Note: This table tests the robustness of the estimated treatment effect using regression equation (1) to the sample definition. We include here all existing municipalities. The sample includes bins 1 and 2. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table B.5 - Robustness: Treatment Effect ($f(x)$: Linear Interaction)

	All political parties							
	Candidates				Councilors			
	Ward		PR		Ward		PR	
	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat at cycle 4 × Cycle 4	3.97***	-0.42	0.97***	0.94***	0.51**	-0.51**	0.10	0.76***
	(1.23)	(0.38)	(0.23)	(0.22)	(0.23)	(0.23)	(0.08)	(0.09)
Treat at cycle 4 × Cycle 5	0.60	0.31	0.67***	1.19***	-0.14	0.14	0.10	0.70***
	(1.00)	(0.39)	(0.17)	(0.22)	(0.24)	(0.24)	(0.07)	(0.08)
Treat at cycle 4 × Cycle 6	-1.24	0.73*	0.28*	1.01***	-0.33	0.33	0.09	0.70***
	(0.97)	(0.43)	(0.15)	(0.22)	(0.28)	(0.28)	(0.06)	(0.08)
Treat at cycle 4 × Cycle 7	-2.05*	0.90*	0.24	1.25***	-0.58*	0.58*	0.04	0.69***
	(1.12)	(0.47)	(0.16)	(0.21)	(0.30)	(0.30)	(0.06)	(0.08)
Running variable form	ward	ward	council	council	ward	ward	council	council
N	865	865	865	865	865	865	865	865

Note: This table tests the robustness of the estimated treatment effect using regression equation (1) to the choice of the functional form for controlling for the relationship between council size and the outcome. In this table $f(x) = \gamma_1 x + \gamma_2 x \cdot Treat$. The sample includes bins 1 and 2. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table B.6 - Robustness: Treatment Effect ($f(x)$: Quadratic)

	All political parties							
	Candidates				Councilors			
	Ward		PR		Ward		PR	
	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat at cycle 4 × Cycle 4	3.98***	-0.36	1.00***	0.89***	0.46**	-0.46**	0.10	0.76***
	(1.21)	(0.37)	(0.23)	(0.22)	(0.23)	(0.23)	(0.08)	(0.09)
Treat at cycle 4 × Cycle 5	0.61	0.37	0.70***	1.14***	-0.18	0.18	0.11	0.71***
	(0.97)	(0.38)	(0.18)	(0.23)	(0.24)	(0.24)	(0.07)	(0.08)
Treat at cycle 4 × Cycle 6	-1.23	0.79*	0.31*	0.95***	-0.38	0.38	0.09	0.70***
	(0.94)	(0.43)	(0.16)	(0.22)	(0.27)	(0.27)	(0.07)	(0.08)
Treat at cycle 4 × Cycle 7	-2.04*	0.97**	0.26	1.20***	-0.63**	0.63**	0.04	0.70***
	(1.09)	(0.46)	(0.17)	(0.21)	(0.30)	(0.30)	(0.06)	(0.08)
Running variable form	ward	ward	council	council	ward	ward	council	council
N	865	865	865	865	865	865	865	865

Note: This table tests the robustness of the estimated treatment effect using regression equation (1) to the choice of the functional form for controlling for the relationship between council size and the outcome. In this table $f(x) = \gamma_1 x + \gamma_2 x^2$. The sample includes bins 1 and 2. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table B.7 - Robustness: Treatment Effect ($f(x)$: Quadratic Interaction)

	All political parties							
	Candidates				Councilors			
	Ward		PR		Ward		PR	
	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat at cycle 4 × Cycle 4	3.86***	-0.13	0.75**	0.86**	0.47	-0.47	0.00	0.71***
	(1.40)	(0.42)	(0.30)	(0.33)	(0.29)	(0.29)	(0.11)	(0.13)
Treat at cycle 4 × Cycle 5	0.49	0.60	0.45*	1.10***	-0.17	0.17	0.01	0.65***
	(1.18)	(0.44)	(0.26)	(0.33)	(0.30)	(0.30)	(0.10)	(0.13)
Treat at cycle 4 × Cycle 6	-1.35	1.03**	0.06	0.92***	-0.36	0.36	-0.01	0.65***
	(1.12)	(0.48)	(0.24)	(0.33)	(0.31)	(0.31)	(0.10)	(0.13)
Treat at cycle 4 × Cycle 7	-2.16*	1.20**	0.02	1.17***	-0.62*	0.62*	-0.06	0.64***
	(1.27)	(0.51)	(0.26)	(0.32)	(0.34)	(0.34)	(0.10)	(0.13)
Running variable form	ward	ward	council	council	ward	ward	council	council
N	865	865	865	865	865	865	865	865

Note: This table tests the robustness of the estimated treatment effect using regression equation (1) to the choice of the functional form for controlling for the relationship between council size and the outcome. In this table $f(x) = \gamma_1 x + \gamma_2 x^2 + (\gamma_3 x + \gamma_4 x^2) \cdot Treat$. The sample includes bins 1 and 2. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table B.8 - Treatment Effect on the Gender Gap in Candidate Characteristics

	Main political parties				
	Education level	Years of schooling	𝟙(Bachelor or more)	𝟙(Attended top 20 uni)	𝟙(Political experience)
	(1)	(2)	(3)	(4)	(5)
Female	-0.12	-0.22	0.00	-0.01	0.11***
	(0.11)	(0.18)	(0.03)	(0.02)	(0.03)
Female x Cycle 5	0.09	0.14	-0.02	0.02	-0.07**
	(0.12)	(0.19)	(0.03)	(0.02)	(0.03)
Female x Cycle 6	-0.02	0.01	-0.00	-0.02	-0.04
	(0.14)	(0.23)	(0.04)	(0.02)	(0.04)
Female x Cycle 7	0.37***	0.56***	0.00	-0.01	-0.03
	(0.13)	(0.21)	(0.03)	(0.02)	(0.03)
Treat at cycle 4	-0.13	-0.22	-0.02	0.06**	0.02
	(0.15)	(0.25)	(0.03)	(0.03)	(0.03)
Treat at cycle 4 x Cycle 5	-0.07	-0.11	-0.04*	-0.01	-0.05**
	(0.09)	(0.14)	(0.02)	(0.01)	(0.02)
Treat at cycle 4 x Cycle 6	-0.12	-0.19	-0.02	-0.03**	-0.00
	(0.09)	(0.15)	(0.03)	(0.01)	(0.03)
Treat at cycle 4 x Cycle 7	-0.08	-0.15	-0.03	-0.02	0.01
	(0.10)	(0.16)	(0.03)	(0.02)	(0.03)
Female x Treat at cycle 4	0.12	0.22	-0.02	-0.03	0.06
	(0.17)	(0.28)	(0.04)	(0.02)	(0.04)
Female x Treat at cycle 4 x Cycle 5	0.08	0.08	0.07	-0.02	-0.01
	(0.17)	(0.28)	(0.05)	(0.03)	(0.05)
Female x Treat at cycle 4 x Cycle 6	0.09	0.09	0.01	0.03	-0.05
	(0.20)	(0.33)	(0.06)	(0.03)	(0.06)
Female x Treat at cycle 4 x Cycle 7	-0.15	-0.27	0.01	0.04	-0.01
	(0.20)	(0.33)	(0.05)	(0.03)	(0.05)
Cycle 5	0.59***	0.99***	0.17***	-0.00	0.11***
	(0.05)	(0.08)	(0.01)	(0.01)	(0.01)
Cycle 6	1.08***	1.76***	0.27***	0.03***	0.13***
	(0.06)	(0.09)	(0.02)	(0.01)	(0.02)
Cycle 7	1.24***	2.07***	0.35***	0.02*	0.11***
	(0.06)	(0.09)	(0.02)	(0.01)	(0.02)
N	13172	13172	13172	13172	13172
Running variable form	council	council	council	council	council
Age polynomials	Yes	Yes	Yes	Yes	Yes
Party affiliation	Yes	Yes	Yes	Yes	Yes
Rookie or incumbent	Yes	Yes	Yes	Yes	Yes
Political experience	Yes	Yes	Yes	Yes	No
Years of schooling	No	No	No	No	Yes

Note: This table reports the effect of being above the threshold on the gender gap in education and political experience of candidates across election cycles. The outcome variables are the candidates' level of education (0-12), years of schooling (0-22), and dummies for having a bachelor's degree or more, for receiving tertiary education from a top 20 university in Korea, and for having an occupation related to politics. The regression specification is given by equation (4). The analysis is performed at the individual level. The sample includes bins 1 and 2, and only candidates from the two main parties for whom we have education/occupation information. "Age polynomials" refers to age and age squared. "Party affiliation" is a dummy equal to one if the candidate is affiliated with the Progressive party. "Rookie or incumbent" refers to a dummy equal to one if the candidate is an incumbent – they have been elected in at least one previous election. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table B.9 - Treatment Effect on the Gender Gap in Voter Preferences

	Main political parties				
	Candidate's vote share in the ward election arm (%)				
Controls:	None	Ballot position	Individual characteristics	N. ward candidates	Party×muni×cycle fixed effects
	(1)	(2)	(3)	(4)	(5)
Female	0.48	-0.71	-0.04	0.46	-2.00**
	(1.06)	(0.97)	(1.02)	(1.02)	(0.87)
Female x Cycle 5	-0.68	-1.59	-2.65**	-3.09***	-1.00
	(1.32)	(1.13)	(1.19)	(1.17)	(0.99)
Female x Cycle 6	-1.46	-1.75*	-2.94***	-3.47***	-1.46*
	(1.17)	(1.00)	(1.03)	(1.04)	(0.87)
Female x Cycle 7	1.68	1.61	0.14	-0.68	-0.10
	(1.22)	(1.15)	(1.19)	(1.16)	(0.97)
Treat at cycle 4	-2.11**	-1.99**	-2.21***	-0.81	
	(1.02)	(0.80)	(0.81)	(0.68)	
Treat at cycle 4 x Cycle 5	0.14	0.29	0.32	-0.48	
	(0.61)	(0.54)	(0.54)	(0.56)	
Treat at cycle 4 x Cycle 6	0.84	0.91	0.94	-0.48	
	(0.73)	(0.63)	(0.63)	(0.68)	
Treat at cycle 4 x Cycle 7	1.26	1.17*	1.22*	-0.38	
	(0.79)	(0.64)	(0.63)	(0.63)	
Female x Treat at cycle 4	-1.21	0.45	-0.14	-0.47	0.43
	(1.87)	(1.54)	(1.61)	(1.52)	(1.15)
Female x Treat at cycle 4 x Cycle 5	2.09	-0.68	-0.40	-0.20	-1.18
	(2.09)	(1.65)	(1.74)	(1.67)	(1.37)
Female x Treat at cycle 4 x Cycle 6	1.56	-0.46	0.17	0.60	-0.09
	(1.88)	(1.53)	(1.60)	(1.53)	(1.30)
Female x Treat at cycle 4 x Cycle 7	0.60	-0.96	-0.20	0.12	0.16
	(2.09)	(1.72)	(1.75)	(1.68)	(1.42)
N	11192	11192	10737	10737	10665
Running variable form	ward	ward	ward	ward	ward
Ballot position	No	Yes	Yes	Yes	Yes
Age polynomials	No	No	Yes	Yes	Yes
Political experience	No	No	Yes	Yes	Yes
Rookie or incumbent	No	No	Yes	Yes	Yes
Years of schooling	No	No	Yes	Yes	Yes
N. ward candidates	No	No	No	Yes	Yes
Party×muni×cycle fixed effects	No	No	No	No	Yes

Note: This table reports the effect of being above the threshold on the gender gap in the vote share (in percentages) obtained by candidates across election cycles. The regression specification is given by equation (4). The analysis is performed at the individual level. The sample includes all candidates nominated in municipalities included in bins 1 and 2 by the two main parties. Each column to the right includes additional controls compared to the preceding column. The controls ensure that we are comparing the gender gap in vote shares for candidates with similar characteristics and under similar election conditions. "Ballot position" refers to dummies for each position in the ballot list. For the definition of variables on individual characteristics ("Age polynomials," "Party affiliation," "Rookie or incumbent," "Years of Schooling"), refer to notes of Table B.8. "N. ward candidates" refers to the total number of candidates competing in the municipality, independently of their party affiliation. "Party×muni×cycle fixed effects" refers to party×municipality×election cycle fixed effects – allowing us to compare men and women of the same party in the same municipality, in the same election cycle. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table B.10 - Probability of Being Constrained in the Number of Female Candidates

	Main political parties (party x municipality)	
	Pr(unconstrained)	
	All main parties	Participates in ward arm
	(1)	(2)
Treat at cycle 4 x Cycle 4	-0.08	-0.09
	(0.08)	(0.07)
Treat at cycle 4 x Cycle 5	0.08	0.12
	(0.07)	(0.07)
Treat at cycle 4 x Cycle 6	0.02	0.05
	(0.07)	(0.06)
Treat at cycle 4 x Cycle 7	0.07	0.09
	(0.07)	(0.07)
Running variable from	council	council
N	1551	1514

Note: This table reports the effect of being above the threshold (defined based on cycle 4 council size) on the probability that the party is unconstrained in the selection of candidates. A party is defined as not constrained if the number of female candidates in the party's list is strictly greater than the number of women the party must place in its list due to quotas. All odd-number candidates in the party list for the PR arm need to be female due to the quota, so the required number of women is 1 if 1 or 2 seats are elected through the PR arm, and 2 if 3 seats are elected through the PR arm. The regression specification is given by equation (1). The unit of analysis is party by municipality. The sample includes bins 1 and 2, and only the two main parties. In column 2, the sample is restricted to only the main parties in municipalities where each party has at least one ward candidate. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Appendix C INSTITUTIONAL SETTING

C.1 Other reforms introduced simultaneously

Table C.1 below summarizes the reforms to the municipal council elections.

Besides the double-arm voting system and the gender quota, described in the main text (Section II.A), an additional change was introduced in 2006. Subsidies were offered to parties based on the female ratio among the parties' candidates nationwide. It is unlikely that the subsidies affected much of the political parties' strategies, particularly at the municipality level. The scale of the subsidies has been criticized for being too low to effectively expand female nomination (Lee, 2003; Kim et al., 2003). They account for only 5-6% of the total value of election subsidies (National Election Commission, 2018). Therefore, the presence of the subsidies is unlikely to have impacted political parties' selection of

candidates.

Amendments to electoral rules continued between the 2006 and 2010 elections. It was stipulated that in either the municipal council elections or the higher-up provincial council elections, there must be at least one female candidate in each National Assembly Election district. As there are around 250 such districts, compared to 226 municipalities, a National Assembly Election district approximately compares to a municipality.[47] Legislative Impact Analysis Reports indicate that most parties chose to satisfy this rule in the municipal council elections, due to the larger number of candidates (Lee, 2019). Selecting which ward to place the female candidate in would have been a strategic concern for the political parties.

It is important to note that none of the other reforms conflicts with our identification strategy of regression discontinuity based on council size.

Table C.1 - Amendments to Legislation on Municipal Council Elections

First applicable election	Amendment
Election cycle 4 (2006)	[PR] Proportional representation introduced
	[W] Single-member plurality vote → Multi-member plurality vote
	[PR] Odd-number candidates in party lists must be female
	[W] Subsidies to parties for nominating female candidates
Election cycle 5 (2010)	[PR] Odd-number candidates in party lists must be female (enforced)
	[W] At least one female candidate per National Assembly Election district

Note: The table summarizes the amendments to the legislation on South Korean municipal council elections. [PR] indicates rules relating to the PR arm and [W] to the ward arm. Adapted from Lim (2018).

C.2 Background behind the adoption of gender quotas

Before gender quotas were adopted in the municipal council elections in 2006, they were adopted first in the National Assembly Election in 2004. The adoption was influenced by increasing demands by women's organizations to raise female representation in politics, which at the time was dramatically behind the international average.[48] As females constitute half the voters, it was in the interest of political parties to put gender quotas forward among their election pledges. Moreover, Jeon (2013) argues that the adoption of the quota was also a political tactic. Political parties wanted to increase the size of the National As-

[47] National Assembly Election districts are divided depending on population size and local representativeness. A large municipality may contain five National Assembly Election districts, and up to five small municipalities may comprise one National Assembly Election district.

[48] See Cho and Kim (2010) for a summary of the major activities of women's organizations.

sembly back to what it was before the size cut during the Asian Financial Crisis, and the fact that the majority of the added seats will go to females, with the quota, made for a good excuse to expand the Assembly.

Once the quota was adopted in the National Assembly Election, it became the natural next step to introduce it in the regional elections. The gender quota in the municipal council election was passed in the National Assembly, led by both major parties. Some argue that there was political motivation behind it, too (Kim, 2005). One new element in the reform was the party nomination system – a ward candidate must be nominated by a party in order to run with the party affiliation – and it has been disputed as a ploy to deepen party influence. Political parties used the quota to justify the party nomination system since the gender quota was embedded in the PR arm where party nomination was essential.

To sum up, it is unlikely there was a major division among political parties in their support of the gender quota when it was passed.

Appendix D EMPIRICAL STRATEGY

D.1 Factors that bind a candidate to a municipality

A candidate is legally required to have been a resident of the municipality they are running in for at least 60 days prior to the election. In addition, as municipal councilors deal with local grass-roots matters, a candidate familiar with the municipality will win more votes *ceteris paribus*. Hence, a candidate usually runs in the municipality they have a connection with, such as their birthplace, long-term residence, or place of education. Moreover, the final say of a party's nomination lies on the head of the municipal branch of the party, so a candidate typically serves the local activities of the party in the municipality they desire to run in for a long time before getting nominated. Finally, once a candidate is nominated in a municipality, they put on a campaign and become known to the residents. So if they were to run again, they would not start over at a new location. For all these factors, rarely do parties move around candidates across municipalities for strategic reasons.

D.2 The composition of PR councilors changes only at the thresholds

In order to buttress the regression discontinuity design, we test whether there is a change in the number of female PR councilors as council size increases, at points *other* than the thresholds. We estimate the following equation:

$$(\text{N. of female PR councilors})_{cbt} = \beta \times (\textit{Larger by one})_{cbt} + \delta_b + \gamma_t + \epsilon_{cbt} \qquad (3)$$

$$\text{where } (\textit{Larger by one})_{cbt} = \begin{cases} 1, & \text{if (council size)}_{cbt} - \text{threshold}_{bt} = x \\ 0, & \text{if (council size)}_{cbt} - \text{threshold}_{bt} = x - 1 \end{cases}$$

for each value of $x \in \{-4, -3, ..., 3, 4\}$, i.e. distance from the threshold. The threshold is council $\times$ election cycle specific, as it depends on the bin the council belongs to.

Equation (3), therefore, estimates the change in the number of female PR councilors when the council size increases by 1, for all points around the threshold. Table D.1 reports the results. It confirms that there is a positive effect only at the threshold.

Table D.1 - The Effect of Council Size on the Number of Female PR Councilors

	x value (distance from the threshold)								
	-4	-3	-2	-1	0	1	2	3	4
Coefficient ($\hat{\beta}$)	-0.03	0.03	-0.03	-0.01	0.92***	-0.02	-0.02	-0.03	0.09
Standard error	(0.09)	(0.02)	(0.03)	(0.04)	(0.06)	(0.08)	(0.08)	(0.08)	(0.09)
N	267	380	210	170	168	147	133	111	87

Note: This table reports the results of the coefficient of $(\textit{Larger by one})_{cbt}$ in regression equation (3), for different values of x. For each x, the sample is councils that are x and $x-1$ away from the threshold (*Larger by one* $= 1$ and $= 0$, respectively.) When $x = 0$, $(\textit{Larger by one})_{cbt}$ corresponds to the treatment definition used in the main identification strategy (with the exception that the sample is restricted to councils just one seat above and below the threshold). The table shows that the number of female PR councilors increases discontinuously only at the treatment thresholds. The sample includes bins 1 and 2. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

D.3 The running variable for ward-specific outcome variables

When the outcome variable relates to the ward election arm, we change the running variable to $\tilde{x}_{cb} \equiv (\text{N. of ward councilors})_{cb} - (\text{N. of ward councilors at the threshold})_b$ in cycle 4.

To illustrate why this is important, let us consider councils just above and below the threshold of 11, i.e. councils with 11 and 10 councilors. Both sets of councils have 9 ward councilors, but this is not taken into account if our running variable is based on council

size. As council size differs by one unit above and below the threshold, controlling for council size would effectively induce us to compare a treated council with *one fewer* ward councilor than the control council, therefore making it difficult to interpret the sign of the coefficient on $(\textit{Treat in cycle 4})$. Redefining the running variable solves this problem.

Note that changing the running variable this way does not change much else. The coefficients $\hat{\alpha}_b$, $\hat{\alpha}_t$, $\hat{\gamma}$ stay the same, as well as the R-squared value.

D.4 Individual-level version of the main regression specification

The individual-level version of equation (1) is:

$$Y_{icbt} = \alpha_b + \alpha_t + \sum_{s=4}^{7} \beta_s \cdot (\textit{Treat in cycle 4})_{cb} + \sum_{s=4}^{7} \pi_s \cdot (\textit{Treat in cycle 4})_{cb} \times \textit{Female}_{icbt} + \sum_{s=4}^{7} \kappa_s \cdot \textit{Female}_{icbt} + f(x_{cb}) + X'_{cbt}\gamma + X'_{icbt}\delta + \epsilon_{cbt} \quad (4)$$

where $(\textit{Treat in cycle 4})_{cb}$ is treatment status in election cycle 4, X_{cbt} denotes municipality-level control variables such as the contemporaneous number of seats, α_b and α_t are bin and cycle fixed effects, and X_{icbt} indicates individual-level controls.

Appendix E MODEL OF PARTY LEARNING

E.1 Derivation: maximum likelihood estimator of μ_g

Conditional on s_i, the distribution of a_i is:

$$a_i|s_i \sim N\left(\mu_g + \frac{\sigma^2}{\sigma_s^2 + \sigma^2} s_i, \frac{\sigma^2\sigma_s^2}{\sigma_s^2 + \sigma^2}\right) \quad (5)$$

Let's define $c = \frac{\sigma^2}{\sigma_s^2+\sigma^2}$, $m(s_i) = \mu_g + \frac{\sigma^2}{\sigma_s^2+\sigma^2} s_i = \mu_g + cs_i$, $\bar{\sigma}^2 = \frac{\sigma^2\sigma_s^2}{\sigma_s^2+\sigma^2}$.

Then the likelihood function is

$$\begin{aligned}\mathcal{L}(\mu_g) &= P(\mathbf{a}|\mathbf{s};\mu_g) \\ &= \Pi_{i=1}^{n}\phi(a_i|s_i;\mu_g) \quad \text{where } \phi : \text{Gaussian probability density function} \\ &= \frac{1}{(\sqrt{2\pi}\bar{\sigma})^n}\exp\left(-\frac{1}{2\bar{\sigma}^2}\sum_{i=1}^{n}\left(a_i - m(s_i)\right)^2\right)\end{aligned}$$

Thus, the maximum likelihood estimator is

$$\hat{\mu}_g = \frac{1}{n}\sum_{i=1}^{n}\left(a_i - cs_i\right) \sim N\left(\mu_g, \frac{1}{n}\bar{\sigma}^2\right) \tag{6}$$

E.2 Extension: if the exact ability of councilors is not revealed

What if the exact ability of councilors is not revealed while they serve their term? Rather, for councilor i, a party receives a second signal of ability that is highly informative about the *absolute* ability of i:

$$v_i \sim N(a_i, \sigma_v^2)$$

where σ_v^2 is a small number. Moreover, say the precision of v_i is inversely related to the closeness of the interaction between councilor i and a party. For instance,

$$\sigma_v^2 = \begin{cases}\sigma_1^2 & \text{if } i \text{ belongs to own party} \\ \sigma_2^2 & \text{else}\end{cases}$$

with $\sigma_1^2 < \sigma_2^2$.

Once the values of the second signals of ability of councilors, $\mathbf{v} = \{v_i\}$, are revealed, the party makes an inference about the value of μ_g via maximum likelihood as before.

Conditional on s_i, the distribution of v_i is

$$v_i|s_i \sim N\left(\mu_g + \frac{\sigma^2}{\sigma_s^2+\sigma^2}s_i, \sigma_v^2 + \frac{\sigma^2\sigma_s^2}{\sigma_s^2+\sigma^2}\right) \tag{7}$$

As in section E.1, let's define $c = \frac{\sigma^2}{\sigma_s^2+\sigma^2}$, $m(s_i) = \mu_g + \frac{\sigma^2}{\sigma_s^2+\sigma^2}s_i = \mu_g + cs_i$. Additionally, define $\bar{\sigma}_1^2 = \sigma_1^2 + \frac{\sigma^2\sigma_s^2}{\sigma_s^2+\sigma^2}$ and $\bar{\sigma}_2^2 = \sigma_2^2 + \frac{\sigma^2\sigma_s^2}{\sigma_s^2+\sigma^2}$. N_1 denotes the set of own-party councilors

of size n_1, and N_2 the set of other councilors of size n_2.

The likelihood function is

$$\begin{aligned}\mathcal{L}(\mu_g) &= P(\mathbf{v}|\mathbf{s};\mu_g) \\ &= \Pi_{i\in N_1} f(v_i|s_i;\mu_g,\sigma_1^2) \times \Pi_{i\in N_2} f(v_i|s_i;\mu_g,\sigma_2^2) \\ &= \frac{1}{(\sqrt{2\pi}\bar{\sigma}_1)^{n_1}} \exp\left(-\frac{1}{2\bar{\sigma}_1^2}\sum_{i\in N_1}\big(v_i - m(s_i)\big)^2\right) \times \frac{1}{(\sqrt{2\pi}\bar{\sigma}_2)^{n_2}} \exp\left(-\frac{1}{2\bar{\sigma}_2^2}\sum_{i\in N_2}\big(v_i - m(s_i)\big)^2\right)\end{aligned}$$

Then the maximum likelihood estimator is

$$\hat{\mu}_g = \frac{\bar{\sigma}_2^2 \sum_{i\in N_1}\big(v_i - cs_i\big) + \bar{\sigma}_1^2 \sum_{i\in N_2}\big(v_i - cs_i\big)}{\bar{\sigma}_2^2 n_1 + \bar{\sigma}_1^2 n_2} \tag{8}$$

The distribution of $\hat{\mu}_g$ is

$$\hat{\mu}_g \sim N\left(\mu_g, \frac{\bar{\sigma}_1^2\bar{\sigma}_2^2}{\bar{\sigma}_2^2 n_1 + \bar{\sigma}_1^2 n_2}\right) \tag{9}$$

The posterior distribution about the value of μ_g follows the same structure as before.

E.3 Conditions for Nash equilibrium allocation of candidates

Because each party does not know about the potential candidates available to the other party, they can only form expectations about the competence of the opponent in each ward. Call the expected competence of the opposing party's best candidate $A^{(1)}$, that of the second best candidate $A^{(2)}$, etc.[49] Also rank wards by competitiveness. Call $|R|^{(1)}$ the absolute value of party R's popularity in the most competitive ward, i.e. the smallest absolute value of $-|I^w - I_R| + |I^w - I_L|$. For simplicity of exposition, we assume that there are sufficiently many potential candidates available to each party such that the expected gap in competence between any candidate and the next-best one is small relative to the gap in competitiveness: $\max_k\{A^{(k)} - A^{(k+1)}\} < \min_k\{|R|^{(k+1)} - |R|^{(k)}\}$. Under this assumption, the Nash equilibrium allocation of candidates is for each party to place the most competent

[49]For example, say $\tilde{\mu}_{f,t} < \tilde{\mu}_{m,t}$ (men are perceived to have a higher mean ability than women) so that the top candidate is expected to be male, drawn from $N(\tilde{\mu}_{m,t}, \sigma^2)$. Then $A^{(1)} = \tilde{\mu}_{m,t} + \sigma\int_{-\infty}^{\infty} x\frac{d}{dx}\Phi(x)^n dx$, where Φ is the cdf of the standard normal distribution, and n is the total number of male potential candidates.

candidate in the most competitive ward.[50]

E.4 Empirical support for key model assumptions

Voters value councilor competence We study the election probabilities for the candidates elected in cycles 1-3, before the introduction of the quota. All councilors were directly elected through plurality vote in single-member constituent wards with no party affiliation. Hence, we can study how much voters value different characteristics, free of potential confounders, such as party preference, differences in party strategic behaviors across wards, or the influence of within-party ballot list position. We restrict the analysis to male candidates as women were rare and highly selected.

Table E.1 displays the results of this analysis. The probability of being elected and the candidates' vote share are regressed on municipality$\times$election cycle fixed effects, and candidates' characteristics – age, education, a dummy for whether the candidate works in politics, and a dummy for whether the candidate was ever elected before. The table demonstrates that higher vote shares go to incumbents, older candidates (likely reflecting their social networks and community influence), and candidates with political experience. More relevantly for our modeling assumption, voters value the education of candidates. In fact, the coefficients on the education degrees show that election outcomes improve monotonically with higher levels of education.

[50]The assumption of $\max_k\{A^{(k)} - A^{(k+1)}\} < \min_k\{|R|^{(k+1)} - |R|^{(k)}\}$ ensures that the expected competence of the opponent does not overturn the competitiveness ranking of wards in equilibrium.

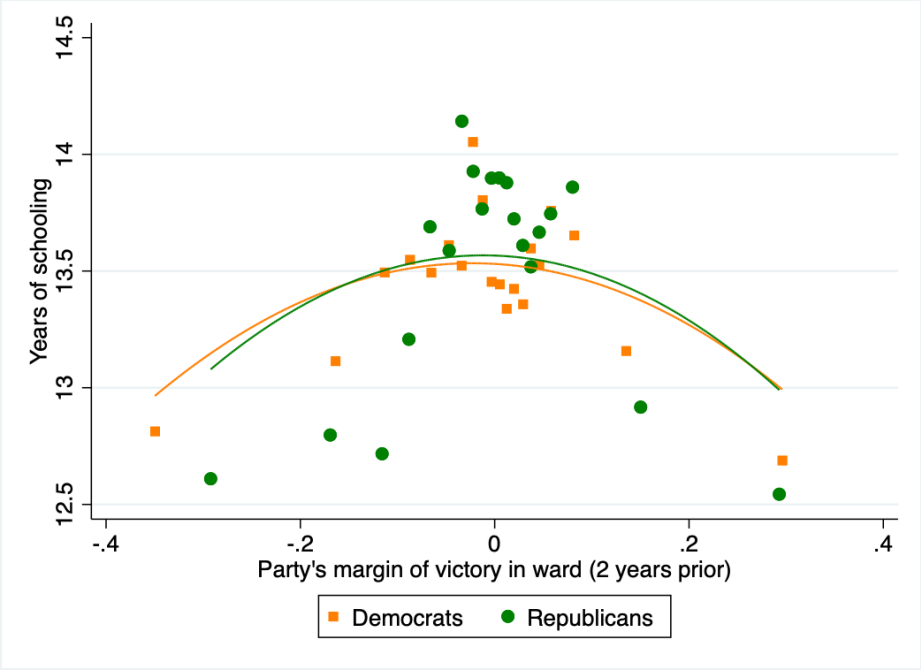
Table E.1 - What Do Voters Care About?

	Pr(Elected)	Vote Share
	(1)	(2)
Middle School	0.01	0.52
	(0.01)	(0.40)
High School	0.02*	0.88**
	(0.01)	(0.34)
Undergraduate Degree	0.05***	1.53***
	(0.01)	(0.36)
Grduate Degree	0.10***	2.83***
	(0.02)	(0.46)
Incumbent	0.16***	6.06***
	(0.01)	(0.29)
Age	0.04***	1.65***
	(0.00)	(0.11)
Age squared	-0.00***	-0.02***
	(0.00)	(0.00)
Political experience	0.04***	1.59***
	(0.01)	(0.33)
N	25201	23919
Municipality×cycle fixed effects	Yes	Yes

Note: The probability of being elected (column 1) and the candidate's vote share (column 2) are regressed on municipality × election cycle fixed effects, and candidates' characteristics – age, education (a dummy for different levels of education achieved), a dummy for whether the candidate works in politics, and a dummy for whether the candidate was ever elected before. The sample consists of the universe of male candidates for the three municipal elections before the introduction of the quota in 1995, 1998, and 2002 (26,606 male candidates), for which we could retrieve occupation, education (95%), and vote share information (90%). Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Competent candidates are placed in competitive wards To eliminate confounding factors related to gender and incumbency status, we focus on the sample of male rookie candidates. Using education as a proxy for competence, Figure E.1 confirms that candidate education level exhibits an inverted V-shaped relationship with party popularity. It peaks in the most competitive wards with near-zero margin of victory. Other notable features are the symmetry around zero and the marked similarity between the two parties. These solidly support the idea that parties allocate candidates according to model predictions: placing competent candidates in competitive wards and less competent ones in strongholds or weakholds.

Figure E.1 - Education of Male Rookie Candidates by Ward-Level Party Popularity

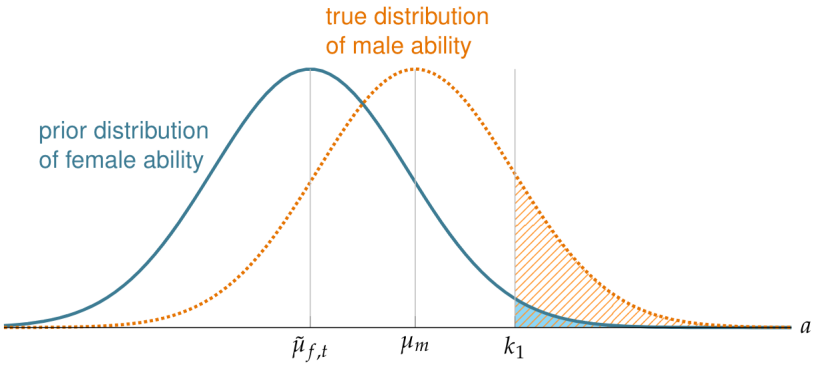


Note: This figure gives a binned scatter plot of the years of schooling of male rookie ward candidates by the party's popularity in the ward. We residualize the years of schooling variable for age, to account for the tendency of increasing educational attainment over time. The party's margin of victory is calculated as the difference in the party's vote share with that of the most popular competitor in the ward in the latest election (the National Assembly election, 2 years before each municipal council election). We demean the party's margin of victory by election×party, to address electoral swings occurring at the national level. The curves are quadratic fits. The sample includes bins 1 and 2.

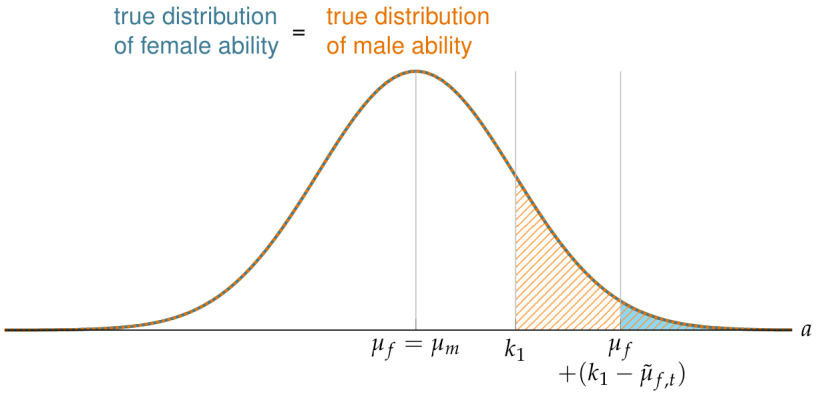
E.5 A diagrammatic illustration of candidates' selection

Figure E.2 illustrates the model for the $b = 0$ case. To simplify matters, suppose the true distribution of male ability is known. If the prior distribution of female ability at election t lies to the left of the male ability distribution, as in diagram (a), then the party will select candidates with perceived ability above a certain cutoff k_1, determined by the total number of candidates. The lowest signal among females is $(k_1 - \tilde{\mu}_{f,t})$, much higher than the lowest among males, $(k_1 - \mu_m)$. The female share of candidates will be given by the relative size of the shaded areas in (a). Now if the true ability distribution of females was identical to that of males, as plotted in diagram (b), then the true abilities of women, revealed post-election, will turn out to be much higher than expected. The party thus reconsiders the value of μ_f using maximum likelihood. The posterior distribution of female ability then is a weighted

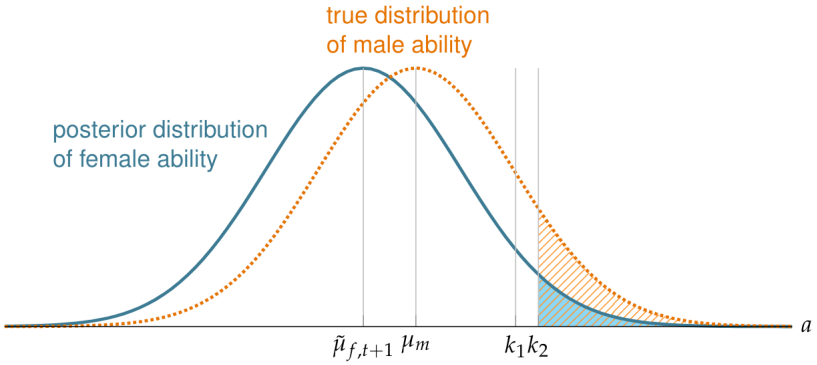
Figure E.2 - Illustration of Model of Belief Updating



(a) Candidate selection at t



(b) Maximum likelihood during the council term of t



(c) Candidate selection at $t + 1$

Note: This figure provides a simplified illustration of the model. A few assumptions are made. First, parties only care about maximizing the average ability of councilors, and not about meeting a particular female ratio. Moreover, we assume that the true distribution of male ability is known. Panel (a) describes the selection of candidates at time t if the prior distribution of female ability at election t lies to the left of the true male ability distribution. Panel (b) illustrates that the true abilities of women revealed post-election would turn out to be much higher than expected if the true ability distribution of females were identical to that of males. Panel (c) describes candidates selection at time $t + 1$, when the posterior distribution of female ability lies closer to the true female ability distribution.

average of the prior and the MLE, and will lie closer to the true female ability distribution, as shown in diagram (c). At election $t+1$, the new cutoff will be k_2, and the female share of candidates will be higher than at t.

Appendix F PARTY-LEVEL RD DESIGN

F.1 The empirical strategy

We conduct a *party*-level analysis, where we compare the strategies of parties that marginally won or lost the election of their first – and therefore female – PR candidate in the previous election cycle. As PR seats are allocated to parties according to the Hare–Niemeyer method (largest remainder method), the closeness to winning is not straightforward from the vote shares. We construct the margin of victory variable (v_{cpt}) following Luechinger et al. (2024).

For the one-period-ahead effects of winning (columns 1-2 of Table X), we employ a regression discontinuity design:

$$Y_{cpt} = \alpha_t + \beta \times Winner_{cp,t-1} + f(v_{cp,t-1}) + X'_{cpt}\gamma + \epsilon_{cpt}$$

where $Winner_{cp,t-1} \equiv \mathbb{1}(v_{cp,t-1} \geq 0)$. $f(v_{cp,t-1})$ is linear and allows for different slopes to the left and right of the cutoff $v_{cp,t-1} = 0$. X_{cpt} represents the control variables: party dummies, election cycle dummies, the number of ward seats, and council size. The sample includes only the two major parties in South Korea, as these are the parties that can be tracked over time.

For the cumulative effects of winning in cycle 4 on period-t outcomes (columns 3-10 of Table X), we estimate for each $t = 5, 6, 7$:

$$Y_{cpt} = \alpha + \beta \times Winner_{cp,4} + f(v_{cp,4}) + X'_{cpt}\gamma + \epsilon_{cpt}$$

REFERENCES (Online Appendix)

Calonico, S., M. D. Cattaneo, and R. Titiunik (2014). Robust nonparametric confidence intervals for regression-discontinuity designs. *Econometrica 82*(6), 2295–2326.

Cho, H.-O. and E. H. Kim (2010). A Study of Historical Context and Institutionalization Process of Gender Quota System and Women's Political Empowerment Movement in Korea 2000-2010. *Journal of Korean Social Trend and Perspective* (79), 110–139.

Jeon, J. Y. (2013). Political Dynamics of Adopting Gender Quota in Korea. *Journal of Korean Politics 22*(1), 29–52.

Kim, S. H. (2005). Local Council Elections - "Reformed" or "Deformed"? *Pressian News*.

Kim, W. H., M. J. Kim, H. C. Lee, and H. K. Kim (2003). *Research on measures to expand female candidate nomination by political parties*. Korea Women's Development Institute.

Lee, J. J. (2019). *The Legislative Impact Analysis of Gender Quota in Local Council District Elections*. Number 44. National Assembly Research Service.

Lee, M. S. (2003). Measures to expand female political representation in preparation for the 17th general election. Panel discussion in the Meeting of Female Members of the National Assembly and Municipal Councils To Increase the Participation of Women in Politics.

Lim, H. K. (2018). Women's political representation and the current state of Gyeonggido: Focused on local elections in 2018. (102). Gyeonggido Family and Women Research Institute [Issue Analysis].

Luechinger, S., M. Schelker, and L. Schmid (2024). Measuring closeness in proportional representation systems. *Political Analysis 32*(1), 101–114.

National Election Commission (2018). Election subsidy payments by year (2001-2018). National Election Commission Data Resource Archive.

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