LEARNING ABOUT WOMEN'S COMPETENCE: THE DYNAMIC RESPONSE OF POLITICAL PARTIES TO GENDER QUOTAS IN SOUTH KOREA*

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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

JEL codes: D72, D83, J16, J71, J78

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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; Esteve-Volart and Bagues, 2012; Fujiwara et al., 2024).

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.

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

[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.

("ward arm") while the rest are elected by closed list proportional representation ("PR arm").[3] The gender quota regulates only the PR arm, stipulating that all odd-number candidates in the party list be female. 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 main 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. Remarkably, by the last election, these parties had a *greater* number of female ward candidates than parties in control municipalities. Our finding that party reactions entirely flip in direction over time is novel to the empirical literature on gender quotas. A full reversal differs profoundly from reduced counteraction, documented in previous work, since it signals a transformative shift where parties actively embrace quota goals.

What is driving the initial counteraction and gradual change in the response to quotas? These changes may stem from any of the three key groups involved: potential candidates, voters, and parties. We first rule out non-party drivers. We show that the estimated patterns cannot be reconciled with parties responding to a faster growth in the supply of qualified female candidates, or with a faster change in voter preferences for women, 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 through

[3]Parties predominantly determine the set of candidates running for election. The case is obvious for the PR arm, where parties compete for seats. Even in the ward arm, 70% of candidates run with party affiliation.

the quota gain incumbency advantage, and combined with a no-re-election norm in the PR arm (Shin, 2014),[4] get renominated in the ward arm in the next election. 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 are due to parties appraising women in general differently. When political parties lack information about women as a group, their experience with individual female candidates not only helps them assess those candidates' competence but also shapes their broader perceptions of women's overall competence, influencing subsequent candidate nominations. 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.

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, even for rookies. This points towards an increase in the perceived competence of women. With a 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 information acquisition. We find that the quota effectively increases the election of rookie female councilors in the PR arm in treated municipalities, exposing parties to new signals about women's political competence. Furthermore, the initial counteraction and the subsequent reversal occur primarily in municipalities where female councilors were entirely absent before the quota, i.e. where information on women was scarce.

Next, we 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,

[4] As PR councilors get elected through party popularity rather than individual merit, it is seen as a one-time "bonus" affair.

even when beliefs are accurate, as formalized in Beaman et al. (2009).[5] 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. This is not consistent with new information merely reducing the uncertainty around the competence of women, which should happen irrespective of ability.[6]

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.[7]

We contribute to a large literature on gender quotas and their role in enhancing female representation. Previous research has studied when quotas are effective, how they should be designed, and how they impact policy.[8] However, the question of how quotas influence perceptions or beliefs still remains underexplored (Dahlerup, 2021), with existing studies focusing on the constituents.[9] This includes the closest paper to our study, Beaman et al. (2009), which finds that exposure to female politicians improves perceptions of female leader effectiveness among voters. In contrast, we focus on political parties.[10] Studying party beliefs is both crucial and complementary to the study of voter beliefs because i) voter discrimination becomes less consequential if, as gatekeepers, parties deny women the opportunity to run in the first place, and ii) feedback loops between party and voter discrimination can perpetuate systemic gender biases in political representation.

We also contribute to the literature on discrimination, studied both theoretically and empiri-

[5]NBER Working Paper (14198) version.

[6]We use education as a proxy for competence, which works well in our setting. Candidates with high education levels get higher vote shares, indicating that voters care about candidates' education. Further, parties place candidates with higher education levels in the most competitive wards, where candidate quality matters more for electoral success (Esteve-Volart and Bagues, 2012). We also confirm that the same result is obtained using an alternative proxy for competence: whether one has previous political experience (serving as a party member).

[7]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).

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

[9]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).

[10]Party beliefs are peripherally investigated by Bhavnani (2009). He presents "weak evidence" (p.32) that reserving seats for women helped parties learn that women can win elections: parties with higher success rates of female candidates nominate a higher share of female candidates in the next election. However, the correlational evidence is limited by the small sample size (four observations; one per party) and could be confounded by a higher number of women benefiting from incumbency advantage.

cally 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 of statistical discrimination with biased beliefs, implying that inclusion does not come at the expense of competence,[11] but rather, corrects a persistent misallocation of talent. Our study exemplifies how quotas aid the escape out of "learning trap" discrimination dynamics (Komiyama and Noda, 2024; Lepage, 2024) – where a society is stuck in an equilibrium with little learning about the quality of members of a disadvantaged group.

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. 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 with ours. This highlights two points we make: the importance of electing *competent* women to propel the process of learning,[12] and the importance of examining effects over the long term.

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

[11] The weak trade-off between inclusion and competence is empirically documented in other settings (e.g. Bagues and Campa, 2021; Besley et al., 2017; Weeks and Baldez, 2015; Baltrunaite et al., 2014; Murray, 2010 for gender, or Dal Bó et al., 2017 for socioeconomic background).

[12] 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.

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, such as 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 villages. All candidates ran as independents with no party affiliation.

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[13]: a closed 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, so multiple candidates from one party could run in the same ward.[14] 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, e.g. 1 out of 10 total council seats, around 90% of elected PR councilors turned out to be the first candidates on the lists and therefore female. Consequently, the introduction of quotas sharply increased the share 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 rose beyond the stipulations of the quota: 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.

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

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

Table I - Descriptive Statistics on Councilors and Candidates

	Quota on PR arm (passed in 2005) ↓						
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
ward candidates	50.8	33.0	35.8	34.3	25.0	23.3	23.1
PR candidates	-	-	-	4.39	3.88	3.23	3.84
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
PR candidates	-	-	-	0.76	0.83	0.91	0.93
PR candidates, rank 1	-	-	-	0.91	1	1	1

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. "Rank 1" PR candidate refers to the first candidate of a party in the PR party list. The sample includes the municipalities in the analysis, excluding five municipalities that merged over time. Statistics including all municipalities are extremely similar. Due to imperfect compliance, the rank-1 PR candidates are not all women in 2006, but there is no difference between treated and control municipalities (p-value=0.65). For descriptive statistics on party lists, refer to Table B.1.

Political landscape Over the sample period, South Korea's political landscape was dominated by two blocs (Conservatives and Progressives), reflecting contrasting views on economic policy, welfare programs, and North Korea relations. Deep-set regional loyalties played a pivotal role in party support. Small parties periodically emerged to challenge the duopoly but struggled to gain traction.

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, there was consensus on the need to address South Korea's low levels of women's political representation, and both major parties led the passage of the gender quota. 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[15] (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.

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

II.B Data

Our data is collected by scraping the website of the National Election Commission (2018). The website posts comprehensive information on all past elections, including candidate details, vote counts, and elected councilor lists.

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. We use personal information to track incumbency status, and use candidate numbers (order on the ballot) to distinguish candidate positions with high likelihoods of election. We also use occupational and educational information as measures of competence.

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 obtained in the PR arm of the latest election before each municipal council election. Moreover, the gap in vote shares of male and female ward candidates informs us of voter preferences for women.

Because ward divisions are centrally determined based on population size, the NEC also publishes population data, such as the number of residents by ward, voting eligibility, and gender. These data are used in balance tests.

Supplementary non-election data from other sources such as data on municipal budgets, used in balance tests (Table II) and descriptive figures (Figures A.1 and A.6), are explained in the table and figure notes.

III Empirical Strategy

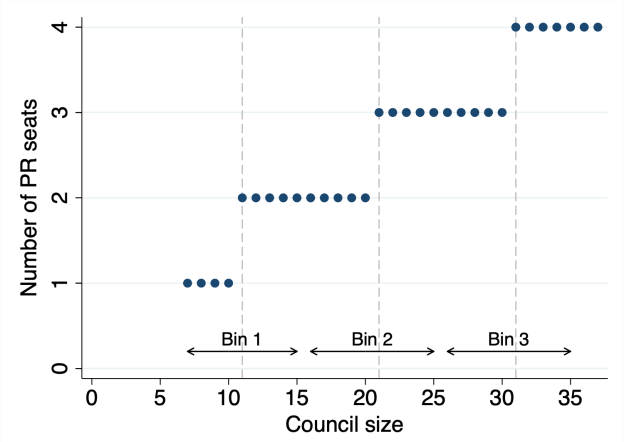
III.A Regression discontinuity design around the number of PR seats

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.

We exploit the discontinuous change in the number of PR seats in a regression discontinuity

design: we compare the set of candidates in municipalities on each side of the threshold, 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, within bins.

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: bin 1 $= \{7, 8, ..., 15\}$, bin 2 $= \{16, ..., 25\}$, and bin 3 $= \{26, ..., 35\}$. Councils in the same bin above and below the threshold are assigned to treatment and control groups, respectively.

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.[16]

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 council c in 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 baseline running variable is $x_{cb} \equiv (\text{council size})_{cb} - \text{threshold}_b$ in cycle 4, with $\text{threshold}_b \in \{11, 21, 31\}$.[17] However,

[16]Treatment status changes for only 5.4% of council×election cycle observations during the analysis period.

[17]Note that the running variable is discrete (low degree of variability), so equation (1) is not suitable for the

when the outcome variable relates to ward elections, we change the running variable to $\tilde{x}_{cb} \equiv$ (N. of ward councilors)$_{cb}$ $-$ (N. of ward councilors at the threshold)$_b$ in cycle 4, to facilitate the interpretation of the coefficients.[18]

(*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 bins, in election cycle s. Moreover, the baseline function form of f is linear and fixed to be the same 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.3- B.5. X_{cbt} denotes control variables, such as contemporaneous council size or the number of ward councilors. The rationale behind the control is explained in Section IV.A.

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. Several 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.[19]

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.

Figure II illustrates this in two ways. Panel A plots the average of the raw number of female PR councilors for each value of council size, pooling all post-quota cycles. The sharp rise in the number of PR councilors at the threshold is evident in bins 1 and 2. The rise in bin 1 is larger than in bin 2, because the likelihood of the additional PR seat going to the number-1 candidate of the next-most popular party, rather than the number-2 candidate of the same party, is higher.

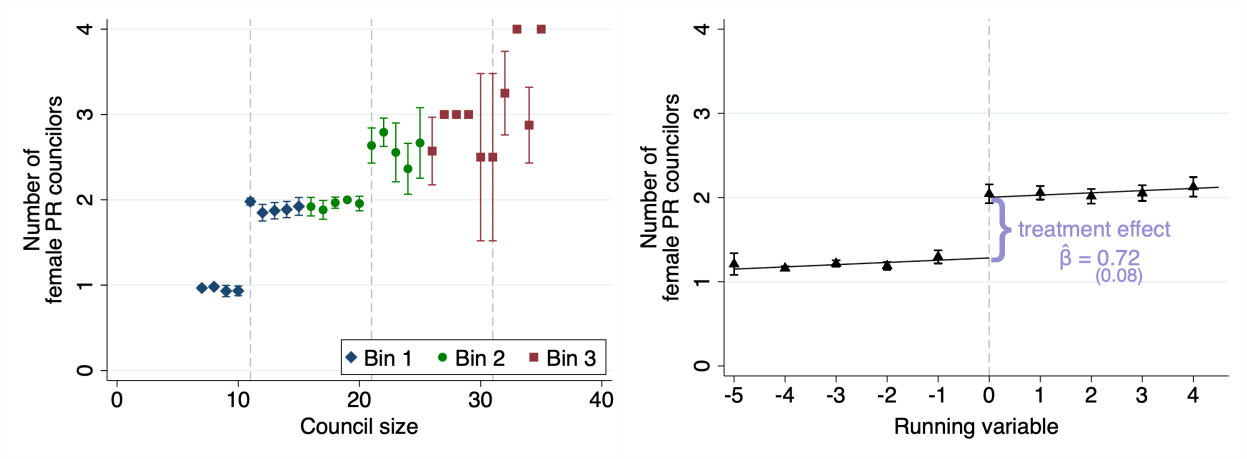
RD estimation method using optimal bandwidths (Calonico et al., 2014) that is common in regression discontinuity designs. However, we check that the estimated treatment effect is robust to different bandwidths, i.e. number of seats around the threshold (Table B.2). We use optimal bandwidths and graph the accompanying RD plots in another regression specification we introduce later, where the method is suitable (Table IX, Figure A.4).

[18]The difference between x_{cb} and $\tilde{x}_{cb}$ arises from the discrepancy between council sizes and the number of ward councilors at the threshold. For example, consider councils with 11 councilors (treated) and 10 councilors (control). Although their council sizes differ by 1, both have 9 ward councilors. Thus, for outcomes relating to the ward arm (e.g. number of female ward councilors), using the running variable based on council size (x_{cb}) would effectively mean comparing a treated council with *one fewer* ward councilor to the control. Thus, even when treatment increases the number of female ward councilors, the coefficient can still be negative. Redefining the running variable to $\tilde{x}_{cb}$ solves this issue. As a case on point, if the outcome was the total number of ward councilors, using x_{cb} yields a treatment effect of -1, whereas using $\tilde{x}_{cb}$ yields 0. Changing the running variable this way does not change much else; $\hat{\alpha}_b$, $\hat{\alpha}_t$, $\hat{\gamma}$, and the R^2 stay the same.

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

The rise is unclear in bin 3 though, where we also have very few observations.[20] Therefore, in the reduced-form results that follow, we restrict our sample to bins 1 and 2.[21]

Figure II - Treatment Effect on the Number of Female PR councilors



Note: Panels A plots the average raw number of female PR councilors by council size, pooling all post-quota cycles. Error bars represent 95% confidence intervals; where missing, only one observation exists. Panel B contains the analysis sample (bins 1 and 2). It illustrates the results of equation (1), except with a constant treatment effect for presentational clarity. The triangles plot the average number of female PR councilors, residualized and re-centered for bin and cycle effects (α_b and α_t), for each value of the running variable (x_{cb}). The lines represent $f(x_{cb})$.

Panel B contains exactly this analysis sample. It illustrates the results of equation (1), except with a constant treatment effect for presentational clarity: $Y_{cbt} = \alpha_b + \alpha_t + \beta \cdot (\textit{Treat in cycle } 4)_{cb} + \pi x_{cb} + \epsilon_{cbt}$. The triangles plot the average number of female PR councilors, residualized and re-centered for bin and cycle effects (α_b and α_t), for each value of the running variable (x_{cb}). Again, the (residualized) number of female PR councilors sharply increases at $x_{cb} = 0$, and $\hat{\beta} = 0.72$ indicates that there are 0.72 more female PR councilors at the threshold. Note that the number of female PR councilors slightly increases in the running variable (the slope of the fitted line, also plotted, is $\hat{\pi} = 0.026$), unlike the "flat" raw averages in Panel A, because the running variable is based on cycle-4 council size and council sizes grow slightly over time.

If we estimate equation (1) with heterogeneous treatment effects by election cycle,[22] we find that the treatment increases female PR councilors by a similar magnitude each cycle. The constancy in the direct effect 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

[20] Bin 3 contains 9 municipalities and 30 municipality×election cycle observations.

[21] We also exclude five municipalities which merge into two larger municipalities over time. Our results are robust to alternative sample criteria: all municipalities (Appendix Table B.6) and additionally excluding one municipality that becomes a provincial council in election cycle 6 (Appendix Table B.7).

[22] Results can be found in Table IV, column 4.

on other outcomes over time can be safely attributed to the initial treatment leading treatment and control groups on different paths.

Finally, to formally test the regression discontinuity design, we check in Appendix Section D.2 that the number of female PR councilors increases only at the threshold and at no other point.

III.C Validity of the regression discontinuity design

Balance Tests 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. We show that there are no discontinuities in *pre-determined* characteristics at the threshold in cycle 4. Table II 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.[23] 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 ward election arm, i.e. the number and size of wards, are balanced as well (columns 5-6).

[23]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 II - 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	-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	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	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	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	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

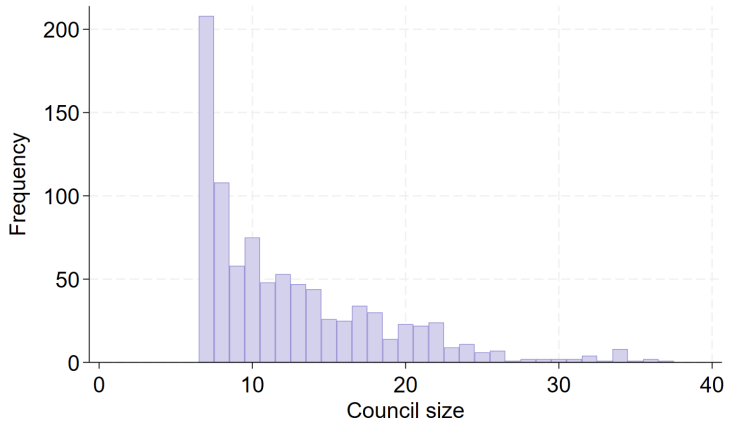
Note: This table shows the absence of discontinuities in pre-determined characteristics at the threshold in cycle 4. The regression specification follows equation (1). The sample consists of bins 1 and 2 in election cycle 4. Panel A: residents, residents of voting age, and number of households by gender/citizenship status (source: National Election Commission, 2018). Panel B: province-level information on hours spent on unpaid domestic or care-giving services (Statistics Korea, 2004), and number of employed/unemployed individuals by gender (Statistics Korea, 2005). Panel C: province-level information on education attainment by gender (Statistics Korea, 2005). 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, 2005), and number and size of wards in each municipality (National Election Commission, 2018). Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

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 III 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.[24]

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 are not allowed to join.[25] 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.

Figure III - Histogram of Council Size



Note: The figure displays the number of councils for each council size, in election cycles 4, 5, 6, and 7.

[24]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 $k \in \{0, 0.01, 0.02, 0.05\}$.

[25]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.

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.[26]

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 III 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.

Table III - 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 running in the ward arm in each election cycle by gender. The regression specification is given by equation (1). Since municipality size and divisions change dramatically during the first three cycles, to ensure comparability before and after the reform, (i) we define the running variable and treatment status contemporaneously – it would be inaccurate to use cycle 4 municipality characteristics to define treatment for earlier cycles; (ii) the sample includes all bins – restricting the sample only to bins 1 and 2 would imply selecting different municipalities before and after the reform. In addition, the sample includes candidates with no party affiliation, as no candidates were affiliated before cycle 4. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

[26]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).

Discussion on SUTVA The Stable Unit Treatment Value Assumption (SUTVA) requires no spillovers across treatment groups. While we are less worried about the violation of SUTVA in the first election after the quota, it is possible that party learning in treatment municipalities spills over to control municipalities, e.g. through communication with party leaders at the district or national level. If this were the case, our treatment effects would be underestimated, indicating that our long-term results represent conservative estimates of the effect of the quota.

IV MAIN RESULTS

IV.A The evolution of councils' gender composition

Did the reform have the intended effect? Table IV reports the results of equation (1) on the number of male and female councilors elected in each municipality, by election arm.

In the first cycle after the introduction of the quota (cycle 4), treated municipalities display an overall higher number of elected female councilors (column 6), although the increase is not statistically significant. Column 4 shows 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, this effect is partially offset by 0.33 fewer women, and 0.45 more men, getting elected through the unregulated ward arm (columns 1-2).

Table IV - Treatment Effect on the Number of Councilors

	All political parties					
Election arm:	Ward		PR		All	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Treat in cycle 4 × Cycle 4	0.45*	-0.33	0.09	0.76***	-0.29	0.29
	(0.26)	(0.22)	(0.08)	(0.09)	(0.33)	(0.28)
Treat in cycle 4 × Cycle 5	-0.13	0.32	0.10	0.70***	-0.87**	0.88***
	(0.29)	(0.23)	(0.06)	(0.08)	(0.35)	(0.29)
Treat in cycle 4 × Cycle 6	-0.23	0.53*	0.09	0.70***	-0.98**	1.10***
	(0.33)	(0.27)	(0.06)	(0.09)	(0.38)	(0.32)
Treat in cycle 4 × Cycle 7	-0.28	0.82***	0.04	0.72***	-1.08***	1.41***
	(0.36)	(0.29)	(0.06)	(0.08)	(0.41)	(0.35)
Running variable form	ward	ward	council	council	council	council
N	865	865	865	865	865	865

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. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Yet, the initial treatment effect does not persist across election cycles. From election cycle 5 onward, treated municipalities elect significantly more female councilors and significantly fewer male councilors (columns 5-6). As columns 3-4 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 ward arm starting from cycle 5 (columns 1-2). By cycle 7, 0.82 more female ward councilors are elected in the treated municipalities than control.

One factor to note is that the councils that were treated in cycle 4 get slightly larger over time compared to control, as signified by the sum of male and female councilors in columns 5-6.[27] To account for this, we control for contemporaneous council size in all subsequent tables estimating equation (1) (as with the running variable, we control for contemporaneous number of ward councilors, instead, for outcomes relating to the ward arm).

IV.B Party strategies and candidate selection

As election outcomes, the results in Table IV 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,[28] we delve into parties' candidate selection. We return to the discussion of voter preferences in Section V.A.

Table V presents the results of equation (1) on the gender composition of candidates in each municipality by election arm. In columns 3, 6, and 9, we control for the total number (male+female) of candidates in each arm. This is 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. The coefficient then represents the number of additional female candidates (=fewer male candidates) in councils above the threshold compared to below, holding the total number of candidate positions to be the same. A positive coefficient indicates that a woman is partially substituting a man for any given candidate position, and therefore corresponds to a higher female share of candidates.

The results on candidates mirror the previous results on elected councilors, with key findings in the ward arm (columns 1-3). In response to the treatment in cycle 4, parties initially nominate 3.78 more male ward candidates. However, this number gradually decreases, leading to 2.24 fewer

[27] If we defined treatment status contemporaneously, the coefficients in columns 1 and 2 would have summed to 0, those in columns 3 and 4 to 1, and those in columns 5 and 6 to 0, each election cycle.

[28] 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.

male ward candidates by cycle 7. These results are graphically represented in Appendix Figure A.3, as an example of an RD plot for the ward arm. The opposite trajectory holds for female ward candidates: the coefficient sign changes from negative (albeit statistically insignificant) in cycle 4 to positive from cycle 5 onward. Combining the results for each gender, column 3 shows that parties in treated municipalities nominate 1.09 more females (1.09 fewer males) than in control municipalities by the last election cycle.

Table V - 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
Fix (male+female) total	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). Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

The increase in female candidates is also observed in the PR arm (columns 4-6). The negative coefficient of cycle 4 in column 6 – indicating a lower female share of PR candidates in treated than control – does not necessarily represent an intentional nomination strategy against women. Rather, it could also be due to treated councils having an additional PR seat, which results in longer PR party lists with higher likelihood of including men.[29] However, the growth in the number of female PR candidates over time in column 5 and the positive coefficient in cycle 7 in column 6 are indeed meaningful. They imply that more and more women are replacing men in the even-number positions on the party list in treated municipalities compared to control.

In sum, parties initially counteract the quota by placing fewer female candidates in the unregulated ward arm, but they gradually reverse their candidate selection strategy.

[29]E.g., if all parties prefer not to nominate women unless forced, control parties in bin 1 will nominate 1 woman each, and treated parties in bin 1 will nominate 1 woman and 1 man each, resulting in a lower female share in treated.

IV.C Focusing on candidates likely to get elected

Table V provides evidence on the composition of the overall pool of ward candidates in each municipality in each election cycle. Pooling all participating parties confounds the 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.[30] 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 consequential 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 or only candidate of the party in the ward.

Table VI - 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
Fix (male+female) total	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, because in one municipality×election cycle, main parties only had 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). Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table VI shows that when we restrict our attention to the main parties, the pattern is starker. Focusing on column 3, the initial counteraction and final reversal are both stronger than in column

[30] Due to frequent party rebranding (name changes), mergers, and splits, we follow the largest faction in each of the two dominant blocs (Conservatives and Progressives).

3 of Table V.[31] These patterns are evident also in pivotal positions in the ballot (columns 4-9).

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 VII 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 find that the treatment offers an incumbency advantage to more women among those already in the candidate pool. Furthermore, the effect spillovers 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 and an increase in women's power within the party.

[31] Unlike column 3, we cannot directly compare the magnitude of the coefficients in columns 1 and 2 of Tables VI and V, because the number of candidates from the two main parties is a smaller number with smaller variance, by definition, than the number of candidates from any party.

Table VII - Paper Summary

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

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 The quota may have encouraged more women to step forward as potential candidates. 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. We take two approaches.

First, 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 improved in average quality or merely expanded without a change in quality, parties would be able to choose a larger number of qualified females from the top distribution of the pool. Empirically, however, the gender gap in characteristics related to candidate quality does not evolve differently between treatment and control municipalities. Table B.8 presents the results of an individual-level version of equation (1) with multifaceted measures of education[32] and political experience as dependent variables.[33] The coefficient of the interaction between the treatment dummy and the female dummy is never statistically significant.

Second, if the pool of potential candidates expands, there will be an increase in the number of independent candidates as well. Independents are individuals with no party affiliation who run on their own initiative in the ward arm. Supply-side mechanisms such as role modeling should be stronger for them, because they bypass party screening, bias, or strategic efforts to limit the number of candidates to avoid splitting votes. However, we show in column 2 of Appendix Table B.9 that the treatment effect on the number of female ward independent candidates is statistically insignificant for all cycles, with no clear pattern – some times positive and other times negative.

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.10 show that coefficients on the treat-

[32] In addition to basic measures such as years of schooling, we include whether the highest degree was awarded from a top 20 university – as ranked in any year between 1995 and 2019 by the JoongAng Newspaper Annual University Rankings.

[33] The regression specification is in Appendix Section D.3.

ment dummy interacted with the female dummy are statistically insignificant, 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, fueled by a no-re-election norm in the PR arm (Shin, 2014), grants them access to the ward arm. When we divide ward candidates by incumbency status (Table VIII), parties do nominate more incumbent women in the ward arm over time (columns 1-3).[34]

Table VIII - 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
Fix (male+female) total	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 (male+female) of incumbent and rookie ward candidates, respectively. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

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

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.[35]

The results are reported in Table IX, and for key outcomes, accompanying RD plots are in Appendix Figure A.4. Columns 1 and 2 show one-period-ahead effects. The probability that the number-1 PR candidate in cycle $t-1$ is renominated as a ward candidate in cycle t is higher by 46 percentage points if she got elected in $t-1$ (column 1). Hence, parties clearly factor in incumbency advantage during ward candidate selection. The renomination of the elected PR woman raises the overall female share of ward candidates of the winning party in cycle t, which is 14 percentage points higher than that of the losing party (column 2).

Table IX - The Effect of a Party's First PR Candidate Winning in Close Elections on the Party's Future Candidate Composition

	Effect of PR1 candidate at t-1 winning on...		**Effect of PR1 candidate in cycle 4 winning on...**					
	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)			Number of rookie female ward candidates, t		
	t=5,6,7	t=5,6,7	t=5	t=6	t=7	t=5	t=6	t=7
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Winner_{t-1}	0.46***	0.14***						
	(0.09)	(0.05)						
$\text{Winner}_{t=4}$			0.34**	0.19	-0.01	-0.01	0.47**	1.33***
			(0.14)	(0.17)	(0.05)	(0.09)	(0.23)	(0.43)
Running var.	Vote margin for winning 1 PR seat, t-1		Vote margin for winning 1 PR seat, cycle 4					
Bandwidth	0.179	0.116	0.182	0.199	0.139	0.122	0.216	0.141
N	311	220	121	133	114	98	141	114

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 3-8 report the cumulative effects of winning in cycle 4 for each future cycle separately. We use the mean-squared-error-optimal bandwidth proposed by Calonico et al. (2014). The regression discontinuity plots of the binned sample means of the outcome variable for columns 1 and 8 are in Figure A.4. The standard errors (in parenthesis) are clustered by municipality×party. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

[35] 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 are in Appendix F.

How far does the incumbency advantage go in explaining the increase in female ward candidates in the long term? Columns 3-8 report the dynamic cumulative effects of marginally winning the first PR candidate in cycle 4. Columns 3-5 show that the incumbency effect does not persist. The probability of her renomination decreases and becomes statistically insignificant in cycle 6, and drops to zero in cycle 7.[36] Critically, however, columns 6-8 show that winning the first PR candidate in cycle 4 gradually increases the number of female *rookie* candidates, from zero more in cycle 5, to 0.47 more in cycle 6 and 1.33 more in cycle 7.[37]

Therefore, parties that randomly experience a quota woman in action nominate more female rookies in the long term. The party-level analysis supports the aggregate result at the municipality level in Table VIII, that being above the council size threshold in cycle 4 increases the overall number of female ward candidates not only through PR women gaining incumbency advantage, but also through more female rookies gradually gaining access to the ward elections.

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.

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, a key change that tightens the link between the model predictions and the empirics. Moreover, we allow for two types of discrimination, taste-based and statistical. 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, not just about the individual but also about the group, similarly to Lepage (2024).

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

[36] 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. After all, the average age of candidates is around 50 for both men and women, even for rookies, and 2 terms is already 8 years.

[37] The patterns are similar when we estimate the effect on the female share of rookie candidates of the party.

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.[38]

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.[39] 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[40]

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

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

[38] Hence, the signals do not contain information on the value of μ_g.

[39] We assume for simplicity that the variances of ability and signal (σ^2 and σ_s^2) are the same across gender and that parties know these values, which allows us to focus on their perceptions of μ_g. Learning about productivity variance or individual signal precision affects the weight attached to individual signals versus group membership but leaves substantive implications unchanged.

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

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:

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

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[41,42]

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

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.[43]

Given the observed abilities, the party also learns about the average ability of each gender μ_g.

[41] 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.

[42] 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 $\mathbb{E}(V_{R,w}) = \tilde{E}\left[\Phi\left(a_i - A_{L,w} - |I^w - I_R| + |I^w - I_L|\right)|s_i,g,t\right]$.

[43] 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 IX where parties that marginally won a quota woman nominate more rookie females in later elections than parties that marginally lost.

The party makes an maximum-likelihood inference about the value of μ_g, 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 **s** to have true abilities **a**?"

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

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

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:

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

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

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

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 the one with the second-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.[44] 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 $W+1$

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

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 from the parts of the signal distribution above $\bar{s}_g$. The female share of candidates is then $\frac{1-\Phi\left(\bar{s}_f/(\sigma^2+\sigma_s^2)\right)}{2-\Phi\left(\bar{s}_f/(\sigma^2+\sigma_s^2)\right)-\Phi(\bar{s}_m/(\sigma^2+\sigma_s^2))}$.[45]

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 a clear 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 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

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

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 less competitive 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 Two comparative statistics are relevant to our empirical exercise. 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: $\frac{\partial(\tilde{\mu}_{g,t+1} - \tilde{\mu}_{g,t})}{\partial a_i} = \frac{\partial(\tilde{\mu}_{g,t+1} - \tilde{\mu}_{g,t})}{\partial \hat{\mu}_g} \frac{\partial \hat{\mu}_g}{\partial a_i} > 0$

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.

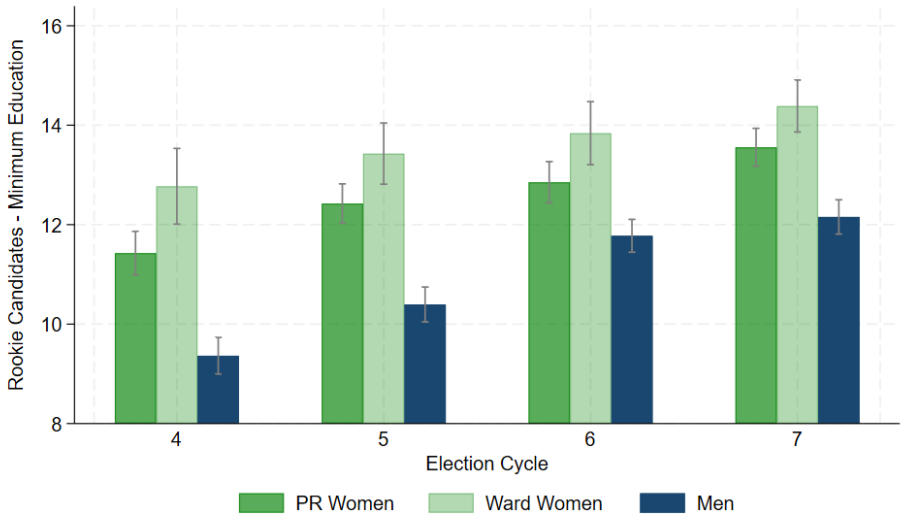
The discrimination framework Before we jump into interpreting the treatment effects of quotas through the model, we establish through a descriptive exercise that the discrimination framework is appropriate for studying party strategies.

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. We test this prediction using candidates' education, which is a correlate of ability observable to parties at candidate selection.[46]

[46]We use education because, apart from it being a common measure of ability in the literature (e.g. Bagues and Campa, 2021; Baltrunaite et al., 2014), it is a good proxy of competence in our setting. Voters value education, as

Figure IV shows that this prediction is empirically met in the data. We plot, for each 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.[47] 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.

Figure IV - Minimum Education of Rookie Female and Male Candidates



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.

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. Through the lens of the model, a decreasing ($\bar{s}_f - \bar{s}_m$) suggests that discrimination against women is weakening.

candidates with high education levels win higher vote shares in the data. Furthermore, parties allocate candidates with higher education to the most competitive wards, where the cost of withholding the highest-ability candidates is greater (Esteve-Volart and Bagues, 2012).

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

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 X displays the evolution in the gender composition of candidates across different wards – stronghold, competitive, and weakhold – defined based on the party's margin of victory in the PR arm in the latest election in each ward (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.[48] As the ward categorization depends on the party at hand, we estimate equation (1) at the municipality$\times$party level. We also control for variables relevant to the party when allocating candidates across wards: number of wards of each type, and average margin of victory for the party in the municipality.

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).[49] 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). Focusing on candidates in useful positions, columns 5 and 11 show that parties in treated municipalities nominate 0.17 fewer women in non-competitive wards initially, and 0.32 more women in competitive wards by the last cycle. These patterns all hold when we look at rookie candidates only (Appendix Table B.13), indicating that they are not driven by an alternative story of incumbency advantage,

[48] Stronghold, competitive, and weakhold wards correspond to victory margins of ≥ 0.05, $[-0.05, 0.05)$, and < -0.05, respectively. The distribution of the margin of victory (and details on how it is constructed) is in Figure A.5.

[49] This model prediction is also consistent with the initial counteraction being concentrated among rookie females, a result reported in Table VIII. 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.

Table X - 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	-0.00	-0.07	-0.05	-0.03	-0.05	-0.03	-0.06	-0.09	-0.09*	-0.08	-0.17**	-0.15**
	(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	0.05	0.02	0.05	0.19**	0.15*	0.14**	0.03	0.03	0.05	0.06	0.04	0.09
	(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	0.06	0.00	0.01	0.23**	0.21**	0.16*	0.04	0.03	0.02	0.08	0.02	0.03
	(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	0.41***	0.36***	0.32***	0.03	-0.00	-0.02	0.11	0.01	-0.01
	(0.05)	(0.04)	(0.04)	(0.12)	(0.11)	(0.10)	(0.06)	(0.06)	(0.05)	(0.09)	(0.08)	(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
Party dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N. of wards of each type	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Average margin of victory	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fix (male+female) total	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No

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 A.5 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. The columns for "Useful" and "Rank 1" (defined under Table VI) represent increasingly high-up positions on the ballot paper, implying higher likelihoods of winning. We control for the number of wards of each type, party dummies, and the average margin of victory for the party in the municipality. We also control for the total number (male+female) of relevant ward candidates, except in columns 3, 6, 9, and 12, since the total number of rank 1 candidates is perfectly multicollinear with the number of wards. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

as opposed to candidate quality, being more important in competitive wards.

Our results by competitiveness of wards demonstrate that a reduction in taste-based discrimination is not able to reconcile the reversal in party strategies across election cycles. Instead, they are consistent with a reduction in statistical discrimination.[50] 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).

Table XI - 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
Fix (male+female) total	No	No	No	No	No	No

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. 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. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

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 XI looks at the effect of being above the threshold on the

[50] 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.

number of elected rookie and incumbent female councilors in the two arms.[51] 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, the additional women are solely rookie women. As a consequence, despite parties' counteraction of the quota resulting in a lower number of female ward councilors in cycle 4 (both rookies and incumbents), the *total* number of female rookie councilors in treated municipalities is higher overall (column 6), even if not significantly so in cycle 4. Hence, the quota exposed parties to new female politicians in action.

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 XII, 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 XII - 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
Fix (male+female) total	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 total number (male+female) of relevant ward candidates (either all or rookie). Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

[51] In this table, we do not fix the male+female total because we are interested in the raw number of new signals about women the treatment brings in, as opposed to how parties select candidates between men and women.

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.[52]

In this section, we present the key evidence demonstrating the existence of downward-biased beliefs: not only the number of women but also the competence of the women experienced matters. If beliefs are accurate, experiencing new women solely reduces the noisiness of the signal and it would happen irrespective of the women's ability. On the other hand, if beliefs are biased, then experiencing more competent women would update beliefs faster toward the truth (comparative static 2).

Table XIII displays the results of a heterogeneity analysis by the quality of the first female PR councilors. Once again, we use candidates' education as a proxy for competence. 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.

Table XIII - 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
Fix (male+female) total	Yes	Yes	Yes	Yes
Characteristics of cycle 4 female candidates	No	Yes	No	Yes

Note: This table reports the results of specification (1) where 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 total number (male+female) of ward candidates. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

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

We find that the shift towards female ward candidates takes off faster and is stronger when the first elected PR women are more educated. The comparison of columns 1 and 3 shows that already in cycle 5, there are 0.77 more female (0.77 fewer male) ward candidates in treatment municipalities than control, but only among the municipalities experiencing high-ability women. The treatment effect is also larger in magnitude and more statistically significant every cycle.

The same results hold in columns 2 and 4, where we add controls to ensure that the treatment effect heterogeneity is not driven by pre-existing disparities in the available pool of women between the above- and below-median municipalities. These controls are i) the number of, and ii) the average years of schooling of, all female candidates from the two main parties in cycle 4.

Lastly, it is worth noting that the results are robust to using an alternative proxy for competence: women's ex-ante political experience (Appendix Table B.11).[53]

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.[54] The statistically insignificant coefficients in Table B.12 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

[53]Whether a woman has ex-ante political experience is inferred from the declared "current occupation" during candidacy registration. 27% of women elected in the PR arm in cycle 4 have political experience, almost all serving as party members and a few others working for elected Members of the National Assembly. It differs from incumbency status, as only one of the elected PR women in cycle 4 served as a councilor before.

[54]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.

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 IX 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. 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 powerful enough to alter the party objective to one that secures the election of more women. Our results resonate with Spaziani (2022)'s finding that gender quotas in Italian municipal elections were limited in bringing women into positions of power.

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 non-political settings, such as company boards, where incumbents are similarly, if not more, male-dominated and attitudes are often male-biased (Figure A.6). 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.

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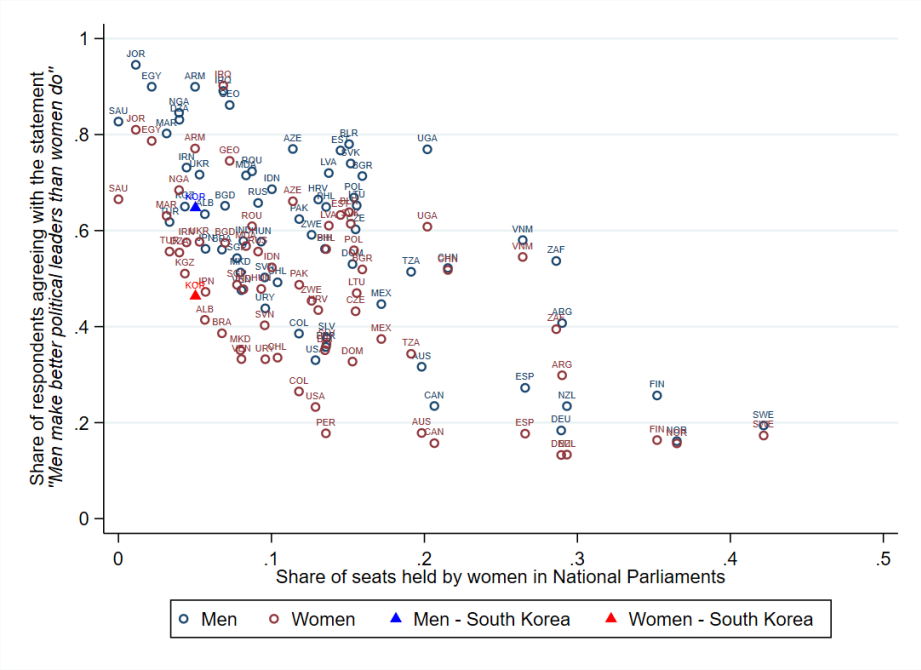
Online Appendix

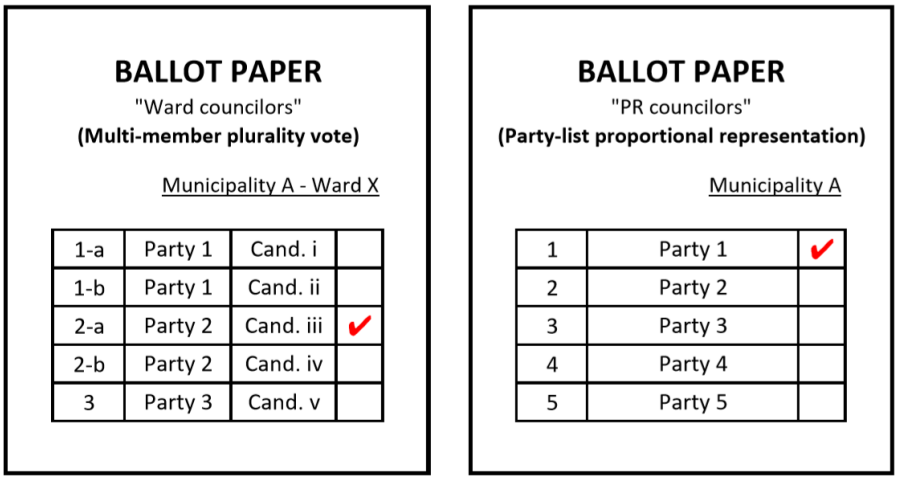
Appendix A ADDITIONAL FIGURES

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



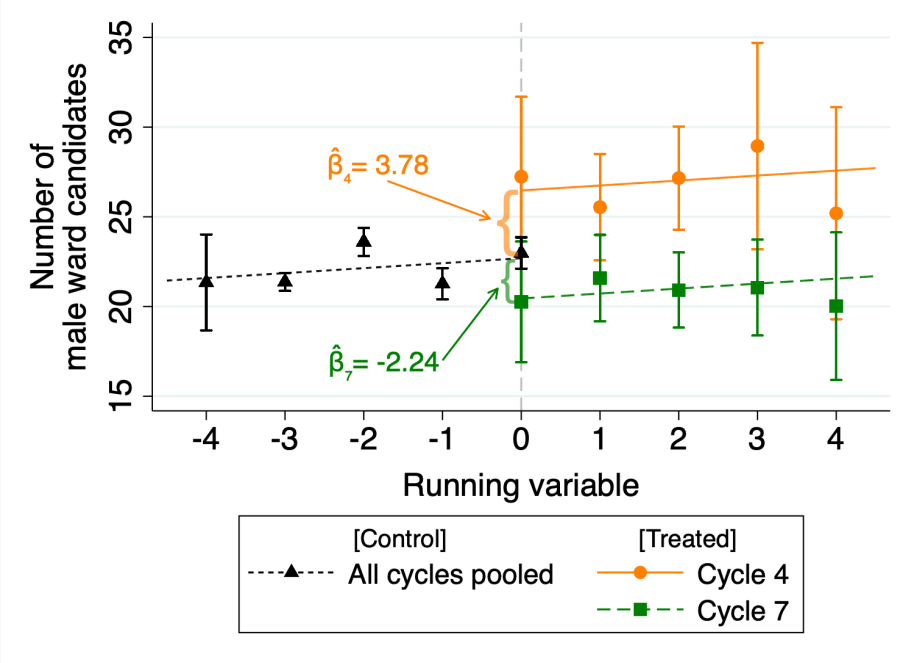
Note: The graph depicts the cross-country correlation between attitudes towards women as political leaders and female representation in National Parliaments in the period just before the introduction of the quota in South Korea (2005). On the y-axis, attitudes towards women are measured as the share 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) (Inglehart et al., 2018). Higher values indicate attitudes more favorable towards men. The x-axis displays the share of seats held by women in national parliaments according to the Inter-Parliamentary Union (2004), average years 1995-2004. South Korean respondents are indicated with a triangle.

Figure A.2 - Ballot Papers in Municipal Council Elections



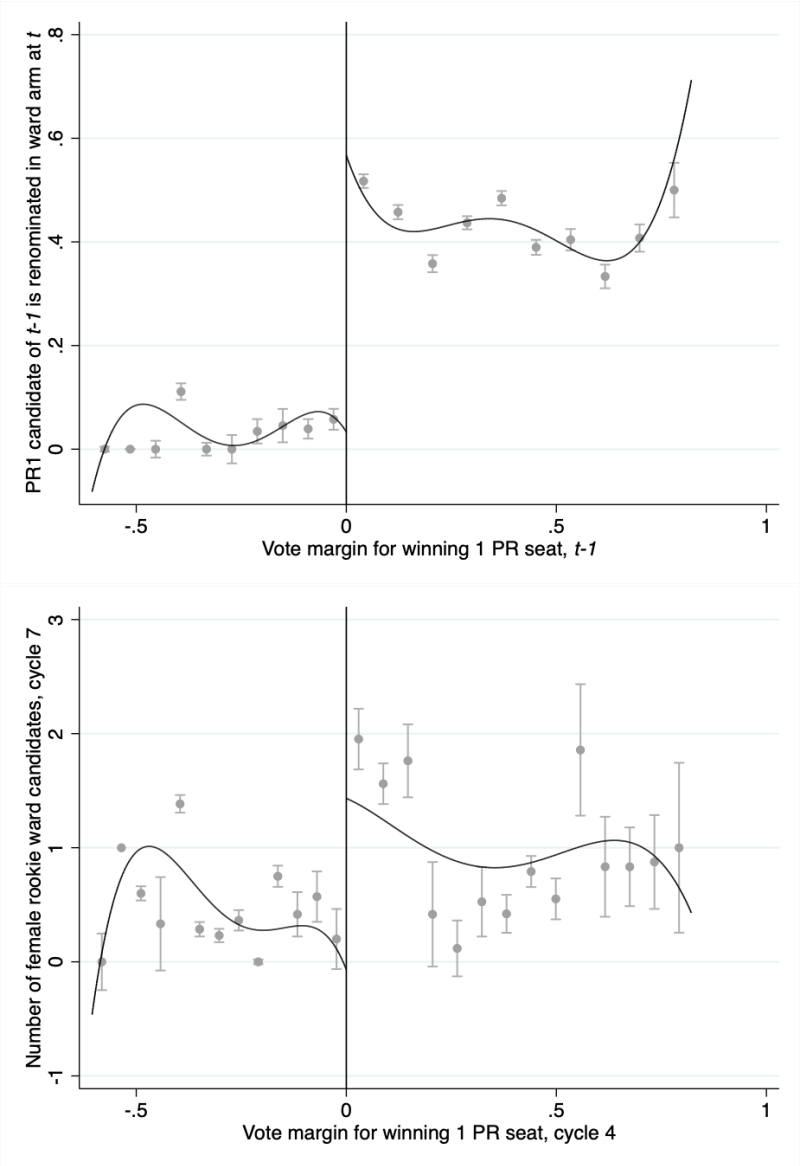
Note: This figure illustrates the ballot papers for a voter residing in ward X of municipality A. The left is used to vote for ward councilors and the right for PR councilors. The ticks indicate how a voter might vote.

Figure A.3 - Treatment Effect on the Number of Male Ward Candidates



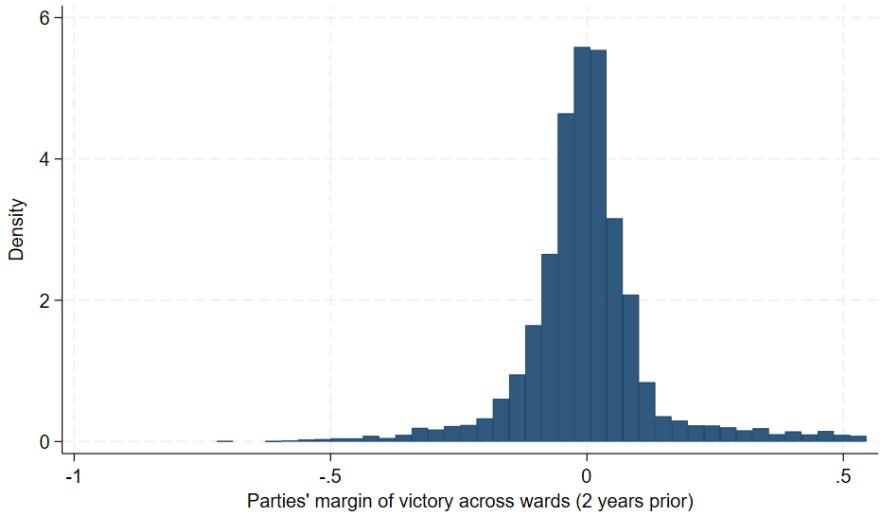
Note: This figure is the graphical counterpart to the results in Table IV, column 1, of estimating equation (1). It plots the average number of male ward candidates, residualized and re-centered for bin and cycle effects (α_b and α_t) and the control variable (contemporaneous number of ward seats), for each value of the running variable ($\tilde{x}_{cb}$). The error bars indicate 95% confidence intervals of each mean value. Only the treatment effects for cycles 4 and 7 are shown for presentational clarity. The lines (short-dashed, dashed, and solid) represent $f(\tilde{x}_{cb})$. Because the running variable is based on the ward arm ($\tilde{x}_{cb}$), it ranges from -4 to 0 for control municipalities, in contrast to x_{cb}, the running variable in the RD plot in Figure II Panel B, which ranges from -5 to -1.

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



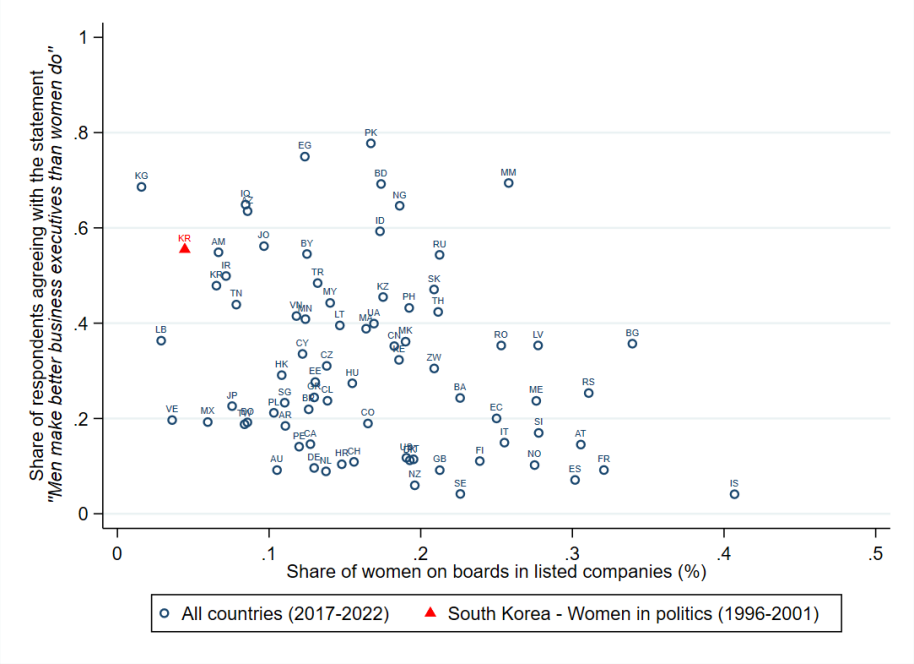
Note: Regression discontinuity plots of binned sample means with 95% confidence intervals, corresponding to results in Columns 1 and 8 of Table IX. The bins are selected to mimic the underlying variability of the data (Calonico et al., 2014), and the curves show the 4th-order global polynomial fit on each side of the cutoff.

Figure A.5 - Parties' Margin of Victory in Previous Elections Across Wards



Note: This figure plots the party's popularity in the ward. 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 sample includes bins 1 and 2.

Figure A.6 - Female Representation on Boards in Listed Companies and Attitudes Towards Women (2017-2022)



Note: The graph depicts the cross-country relationship between attitudes towards women as business executives and female representation in listed companies' boards. On the y-axis, attitudes towards women are measured as the share of respondents agreeing with the statement "Men make better business executives than women do" in the World Values Survey, wave 7 (2017-2022) (Haerpfer et al., 2020). Higher values indicate attitudes more favorable towards men. The x-axis displays the share of women on the boards of listed companies in 2022, calculated using the ORBIS database (Bureau van Dijk, 2022). Red triangle (▲): for comparison, we plot the situation of women in political bodies in South Korea just before the introduction of the quota. Attitudes towards women as politicians in South Korea are measured as the share of respondents agreeing with the statement "Men make better political leaders than women do" in the World Values Survey, waves 3 (1996) and 4 (2001) (Inglehart et al., 2018). Female representation in politics is measured as the share of seats held by women in the South Korean National Assembly (1997-2001 average) according to the Inter-Parliamentary Union (2004) .

Appendix B ADDITIONAL TABLES

Table B.1 - Candidates and Councilors by Party Affiliation

	Candidates				Councilors			
	Ward		PR		Ward		PR	
	Mean	Std	Mean	Std	Mean	Std	Mean	Std
Election Cycle 1								
Independent	1	0	-	-	1	0	-	-
Election Cycle 2								
Independent	1	0	-	-	1	0	-	-
Election Cycle 3								
Independent	1	0	-	-	1	0	-	-
Election Cycle 4								
N. parties	4.42	1.05	2.84	0.76	2.45	0.83	1.6	0.89
Independent	0.41	0.15	-	-	0.11	0.14	-	-
Progressive party	0.16	0.08	0.29	0.17	0.20	0.17	0.18	0.25
Conservative party	0.24	0.13	0.47	0.30	0.54	0.31	0.64	0.39
Election Cycle 5								
N. parties	4.50	1.82	2.88	1.62	2.63	0.69	1.67	0.65
Independent	0.32	017	-	-	0.14	0.16	-	-
Progressive party	0.21	0.16	0.30	0.29	0.32	0.26	0.41	0.39
Conservative party	0.33	0.18	0.49	0.31	0.43	0.25	0.44	0.40
Election Cycle 6								
N. parties	3.67	1.19	1.96	0.69	2.32	0.53	1.44	0.51
Independent	0.34	0.16	-	-	0.13	0.15	-	-
Progressive party	0.24	0.16	0.38	0.27	0.37	0.26	0.40	0.37
Conservative party	0.35	0.18	0.55	0.30	0.48	0.26	0.59	0.38
Election Cycle 7								
N. parties	4.68	1.45	2.67	0.96	2.45	0.63	1.43	0.51
Independent	0.20	0.16	-	-	0.09	0.14	-	-
Progressive party	0.32	0.12	0.43	0.20	0.54	0.21	0.66	0.33
Conservative party	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 independents, i.e. candidates that run with no party affiliation. The residual category (omitted) includes all other parties. For "N. parties", independent candidates are counted as 1 party.

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

	Ward				PR				All			
	Candidates		Councilors		Candidates		Councilors		Candidates		Councilors	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
***Panel A*: distance ≤ 4 (baseline specification)**												
Treat	0.18	0.58*	0.28	-0.28	0.53***	1.12***	0.08	0.71***	1.53***	1.65***	-0.89***	0.89***
	(0.80)	(0.35)	(0.22)	(0.22)	(0.15)	(0.18)	(0.06)	(0.07)	(0.48)	(0.22)	(0.27)	(0.27)
N	865	865	865	865	865	865	865	865	865	865	865	865
***Panel B*: distance ≤ 3**												
Treat	0.07	0.61*	0.29	-0.29	0.45***	1.13***	0.07	0.71***	1.61***	1.58***	-0.92***	0.92***
	(0.80)	(0.34)	(0.22)	(0.22)	(0.15)	(0.19)	(0.06)	(0.07)	(0.48)	(0.23)	(0.28)	(0.28)
N	821	821	821	821	821	821	821	821	821	821	821	821
***Panel C*: distance ≤ 2**												
Treat	1.12	0.68*	0.20	-0.20	0.43**	1.16***	0.01	0.72***	1.81***	1.59***	-0.83**	0.83**
	(0.92)	(0.36)	(0.24)	(0.24)	(0.19)	(0.23)	(0.07)	(0.09)	(0.53)	(0.28)	(0.33)	(0.33)
N	524	524	524	524	524	524	524	524	524	524	524	524
***Panel D*: distance ≤ 1**												
Treat	0.18	0.86**	0.29	-0.29	0.62**	0.89***	-0.00	0.64***	2.20***	1.50***	-1.15**	1.15**
	(1.08)	(0.41)	(0.27)	(0.27)	(0.28)	(0.31)	(0.11)	(0.13)	(0.73)	(0.39)	(0.46)	(0.46)
N	324	324	324	324	324	324	324	324	324	324	324	324
***Panel E*: distance $= 0$**												
Treat	0.56	0.68	0.21	-0.21	0.59**	0.70***	0.01	0.59***	1.03**	1.29***	-0.59	0.59
	(1.17)	(0.44)	(0.29)	(0.29)	(0.23)	(0.21)	(0.08)	(0.10)	(0.48)	(0.28)	(0.35)	(0.35)
N	164	164	164	164	164	164	164	164	164	164	164	164

Note: This table tests the robustness of the estimated treatment effect using regression equation (1) for different bandwidths. Bandwidths refer to the distance to the threshold. 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. 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 ($f(x)$: 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 in cycle 4 × Cycle 4	3.97***	-0.42	0.97***	0.94***	0.64**	-0.48**	0.10	0.76***
	(1.23)	(0.38)	(0.23)	(0.22)	(0.28)	(0.24)	(0.08)	(0.09)
Treat in cycle 4 × Cycle 5	0.60	0.31	0.67***	1.19***	0.05	0.17	0.10	0.71***
	(1.00)	(0.39)	(0.17)	(0.22)	(0.31)	(0.25)	(0.07)	(0.08)
Treat in cycle 4 × Cycle 6	-1.24	0.73*	0.28*	1.01***	-0.05	0.39	0.09	0.71***
	(0.97)	(0.43)	(0.15)	(0.22)	(0.35)	(0.28)	(0.06)	(0.08)
Treat in cycle 4 × Cycle 7	-2.05*	0.90*	0.24	1.25***	-0.11	0.69**	0.05	0.72***
	(1.12)	(0.47)	(0.16)	(0.21)	(0.37)	(0.31)	(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 of equation (1) to the choice of the functional form for the relationship between council size and the outcome. In this table, $f(x) = \pi_1 x + \pi_2 x \cdot Treat$. The baseline results are, in order, in columns 1-2 and 4-5 of Table V, and columns 1-4 of Table IV. 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 ($f(x)$: 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 in cycle 4 × Cycle 4	3.98***	-0.36	1.00***	0.89***	0.58**	-0.43*	0.10	0.77***
	(1.21)	(0.37)	(0.23)	(0.22)	(0.27)	(0.23)	(0.08)	(0.09)
Treat in cycle 4 × Cycle 5	0.61	0.37	0.70***	1.14***	-0.01	0.22	0.11	0.71***
	(0.97)	(0.38)	(0.18)	(0.23)	(0.30)	(0.24)	(0.07)	(0.09)
Treat in cycle 4 × Cycle 6	-1.23	0.79*	0.31*	0.95***	-0.11	0.43	0.09	0.71***
	(0.94)	(0.43)	(0.16)	(0.22)	(0.34)	(0.28)	(0.07)	(0.09)
Treat in cycle 4 × Cycle 7	-2.04*	0.97**	0.26	1.20***	-0.17	0.73**	0.05	0.73***
	(1.09)	(0.46)	(0.17)	(0.21)	(0.37)	(0.30)	(0.06)	(0.09)
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 of equation (1) to the choice of the functional form for the relationship between council size and the outcome. In this table, $f(x) = \pi_1 x + \pi_2 x^2$. The baseline results are, in order, in columns 1-2 and 4-5 of Table V, and columns 1-4 of Table IV. 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 ($f(x)$: 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 in cycle 4 × Cycle 4	3.86***	-0.13	0.75**	0.86**	0.69*	-0.43	0.00	0.71***
	(1.40)	(0.42)	(0.30)	(0.33)	(0.37)	(0.30)	(0.11)	(0.14)
Treat in cycle 4 × Cycle 5	0.49	0.60	0.45*	1.10***	0.10	0.23	0.01	0.66***
	(1.18)	(0.44)	(0.26)	(0.33)	(0.39)	(0.32)	(0.10)	(0.14)
Treat in cycle 4 × Cycle 6	-1.35	1.03**	0.06	0.92***	-0.00	0.44	-0.01	0.66***
	(1.12)	(0.48)	(0.24)	(0.33)	(0.42)	(0.33)	(0.10)	(0.14)
Treat in cycle 4 × Cycle 7	-2.16*	1.20**	0.02	1.17***	-0.06	0.74**	-0.05	0.68***
	(1.27)	(0.51)	(0.26)	(0.32)	(0.43)	(0.36)	(0.10)	(0.14)
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 of equation (1) to the choice of the functional form for the relationship between council size and the outcome. In this table, $f(x) = \pi_1 x + \pi_2 x^2 + (\pi_3 x + \pi_4 x^2) \cdot Treat$. The baseline results are, in order, in columns 1-2 and 4-5 of Table V, and columns 1-4 of Table IV. 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 (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***	0.47*	-0.35*	0.08	0.77***
	(1.15)	(0.35)	(0.22)	(0.22)	(0.25)	(0.21)	(0.08)	(0.09)
Treat in cycle 4 × Cycle 5	0.54	0.45	0.60***	1.08***	-0.14	0.30	0.09	0.64***
	(0.90)	(0.36)	(0.17)	(0.23)	(0.28)	(0.23)	(0.06)	(0.09)
Treat in cycle 4 × Cycle 6	-1.42*	0.91**	0.26*	1.00***	-0.23	0.52*	0.08	0.70***
	(0.84)	(0.42)	(0.15)	(0.22)	(0.33)	(0.27)	(0.06)	(0.08)
Treat in cycle 4 × Cycle 7	-2.26**	1.11**	0.21	1.24***	-0.29	0.83***	0.04	0.72***
	(1.00)	(0.44)	(0.16)	(0.22)	(0.36)	(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 selection criteria. Here we include all existing municipalities. The baseline results are, in order, in columns 1-2 and 4-5 of Table V, and columns 1-4 of Table IV. 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 (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***	0.46*	-0.34	0.09	0.76***
	(1.17)	(0.35)	(0.22)	(0.22)	(0.26)	(0.22)	(0.08)	(0.09)
Treat in cycle 4 × Cycle 5	0.42	0.51	0.65***	1.21***	-0.12	0.31	0.10	0.70***
	(0.91)	(0.37)	(0.17)	(0.23)	(0.29)	(0.24)	(0.06)	(0.08)
Treat in cycle 4 × Cycle 6	-1.45*	0.93**	0.26*	1.02***	-0.22	0.52*	0.08	0.70***
	(0.85)	(0.42)	(0.15)	(0.22)	(0.33)	(0.27)	(0.06)	(0.09)
Treat in cycle 4 × Cycle 7	-2.26**	1.10**	0.21	1.27***	-0.28	0.82***	0.04	0.72***
	(1.01)	(0.44)	(0.16)	(0.22)	(0.36)	(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 selection criteria. Here we include only municipalities for which we can observe all election cycles (balanced panel), excluding 1 municipality that becomes a provincial council in election cycle 6. The baseline results are, in order, in columns 1-2 and 4-5 of Table V, and columns 1-4 of Table IV.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 × Cycle 5	0.09	0.14	-0.02	0.02	-0.07**
	(0.12)	(0.19)	(0.03)	(0.02)	(0.03)
Female × Cycle 6	-0.02	0.01	-0.00	-0.02	-0.04
	(0.14)	(0.23)	(0.04)	(0.02)	(0.04)
Female × Cycle 7	0.37***	0.56***	0.00	-0.01	-0.03
	(0.13)	(0.21)	(0.03)	(0.02)	(0.03)
Treat in cycle 4	-0.13	-0.22	-0.02	0.06**	0.02
	(0.15)	(0.25)	(0.03)	(0.03)	(0.03)
Treat in cycle 4 × Cycle 5	-0.07	-0.11	-0.04*	-0.01	-0.05**
	(0.09)	(0.14)	(0.02)	(0.01)	(0.02)
Treat in cycle 4 × Cycle 6	-0.12	-0.19	-0.02	-0.03**	-0.00
	(0.09)	(0.15)	(0.03)	(0.01)	(0.03)
Treat in cycle 4 × Cycle 7	-0.08	-0.15	-0.03	-0.02	0.01
	(0.10)	(0.16)	(0.03)	(0.02)	(0.03)
Female × Treat in cycle 4	0.12	0.22	-0.02	-0.03	0.06
	(0.17)	(0.28)	(0.04)	(0.02)	(0.04)
Female × Treat in cycle 4 × Cycle 5	0.08	0.08	0.07	-0.02	-0.01
	(0.17)	(0.28)	(0.05)	(0.03)	(0.05)
Female × Treat in cycle 4 × Cycle 6	0.09	0.09	0.01	0.03	-0.05
	(0.20)	(0.33)	(0.06)	(0.03)	(0.06)
Female × Treat in cycle 4 × 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 Number of Female Ward Candidates with No Party Affiliation

	Independent candidates
	Female
	(1)
Treat in cycle 4 × Cycle 4	0.09
	(0.11)
Treat in cycle 4 × Cycle 5	0.04
	(0.10)
Treat in cycle 4 × Cycle 6	0.24
	(0.15)
Treat in cycle 4 × Cycle 7	-0.18
	(0.12)
Running variable form	ward
N	865

Note: This table reports the effect of being above the threshold on the number of women running for elections without party affiliation in the ward arm. The regression specification is given by equation (1). The sample includes bins 1 and 2. The outcome variable is the number of female candidates with no party affiliation in each election cycle and municipality. Table B.1 provides details regarding the size of this group of candidates, which remains substantial over the election cycles. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table B.10 - 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 × Cycle 5	-0.68	-1.59	-2.65**	-3.09***	-1.00
	(1.32)	(1.13)	(1.19)	(1.17)	(0.99)
Female × Cycle 6	-1.46	-1.75*	-2.94***	-3.47***	-1.46*
	(1.17)	(1.00)	(1.03)	(1.04)	(0.87)
Female × Cycle 7	1.68	1.61	0.14	-0.68	-0.10
	(1.22)	(1.15)	(1.19)	(1.16)	(0.97)
Treat in cycle 4	-2.11**	-1.99**	-2.21***	-0.81	
	(1.02)	(0.80)	(0.81)	(0.68)	
Treat in cycle 4 × Cycle 5	0.14	0.29	0.32	-0.48	
	(0.61)	(0.54)	(0.54)	(0.56)	
Treat in cycle 4 × Cycle 6	0.84	0.91	0.94	-0.48	
	(0.73)	(0.63)	(0.63)	(0.68)	
Treat in cycle 4 × Cycle 7	1.26	1.17*	1.22*	-0.38	
	(0.79)	(0.64)	(0.63)	(0.63)	
Female × Treat in cycle 4	-1.21	0.45	-0.14	-0.47	0.43
	(1.87)	(1.54)	(1.61)	(1.52)	(1.15)
Female × Treat in cycle 4 × Cycle 5	2.09	-0.68	-0.40	-0.20	-1.18
	(2.09)	(1.65)	(1.74)	(1.67)	(1.37)
Female × Treat in cycle 4 × Cycle 6	1.56	-0.46	0.17	0.60	-0.09
	(1.88)	(1.53)	(1.60)	(1.53)	(1.30)
Female × Treat in cycle 4 × 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
Fix (male+female) total	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.11 - Treatment Effect on the Number of Female Ward Candidates by the Quality of the First Female PR Councilors: Political Experience

	Main political parties			
Political Experience of the first PR women:	No experience		Has experience	
	Female (1)	Female (2)	Female (3)	Female (4)
Treat in cycle 4 × Cycle 5	-0.20	-0.00	1.11**	1.04**
	(0.33)	(0.34)	(0.50)	(0.43)
Treat in cycle 4 × Cycle 6	0.05	0.27	1.27**	1.20***
	(0.40)	(0.39)	(0.52)	(0.39)
Treat in cycle 4 × Cycle 7	0.68	0.87**	1.05*	1.01**
	(0.47)	(0.43)	(0.60)	(0.48)
Running variable form	ward	ward	ward	ward
N	375	375	176	176
Fix (male+female) total	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 at least one of the PR women elected in the municipality in cycle 4 had ex-ante political experience (typically serving as party members). Note that ex-ante political experience differs from incumbency status as only one of these women served as councilor before. Columns 2 and 4 control for i) the number of, and ii) the average political experience 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 ex-ante political experience information. We control for the total number (male+female) of ward candidates. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table B.12 - Probability of Being Constrained in the Number of Female Candidates

	Main political parties (party × municipality)	
	Pr(unconstrained)	
	All main parties	Participates in ward arm
	(1)	(2)
Treat in cycle 4 × Cycle 4	-0.08	-0.09
	(0.08)	(0.07)
Treat in cycle 4 × Cycle 5	0.08	0.12
	(0.07)	(0.07)
Treat in cycle 4 × Cycle 6	0.02	0.05
	(0.07)	(0.06)
Treat in cycle 4 × 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 that participate in the ward arm, i.e. have at least one ward candidate. Standard errors (in parenthesis) are clustered by municipality. $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$

Table B.13 - Treatment Effect on the Number of Female Rookie 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 Cycle 4 × Cycle 4	-0.02	-0.03	-0.03	-0.05	-0.05	-0.02	-0.06	-0.06	-0.07*	-0.08	-0.09*	-0.10**
	(0.04)	(0.03)	(0.03)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.06)	(0.05)	(0.05)
Treat Cycle 4 × Cycle 5	0.03	0.04	0.05*	0.08	0.09*	0.10**	-0.02	-0.02	-0.01	-0.00	0.01	0.04
	(0.03)	(0.03)	(0.03)	(0.06)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)
Treat Cycle 4 × Cycle 6	0.03	0.01	0.02	0.13**	0.12**	0.07	-0.07*	-0.05	-0.03	-0.04	-0.04	-0.02
	(0.04)	(0.03)	(0.03)	(0.06)	(0.05)	(0.05)	(0.04)	(0.03)	(0.03)	(0.05)	(0.05)	(0.04)
Treat Cycle 4 × Cycle 7	0.02	0.00	0.01	0.17**	0.18**	0.22***	-0.01	-0.02	-0.03	0.01	-0.02	-0.02
	(0.03)	(0.03)	(0.02)	(0.08)	(0.08)	(0.06)	(0.05)	(0.04)	(0.04)	(0.06)	(0.05)	(0.05)
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
Party dummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N. of wards of each type	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Average margin of victory	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Fix (male+female) total	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 rookie 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 rookie female ward candidates in each type of ward. The columns for "Useful" and "Rank 1" (defined under Table VI) represent increasingly high-up positions on the ballot paper, implying higher likelihoods of winning. We control for the number of wards of each type, party dummies, the average margin of victory for the party in the municipality, and the total number (male+female) of relevant ward candidates. 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 the political parties' candidate selection strategies much, 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).

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.[55] 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).

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).

[55] 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.

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.[56] 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 Assembly 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

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

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:

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

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

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 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

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

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.[57] 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 candidate in the most competitive ward.[58]

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×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,

[57] 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.

[58] 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.

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.

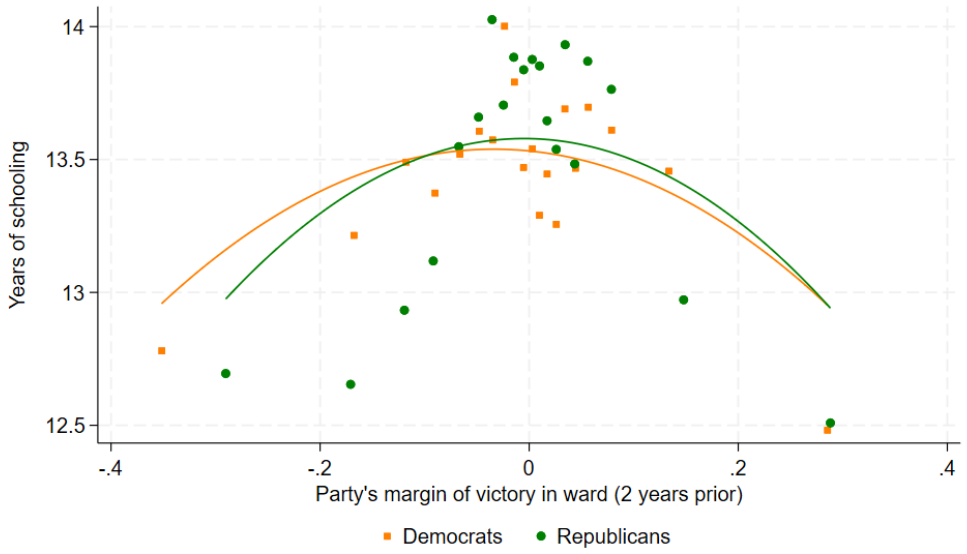
Table E.1 - What Do Voters Care About?

	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 has political experience, 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

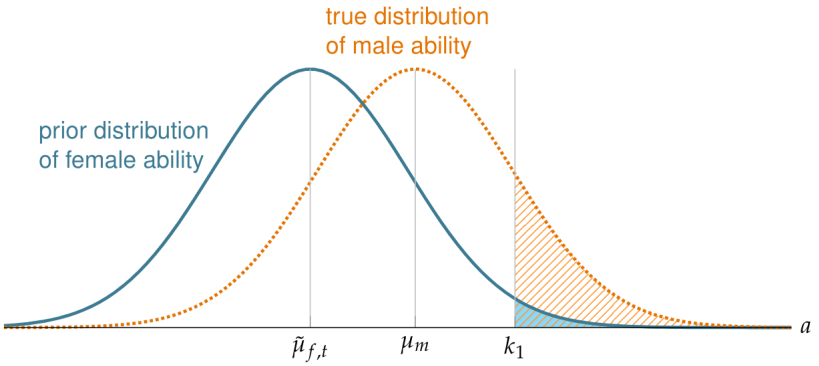


Note: This figure gives a binned scatter plot of the years of schooling of male rookie ward candidates by the party's popularity in the ward. We residualize the years of schooling variable for age, to account for the tendency of increasing educational attainment over time. The party's margin of victory 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.

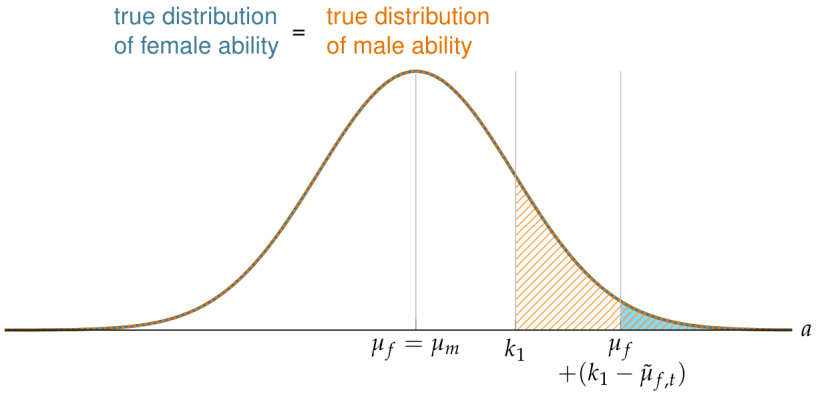
E.5 A diagrammatic illustration of candidates' selection

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

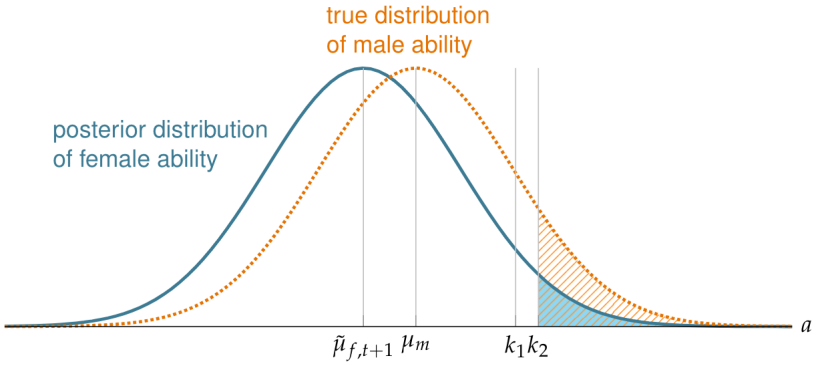
Figure E.2 - Illustration of Model of Belief Updating



(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.

ability then is a weighted 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 vote margin variable (v_{cpt}) following Luechinger et al. (2024). It represents the distance from the party's actual vote share in the PR arm to the one the party needs to win 1 PR seat.

For the one-period-ahead effects of winning (columns 1-2 of Table IX), 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 3-8 of Table IX), we estimate for each $t = 5, 6, 7$:

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

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