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

Jay Euijung Lee† Martina Zanella‡

Although gender quotas in politics are one of the most common affirmative action policies worldwide, the merits of these policies remain an object of debate. Opponents of quotas are concerned with an equity-efficiency tradeoff – quotas lower the average quality of politicians. This paper explores this tradeoff by studying the effect of gender quotas on political parties' selection of candidates in South Korean municipal council elections. South Korea provides us with a rare opportunity to observe how highly male-dominated political parties react to gender quotas: (i) we can exploit the discontinuity in the intensity of the quota's effect at given cut-offs of council size; (ii) gender quotas were implemented in only one of two independent election arms, leaving space for adjustment in the other arm. We find that political parties initially counteract the quota by putting forth fewer female candidates in the unaffected arm. However, this pattern gradually reverses over time. The evidence is consistent with efficiency gains from the quota. Parties initially selected a suboptimally low number of women due to biased beliefs regarding their ability, but they slowly revise their beliefs after exposure.

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

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†Department of Economics, Stockholm University, and CEP (LSE); email: Jay-Euijung.Lee@su.se.

‡Department of Economics, Trinity College Dublin, TRiSS, and TIME; email: zanellam@tcd.ie

I. INTRODUCTION

Gender quotas in politics are currently used by 130 countries of the world (International IDEA, 2023). The rationale behind quotas is that there would be too few women in politics otherwise. Opponents of quotas, however, are concerned with an equity-efficiency tradeoff – equal representation comes at the expense of efficiency if quotas reserve for women seats that would have been filled by more qualified men. Time and again, the empirical evidence has shown that quotas come at little cost to efficiency; if anything, they improve the overall quality of political representatives (Holzer and Neumark, 2000; Murray, 2010; Baltrunaite et al., 2014; Weeks and Baldez, 2015; Besley et al., 2017; Bagues and Campa, 2021).

Then, why do we see so few women in politics in the absence of quotas? If there are efficiency gains to be had with more women, it becomes puzzling why we need quotas in the first place to increase female representation. Yet, the large literature on gender quotas focuses on election or policy outcomes, remaining silent on the root of the problem.[1] This paper sheds light on this question by studying how highly male-dominated political parties in South Korea change their selection of political candidates in response to gender quotas. Our findings put forward a lack of information and biased beliefs about the competence of women as a barrier to achieving equal representation.

South Korean municipal councils are a particularly apt setting to study this question for several reasons. The institutional setup of the quota in South Korea allows us to detect what is typically unobservable: the preference of political parties for female candidates, or lack thereof. The gender quota regulates only one of the two separate arms through which councilors get elected. We can thus study how parties strategically respond in the unconstrained arm. Furthermore, with a 2.2% female share prior to the quota, South Korean municipal councils represent an environment potentially susceptible to a lack of information on women – a common feature of highly gender-imbalanced environments where quotas are needed the most. This also sets the paper apart from previous studies of gender quotas where female shares were much higher.[2] Lastly, in a highly male-dominated environment where the quota may act as a big shock to the status quo, long-term strategies might differ from immediate responses. We, therefore, track parties over four election

[1] A sizable body of papers studies the impact of quotas – and more generally female representation – on women's political presence and empowerment (e.g. Beaman et al., 2009; Casas-Arce and Saiz, 2015; Brollo and Troiano, 2016; Baskaran and Hessami, 2018; Bhalotra et al., 2018; Baltrunaite et al., 2019), competence/quality of future candidates and elected politicians (for example, Bagues and Campa, 2021; Bagues and Campa, 2020; Besley et al., 2017; Baltrunaite et al., 2014), and allocation of public expenditure (Chattopadhyay and Duflo, 2004; Clots-Figueras, 2012; Rigon and Tanzi, 2012; Ferreira and Gyourko, 2014; Braga and Scervini, 2017; Bagues and Campa, 2021; Lippmann, 2022; etc.).

[2] 29% in 2007 Spain (Bagues and Campa, 2021, around 40% in 1993 Sweden (Besley et al., 2017), 8% in 1993 Italy (Baltrunaite et al., 2014; Weeks and Baldez, 2015), and 11% in 2000 France (Murray, 2010).

cycles post-quota. This is made possible by a novel dataset containing information on the universe of candidates and elected councilors for South Korean municipal councils since their inception in 1995 – 55,040 candidates and 7 election cycles – that we assembled by scraping the website of the National Election Commission. It is indeed the evolution of parties' responses over time that helps us uncover the reasons behind the initial under-representation of women.

For our identification strategy, we employ a regression discontinuity design that exploits the cross-sectional variation in the intensity of the quota emerging from differences in council size. In South Korea's mixed electoral system, one group of councilors is elected by plurality vote in the municipality's constituent wards ("ward warm") while the other group is elected by party-list proportional representation ("PR arm"). The gender quota stipulates that all odd-number candidates in the party list for the PR arm be female.[3] The number of PR seats increases as a step function of a municipality's council size, creating discontinuities in the intensity of the quota's bite at certain cutoffs of council size. We use this cross-sectional variation in the number of seats reserved for proportional representation as a measure of the intensity of exposure to the gender quota to study its effect on how political parties select candidates in the ward election arm.

We find that the presence of an unconstrained arm allowed parties to counteract the introduction of the quota. In the treated municipalities affected more intensely by the quota, parties initially put forward fewer female candidates in the unconstrained ward arm. The reduction in the number of female candidates is especially pronounced when the probability of winning is higher – in favorable ballot positions, in wards where a party has a stronghold, and among the two largest parties. Hence, although the quota was successful in fostering the election of women through the constrained PR arm, fewer female councilors got elected through the unconstrained ward arm in the first cycle after the introduction of the quota.

However, the 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 unconstrained ward arm. By the last election, these municipalities had entirely reversed their initial reaction and, in fact, had a *greater* number of female ward candidates than control municipalities. These patterns are echoed in the election outcomes. Treated municipalities elect significantly more female councilors and significantly fewer male councilors from election cycle 5 onward.

What is driving this initial counteraction and gradual change in the response to quotas? The evidence is consistent with the predictions of a simple model of learning, presented in Section VI., where parties have imperfect information and biased beliefs regarding women's ability as political leaders. As a consequence, they initially select a suboptimally low number of women, but they

[3]Parties, in particular party leaders, determine the set of candidates running for election. The case is obvious for the PR arm because one cannot be elected without being a member of a party in that arm. However, also in the ward arm, it is the parties that nominate the candidates to run for election. It is possible that a candidate runs as an independent, but very rarely he or she will win.

gradually learn about their competence through exposure to female councilors. The model extends standard models of statistical discrimination (Aigner and Cain, 1977) and formalizes how learning occurs not just about the individual (Altonji and Pierret, 2001) but also about the group they belong in. Four pieces of evidence, guided by the model predictions, support this learning story.

First, the change in candidates' selection is related to the acquisition of new information about women as politicians. The model predicts that the process of belief updating is faster the greater the number of newly elected female councilors. We find that the quota effectively promoted 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.

Second, the shift towards female candidates occurs at a faster rate when elected women are more competent, in line with the prediction that beliefs on the ability of women update faster the better women are found to be. Using education as a proxy for competence (Baltrunaite et al., 2014; Bagues and Campa, 2021), we compare the evolution in the choice of candidates for parties in municipalities where the first female PR councilors post-quota (cycle 4) were above- and below-median level of education. In the cycles following the exposure to these differentially able women, we find stronger increases in the number of female ward candidates in treated municipalities in the above-median group.

Third, experiencing a woman in action is pivotal for parties to learn about her competence, and parties with more biased priors learn more. In a *party*-level analysis, we compare parties in close PR elections that marginally won a female councilor against those that marginally lost. As only the winners are able to see their female candidates elected by random chance, this comparison gives us the causal effect of experiencing those women in action. We also distinguish parties by their ex-ante gender bias, using the fact that the gender of the even-number positions in the party list is unrestricted. We find that winning the election significantly improves a woman's chances to rerun in the next election cycle. However, the effect is completely driven by parties that placed a man in the second PR seat, so it is not due to gained experience or visibility. Rather, this evidence is consistent with the model prediction that belief updating is faster the larger the bias in the prior.

Lastly, the evidence points towards parties not only learning about the competence of the elected women but also updating their beliefs regarding women as a group. The increase in female ward candidates comes from not just incumbent women, but also rookie women who have zero councilor experience and on whom parties lack information. This suggests that parties' beliefs are changing about women as a whole as a decreasing gender gap in the prior leads to an increasing number of new women relative to men.

Even if there were absolutely no learning, three potential alternative explanations could be consistent with a faster increase in the number of women in treated municipalities. First, the supply of available competent female candidates might grow faster in treated municipalities compared to

control municipalities. Second, parties might be responding to a faster change in voter preferences for females in treated municipalities. Third, parties may have taste-based discrimination against women, and grow out of their distaste for women faster in treated municipalities. None of these alternative mechanisms find support in the data.

From a policy perspective, much can be learned from the South Korean experience. This paper shows that quotas might deliver undesirable results when biased beliefs against female politicians are prevalent. With females holding only 2.2% of seats before the quota and more than 60% of the population agreeing with the statement that men make better political leaders than women (see Figure A.2), South Korea would have been such a context. Indeed, we observe parties and their leaders initially counteracting the quota.

Quotas can still be effective in the long run, however, when designed appropriately. The quota imposed that a minimum number of qualified female councilors got elected, thereby opening up the possibility for learning to take place. This is different from other types of quotas that do not ensure women end up elected, such as quotas on the minimum share of women in candidate lists. Such quotas have been found to be limited in increasing female representation to appreciable levels (Dahlerup and Freidenvall, 2013; Bagues and Campa, 2021).

South Korean politics is not the only context characterized by strong male dominance and conservative gender attitudes. The South Korean experience can be informative for many other countries currently characterized by very low female representation in politics, including Brazil, Japan, Hungary, Iran, Malaysia, Moldavia, Lebanon, Mali, and Nigeria.[4] Moreover, affirmative action policies are currently discussed also in other settings such as company boards (e.g. Global Gender Gap Report, 2021), where the incumbents are similarly if not more, male-dominated and attitudes are equally male-friendly (see Figure A.3 in Appendix Section A.).

Our paper contributes to a large and growing literature on the consequences of political gender quotas, studied in numerous contexts and with mixed results (see Hessami and da Fonseca, 2020 for a review). However, while several studies look at final outcomes, only a few focus on the mechanisms that lead to these results, and even fewer study the reactions of the male-dominated pre-existing parties and their leaders (e.g. Esteve-Volart and Bagues, 2012; Casas-Arce and Saiz, 2015; Besley et al., 2017). We contribute to this literature as we are able to pin down the strategic responses of parties to the introduction of quotas and study them in an unusually rich way. The voting system with the quota only applying to the proportional representation arm implies a whole other arm is unconstrained. Furthermore, the unconstrained arm of the election system is the way through which around 85% of councilors are elected, and therefore constitutes the more consequential arm. Such a structure of gender quota greatly expands the degree of freedom in which parties can respond, relative to quotas that reserve seats for women (Chattopadhyay and Duflo,

[4]See Figure A.1 in the Appendix for data on female representation in national parliaments and attitudes.

2004; Clayton, 2015), alternate between male and female candidate lists (Besley et al., 2017), or mandate a minimum share of women in candidate lists (De Paola et al., 2010; Esteve-Volart and Bagues, 2012; Baltrunaite et al., 2014). The unique nature of South Korea's election system is what allows us to disentangle the immediate and follow-up responses, uncovering the story of learning about female competence.

The remainder of the paper is organized as follows. Section II. provides a background on the institutional setting of South Korea's municipal council elections. We then describe the data in Section III.. Section IV. lays out our empirical strategy, and Section V. discusses the results. In Sections VI. and VII., we present a model and we discuss the pieces of evidence that point towards learning as an explanation for the results. Finally, Section VIII. concludes.

II. INSTITUTIONAL SETTING

II.A. The role of municipal councils

There are 226 municipal councils in South Korea. Municipal councils represent the legislative branch that works with municipal governments, the executive branch, to oversee local matters. Councils have several legally defined responsibilities, which include reviewing and approving the spending of municipal governments, adopting and revising local bills, monitoring the municipal governments' administrative functions, and examining petitions submitted by residents. Municipal governments administer around a third of South Korea's total public expenditure (Ministry of the Interior and Safety, 2018).

II.B. Electoral rules and gender quotas

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

However, major reforms were made to the electoral rules from the fourth election in 2006. They are summarized in Table I. First, a parallel voting system was introduced. Candidates could be elected through two alternative arms[5]: a party-list proportional representation arm (PR arm) and a plurality vote arm (Ward arm). At least 10% of the councilors needed to be elected through party-list proportional representation. Hence, the number of councilors elected through the PR arm increased as a step function of the total council size: 1 for councils with up to 10 seats, 2 for those

[5]The same person could only be listed as candidate for the party in one of the two arms.

with 11 to 20 seats, 3 for those with 21 to 30 seats, and so on.

[Table I here]

The remaining seats were reserved for plurality voting in multi-member constituent wards. Each constituency elected between 2 and 4 councilors, and therefore multiple candidates from the same party could run in the same constituency.[6] Figure I illustrates what the ballot papers look like for the two arms of the municipal council elections.

[Figure I here]

Second, a gender quota was put in place: all odd-number candidates in the party list for the proportional-representation arm needed to be female. As the numbers of seats reserved for proportional representation are small, most elected councilors turned out to be the first candidates in the lists, and therefore female. As a consequence, the introduction of quotas sharply increased the proportion of female councilors. Municipal councils were severely male-dominated prior to the reform, with only 2.2% of councilors being female. Due to the introduction of quotas in 2005, female representation in municipal councils reached more than 30% in the last election in 2018. Figure II illustrates how the female ratio developed in municipal councils over time. The most striking feature is the sharp rise in the female ratio immediately after the reform.

[Figure II here]

Last, subsidies were offered to parties based on the female ratio among the parties' candidates nationwide. However, it is unlikely that the subsidies affected much of the political parties' strategies, particularly at the municipality level. The scale of the subsidies has been criticized for being too low to effectively expand female nomination (Lee, 2003; Kim et al., 2003; Jin, 2018). Indeed, they account for only around 5 to 6% of the total value of election subsidies (National Election Commission, 2018). Therefore, the presence of the subsidies is unlikely to have impacted political parties' selection of candidates.

Amendments to electoral rules continued between the 2006 and 2010 elections. It was stipulated that in either the municipal council elections or the higher-up provincial council elections, there must be at least one female candidate in each general election district. As there are around 250 general election districts, compared to 226 municipalities, a general election district approximately compares to a municipality.[7] Legislative Impact Analysis Reports indicate that most parties

[6]The maximum number of candidates a party could nominate for a ward equalled the preset number of seats for that ward.

[7]General election districts are divided depending on population size and local representativeness. A large municipality may contain five general election districts, and up to five small municipalities may comprise a general election district.

chose to satisfy this rule in the municipal council elections, due to the larger number of candidates (Lee, 2019). Selecting which ward to place the female candidate in would have been a strategic concern for the political parties.

II.C. Background behind the adoption of gender quotas

If some parties had led the movement for the reform against opposition from other parties, then we should recognize that parties' strategic responses to the quota might be very heterogeneous in nature. Thus, here we discuss the background behind the adoption of the quota.

Before gender quotas were adopted in the municipal council elections, they were adopted first in the general election for the National Assembly 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.[8] 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 general 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 their party in order to run with the party affiliation – but it was 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 proportional representation arm where party nomination was essential.

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

III. DATA

Two sources of data are used. First, data related to the execution of the elections are collected by web scraping the website of the National Election Commission. The website posts detailed data on all past elections, including population, candidate information, and vote outcomes. Second, to examine the consequence of the municipal councils' legislative activities, we use the data on

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

municipal governments' expenditures from the Local Finance Disclosure System of the Ministry of the Interior and Safety.

III.A. Population

Because ward divisions are centrally determined based on population size, population data is published. The number of residents is available by ward, voting eligibility, gender, and citizenship status. Moreover, the data includes the number of households by ward. This data is used to perform balancing checks in order to validate the identification strategy, which relies on the assumption that municipalities locally around the PR seat thresholds are similar.

III.B. Candidates

Various background characteristics of all candidates are also made publicly available by the National Election Commission. These are election arm (ward or PR) classification, election district name, candidate number, party affiliation, name, gender, date of birth, age, occupation, education, and pertinent work experience. Whether a candidate is favored by his or her party is revealed by the election arm and candidate number. Typically, candidates that are deemed less competitive are placed on the PR election arm, and the candidate numbers directly translate to the position on the ballot, in which higher positions attract more votes.

Figure III illustrates how the female share among candidates has been increasing continually, even when not stipulated by the quota. In particular, plot [b] shows that more females are running in wards as the sole candidates of their parties, and plot [c] shows that more females are taking the highest ballot positions even when multiple same-party candidates are running. Plot [d], on the other hand, shows that more females are taking the even-number party list slots, which would not happen with a strong preference for men.[9]

[Figure III here]

III.C. Votes

The website of the National Election Commission also includes vote counts by ward. These vote counts enable us to see in which wards parties have their strongholds. Therefore, we can categorize wards into safe and contestable ones from the perspective of the political parties. Parties would then allocate their favored and less favored candidates to different wards accordingly.

[9] In the latest general election of 2020, where the same gender quota on the PR arm applies, almost all PR candidates in positions 2, 4, and 6 are male.

Moreover, we can learn by which margin the winners won. In the regression discontinuity identification strategy, we rely on the assumption that close victories result in sharp changes in the composition of councilors by party, in an environment where parties enjoy similar degrees of popularity from the voters.

Electoral outcomes determine the gender ratio of the elected councilors. Table II provides descriptive statistics on the gender composition of councils by election cycle. The table also depicts how the reform in 2005 introduced the PR arm as well as the gender quota in that arm.

[Table II here]

III.D. Municipal budget

Municipal budget data is used to perform balancing checks, to show that municipalities locally around the PR seat thresholds are similar in terms of economic scale and council performance. The budget of a municipal government reflects the economic prosperity of the municipality, as around half is sourced from local tax and non-tax revenue. In addition, data is available on the share of the municipality's expenditures spent on running the municipal council (2002-2020). There have been numerous accusations in the past of councilors appropriating large sums of the local budget for their private use (Local Decentralization Bureau – Election and Local Council Division, 2019). For instance, they would go on international policy-research trips where the itinerary largely consists of sightseeing. Another example is of councilors ordering member pins made of pure gold. As such, a measure of the performance of a council is the frugality of its operating costs. Newspapers have traditionally included it in their assessments of councils (Jang, 2008).

IV. Empirical Strategy

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

To get at the causal effect of the gender quota, we make use of the fact that the gender quota affects municipalities at different intensities depending on the number of PR seats in the council. To remind ourselves, the number of PR seats is important as the gender quota only applied to the PR arm, and it stipulated that all odd-number candidates in the party list for the proportional-representation arm needed to be female. Since at least 10% of the councilors needed to be elected through party-list proportional representation, the number of councilors elected through the PR arm increased 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 is depicted by the navy dots in Figure IV.

[Figure IV here]

This provides a discontinuity in the number of PR seats at given thresholds of council size. For all councils with a size smaller or equal to 10 seats, at least one councilor must be elected through proportional representation. For councils with a number of seats higher than 10 but smaller or equal to 20, at least two councilors must be elected through proportional representation, and so on and so forth.

We exploit this discontinuous change in the number of PR seats as a function of council size in a regression discontinuity design that compares the characteristics of candidates in municipalities on each side of the thresholds while controlling for council size. In order to account for the fact that there is not just one but many thresholds (10, 20, 30), we categorize councils into bins based on the proximity to thresholds, as illustrated in Figure IV.

This strategy identifies the effect of an additional PR councilor, rather than an additional *female* PR councilor. However, in this setting, an additional PR councilor strongly implies an increase in the number of female PR councilors. While the gender quota does not necessitate that the second PR councilor be male, in practice almost all PR councilors end up being female.[10] This is due to PR candidates even in even-number positions frequently being female, and elected PR councilors frequently being the number-1 candidates of multiple parties.[11] Evidence that this is the case is provided in Section IV.B..

The regression discontinuity specification is given by:

$$Y_{cbt} = \alpha_b + \alpha_t + \sum_{s=4}^{7} \beta_s \times Treat_{cbt} + f(x_{cbt}) + \epsilon_{cbt} \tag{1}$$

where Y_{cbt} denotes the outcome variable for municipal council c belonging to bin b in election cycle t. As we are interested in characterizing parties' strategies in the selection of candidates, the outcomes we consider are the number of ward and PR candidates and councilors by gender. The running variable is $x_{cbt} \equiv (\text{council size})_{cbt} - \text{threshold}_b$, with $\text{threshold}_b \in \{10, 20, 30\}$. In addition, $Treat_{cbt} \equiv \mathbb{1}(x_{cbt} \geq 0)$, signifying an additional PR councilor. Therefore, β_s estimates the effect of having an additional PR councilor, pooling all the bins together, in election cycle s. Moreover, the baseline function form of f is linear, and we do not allow for the effect of x_{cbt} to differ to the left and right of the threshold. The reason for this choice is that making f quadratic or allowing for differential trends on either side of the threshold barely makes a difference, as it can be seen in Table A.7- A.9 in Appendix.

A factor to note is that when the outcome variable relates to ward elections, we change the running variable to $\tilde{x}_{cbt} \equiv (\text{N. of ward councilors})_{cbt} - (\text{N. of ward councilors at the threshold})_b$ for ease of interpretation. To illustrate why this is important, let's consider councils just above

[10] Table II shows that among PR councilors, 87% to 98% are female each election.

[11] Appendix Table A.1 shows that it is relatively rare to find multiple PR seats getting allocated to the same party.

and below the threshold of 10 councilors, 11 and 10 councils respectively. When $Treat = 0$, one councilor must be elected through proportional representation, which implies that 9 remaining councilors are elected through the ward arm. At the same time, when $Treat = 1$, two councilors must be elected through proportional representation, which implies that 9 remaining councilors are elected through the ward arm. This is not taken into account when we control for a running variable based on council size. As council size differs by one unit above and below the threshold, controlling for council size would effectively induce us to compare a council where $Treat = 1$ with one fewer ward councilor than the one with $Treat = 0$, therefore making more difficult to interpret the sign of the coefficient on $Treat$. Redefining the running variable addresses this problem.[12]

Besides equation (1), we consider a second specification based on treatment status at election cycle 4:

$$Y_{cbt} = \alpha_b + \alpha_t + \sum_{s=4}^{7} \beta_s \times (\textit{Treat at cycle } 4)_{cb} + f(x_{cb4}) + X'_{cbt}\gamma + \epsilon_{cbt} \tag{2}$$

where $(\textit{Treat at cycle } 4)_{cb} \equiv Treat_{cb4}$, and X_{cbt} denote control variables such as council size or the number of ward seats.

The difference between equations (1) and (2) is that they estimate the effects of contemporaneous treatment and initial treatment, respectively. This distinction is important if councils change their size and, as a consequence, treatment status across election cycles. In practice, it makes barely any difference which specification we use, because the treatment status changes after election cycle 4 for only 3.7% of the councils.

For the analysis, we settle on equation (2) as our main specification for two reasons. First, the initial treatment assignment is more exogenous. Upon the first treatment, treated and control municipalities may evolve on different paths, causing council size and treatment status to change, making treatment and control groups no longer balanced. The second reason has to do with the possibility to compare the estimated treatment effects across election cycles and identify the long-term effect of quotas. Measuring the effect of the initial treatment assignment maintains the same composition of treated municipalities across election cycles. On the other hand, defining treatment status by exploiting contemporaneous treatment assignment does not allow us to attribute variations in treatment effect over time to differences between immediate and follow-up effects for the same councils. As a matter of fact, differences might also be due to a small number of councils changing their treatment status over time. With equation (2), this possibility is shut down.

The standard errors are clustered by municipality. This is motivated by two considerations. First, the variation of the treatment assignment is at the level of the municipality. Second, parties

[12] Changing the running variable this way does not change much else. In fact, the coefficients $\hat{\psi}_0$ and $\hat{\psi}_1$ stay the same, as well as the R-squared value.

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

IV.B. Did the quota bite?

Because we are interested in the consequence of the change in the gender composition of councilors brought about by the quota, it is important to verify that there is a change in the number of *female* PR councilors at the discontinuity thresholds.

Table III reports the results of equation (2) with the number of female PR councilors as the outcome variable, separately for each bin. Having an additional PR councilor at cycle 4 significantly increases the number of female PR councilors over all the cycles at bins 1 and 2. However, there is no such effect at bin 3, where we also have very few observations. The regression results of Table III are echoed by Figure V, which shows that the average number of female PR councilors sharply increase at the thresholds of bins 1 and 2, but not at bin 3. Therefore, in the reduced-form results that follow, we restrict the sample to bins 1 and 2.

Furthermore, for both bins 1 and 2 (columns (1) and (2) of Table III) the effect of the treatment at cycle 4 on the number of female PR councilors remains constant across election cycles. This is not surprising as the vast majority (96.3%) of the initially treated municipalities continue to get treated each cycle. However, it is important as it confirms that if we see an evolution of the treatment effect on party strategies over time, this could be safely attributed to the initial treatment leading treatment and control groups on different paths.

As a way to buttress the validity of the regression discontinuity design, Appendix Section C.1. formally tests and confirms that as council size increases, there is a change in the number of female PR councilors only at the thresholds and at no other point.

[Table III here]

IV.C. Validity of the regression discontinuity design

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

Balance Tests The first piece of evidence concerns the absence of discontinuities in pre-determined characteristics at the threshold in cycle 4. The sample consists of councils at election cycle 4, and the results of estimating equation (2) are presented in Table IV.

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.[13] In Panel D, columns (1)-(2) refer to the vote share received by each main party in the previous election's PR arm. Columns (3)-(4) show that the initial treatment group is balanced in terms of economic prosperity and council performance. Columns (5)-(6) demonstrate that the structure of the ward election arm is balanced, as there is no difference in the number or size of wards between the treatment and control municipalities.

[Table IV here]

Bunching The second piece of analysis examines the density of council size at the threshold, looking for bunching in its distribution. 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 VI displays the histogram of the frequency of municipalities by council size. Visually, it is hard to say there is bunching around the thresholds of 10 and 20. 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 thresholds of 10 and 20, it is also rejected with similar p-values for randomly selected cutoffs of council size.

Nonetheless, the evidence from the previous balance checks and existing electoral rules support the hypothesis that municipalities do not manipulate their council size around the threshold. Municipalities are found not to be systematically different below and above the threshold, which we would expect to find if manipulation was possible. In addition, electoral rules make it difficult to gerrymander in practice. The division of election constituencies is determined by the Municipal

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

Council Election Committee, which municipal councilors or party members are not allowed to be on.[14] The committee determines the council size based on population, administrative districts, topography, transportation, and other conditions. The committee also cannot split the smallest administrative district and make it a part of another ward. In sum, strict rules prevent the membership of interested individuals on the committee and circumscribe how the election constituencies are drawn up.

[Figure VI here]

Placebo Test Section V.D. presents the results of a placebo test where the discontinuity in council size had no effect on the gender composition of candidates and elected councilors in the three election cycles before the introduction of the quota.

V. MAIN RESULTS

V.A. Did the reform have the intended effect? The evolution of councils' gender composition

The results of equation (2) on the number of councilors elected in each municipality are reported in Table V. Two interesting patterns emerge.

In the first cycle after the introduction of the quota (cycle 4), treated municipalities display an overall higher number of elected female councilors (columns (7)-(9)), but the effect is not significantly different from zero. It cannot be that the quota failed in bringing in women, as we previously saw in Table III. Indeed, columns (5) and (6) of Table V show that a higher number of women – 0.76 women for every additional PR seat – do get elected in treated councils through the PR arm due to the quota. Yet, in treated councils fewer women and significantly more men are elected in cycle 4 through the ward arm, the arm unaffected by the quota (columns (1)-(3)).

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

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

[Table V here]

V.B. Party strategies and candidate selection

As these are election outcomes, the above results could arise 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 may be driven 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,[15] we delve into parties' candidate selection. We return to the discussion of voter preferences in Section VII.E..

Table VI displays the results of equation (2) on the gender composition of the candidates put forward in each municipality in each arm. The results on candidates mirror the previous results on elected councilors. The most interesting finding is captured by columns (1) and (2). In response to the treatment at cycle 4, parties initially put up more male ward candidates but gradually decrease the number across election cycles. Eventually, in election cycle 7, the parties in the treated municipal councils put forward fewer male candidates than those in untreated councils. As for female ward candidates, the opposite pattern holds: the coefficient sign changes from negative (albeit statistically insignificant) in cycle 4 to positive from cycle 5 onward.

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

[Table VI here]

V.C. Focusing on candidates likely to get elected

Table VI provides evidence on the composition of the overall pool of ward candidates put forward in each municipality in each election cycle. However, pooling all participating parties obstructs the study of dynamic changes in party strategies when many small parties emerge and soon disappear. Moreover, changes in the composition of ward candidates may not affect the composition of political bodies if they are driven by candidates in positions that have no hope of getting elected.

Thus, we next turn our focus to candidates from the two main parties and in ballot positions characterized by a high probability of election. The two main parties – the Conservative Party and the Progressive Party – dominate South Korean local elections, producing at least 74% of ward councilors and 82% of PR councilors every election (Appendix Table A.2). We determine positions likely to win based on two concepts: (i) high-up positions in the ballot list, since candidates high

[15] The predicted vote share of a candidate in the ward arm, based on i) the popularity of his/her 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.

up on the ballot (within-party) win more votes, and (ii) positions in wards where a party has a stronghold.

Table VII shows that when we restrict our attention to candidates for whom election is probable, not only do we see the same patterns, but the patterns are even stronger. We consider candidates placed in "useful" positions – position 1 if the ward elects 1-2 councilors and positions 1 and 2 if the ward elects 3-4 councilors; and "rank 1" positions – the first candidate of the party in the ward. Main parties in treated municipalities put forward a higher number of male candidates and a smaller number of female candidates in cycle 4 (columns (1)-(3)), especially in pivotal positions in the ballot, where the probability of election is higher (columns (4)-(9)). However, the initial counteraction in the unrestricted ward arm is reversed already from cycle 5.

As political parties can choose how many candidates to champion,[16] columns (3), (6), and (9) report how the number of female ward candidates compares between treatment and control municipalities when we control for the total number of ward candidates in the positions considered (all positions, useful positions, rank 1 candidates). One may argue that the total number of candidates is a "bad control" in the regression because it is an outcome of the treatment (Angrist and Pischke, 2009). However, as the total number of candidates equals the sum of the number of male and female candidates, columns (3), (6), and (9) inform us of whether the additional woman is placed in the ballot list as a substitute for men or in addition to men. We can clearly see that *substitution* between the two genders occurs.

[Table VII here]

Also when we look at parties' strategies across wards, we observe the same patterns. Table VIII shows how parties select candidates for different types of wards. We categorize wards based on whether the party had a stronghold in the previous election, in which case we call the ward "safe."[17] These are wards where we can assume the party candidates have a very high probability of being elected. Since whether a ward is safe is dependent on the party at hand, the regressions in Table VIII are at the municipality $\times$ party level. The specification employed is equation 2 where we control for the number of safe and unsafe wards, and the average margin of victory for the party in the municipality. These variables are based on the previous election cycle results and are known to the party when designing the allocation of candidates across wards. As in Table VII, in even columns we control for the total number of ward candidates in the positions considered, to provide evidence of the substitution between women and men.

[16] The maximum number of ward candidates for a party is the total number of ward seats in the council, but there is no minimum.

[17] A party is considered to have a stronghold in a ward if the party wins the greatest vote share in the PR arm in the ward, and it got over 10 percentage points more vote share than the next popular party. For cycle 4, the margin of victory is calculated based on district elections as there is no previous PR election.

We can see that parties had a preference for placing male candidates in safe wards in cycle 4, especially in high-up positions in the ballot – useful seats and rank 1 positions. The preference for men, however, disappears from cycle 5 onward. Furthermore, from cycle 5 onward, parties in treated municipalities start placing more women among candidates in unsafe wards. This is what is driving the overall increase in the number of female candidates observed at the municipality level. Therefore, although the number of female ward candidates increases faster over time in treatment than in control municipalities, they remain bound to the wards with a lower likelihood of election.[18]

[Table VIII here]

V.D. Placebo test

In the last sections, we showed that treated municipalities put forward a different number of female and male candidates compared to municipalities below the threshold where this arm is less important. Before going into the potential mechanisms that can explain the effects we observe, we report the result of a placebo test where we check that the thresholds are meaningful only after and not before the reform of the election system.

We test whether the number of male and female ward candidates changed at the threshold before and after the reform. Before the introduction of the quota in 2006, there was no proportional representation arm and all the candidates were elected through plurality voting (as in the ward arm after the introduction of the quota). Hence this test allows us to assess whether the probability of getting an additional PR seat upon the reform is correlated with other factors that affect the number of male and female candidates. Table IX shows that up to election cycle 3, the effect of being past the threshold is not statistically significantly distinguishable from zero. It is in election cycle 4 that the treatment induces an effect, as expected. This test provides supportive evidence that we are estimating the effect of the introduction of the quota, and the results are not driven by treated municipalities being different from control municipalities ex-ante.

[Table IX here]

VI. A SIMPLE MODEL OF PARTY LEARNING

The evidence provided so far indicates that parties reacted to the introduction of the quota in the PR arm by reducing the number of women among ward candidates immediately after the reform. The substitution away from women was stronger in ballot positions and wards where candidates

[18] We provide an interpretation of this result at the end of Section VII.E..

had higher chances of getting elected. However, from cycle 5 onward, parties in municipalities above the threshold started placing more women among ward candidates.

We propose that these results can be reconciled with the quota allowing parties to learn about women's competence through exposure. In this section, we lay out a simple model of learning. Parties start with downward biased beliefs about women's competence and consequently select a suboptimally low number of women. However, they gradually update their beliefs toward the truth as the policy forces them to be exposed to female politicians. Guided by the predictions of the model, we present in Section VII. the empirical evidence consistent with learning being the key mechanism behind the observed reversal in candidates' selection and rule out alternative explanations.

VI.A. Setting

Parties $p = 1, ..., P$ participate in a municipal council election in election cycle t. A party selects from a group of prospective candidates those to put up for election. For the selected candidates, the party also allocates them to different candidate positions, which are ranked by some historic probability of election. Prospective candidates differ solely in their gender $g \in \{M, F\}$ and their competence a_i (Besley et al., 2017):

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

where μ_g is the mean ability of gender g.

Parties have imperfect information regarding the competence of a new candidate. The true competence of the prospective candidate is unknown, but parties observe a signal of competence:

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

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

VI.B. Party's problem

A party has only one objective: maximize the number of elected councilors from the party. We assume that voters vote for parties as opposed to individual candidates[19], and they choose a party based on inherent party ideology and the ability and gender of the candidates from the party. Therefore, for electoral success, party p chooses candidates among the pool of available prospec-

[19]This assumption is made for simplification and is based on the observation that even in the ward arm, voters tend to vote for the candidate from their preferred party. To see this, we first predicted the vote share of a candidate in the ward arm based on the popularity of his/her party – measured by the party's vote share in the PR arm – and the historical tendency of voters to vote more for candidates higher up on the ballot paper. The correlation between the actual vote share and the predicted one is 0.90.

tive candidates to maximize

$$E(a_{p,t}) + h(f_{p,t})$$

where $a_{p,t}$ denotes the average ability of councilors from party p in election cycle t, and $f_{p,t}$ is the share of female councilors from party p. $h(.)$ is a strictly concave function that attains its maximum at $f_t^* \in (0,1)$ and denotes voter preferences for the gender composition of councilors. Put simply, the party wants to maximize the expected average ability of councilors while achieving some gender ratio close to f_t^*.

That voters care about councilor competence is a critical feature of the model. It is in line with the evidence on election probabilities of candidates before the introduction of the quota, where voters indeed reward candidates' competence. More details can be found in Appendix D.1..

VI.C. Party's beliefs at candidate selection

As parties do not have perfect information regarding the ability of new candidates, they also hold imperfect information regarding the mean ability of the group μ_g. 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 prospective 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.

The party selects candidates taking into account the value of $\tilde{E}(a_i|s_i, g, t)$. Within gender, it chooses the prospective candidate with the highest value of s_i first, then moves on to the one with the next highest value of s_i, etc.

Because the signals provide information on only the *relative* ability within gender, these signals are not informative about the value of μ_g. Hence, the party cannot find out about the average ability of each gender g from the set of signals of the prospective candidates.

VI.D. Party learning

Once candidate i is elected and serves as councilor, the party learns about his/her competence. We assume for simplicity that learning is complete and the true competence of the candidate $\mathbf{a} = \{a_i\}$ is revealed.[20]

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

[20]This assumption could be relaxed. An extension of the model with imperfect belief updating regarding councilors' competence can be found in Appendix D.2..

The party makes an inference about the value of μ_g via maximum likelihood. In doing so, parties use the fact that these councilors are positively selected out of the pool of prospective candidates, and they had previously received initial signals $\mathbf{s} = \{s_i\}$.

Conditional on s_i, the distribution of a_i is:

$$a_i|s_i \sim N\left(\mu_g + \frac{\sigma^2}{\sigma_s^2+\sigma^2}s_i, \frac{\sigma^2\sigma_s^2}{\sigma_s^2+\sigma^2}\right) \tag{3}$$

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

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

The maximum likelihood estimator is

$$\hat{\mu}_g = \frac{1}{n}\sum_{i=1}^n\left(a_i - cs_i\right) \sim N\left(\mu_g, \frac{1}{n}\bar{\sigma}^2\right) \tag{4}$$

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:

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

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

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

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

VI.E. Comparative statistics

Speed of updating: Updating 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:[21]

[21]The exact comparative statistics that match the empirical evidence of the learning mechanism in Section VII.B. is

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

3. The larger the (downward) bias in the prior belief:

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

Selection of candidates: A party selects more male candidates

1. The larger the difference in the male and female prior mean ($\tilde{\mu}_{m,t} - \tilde{\mu}_{f,t}$):

$$\frac{\partial\big[\tilde{E}(a_i|s_i, M, t) - \tilde{E}(a_i|s_i, F, t)\big]}{\partial\big(\tilde{\mu}_{m,t} - \tilde{\mu}_{f,t}\big)} > 0$$

(numerator: gap in the perceived ability of men and women with the same signal s_i)

VII. EVIDENCE ON LEARNING ABOUT WOMEN'S COMPETENCE

The model formalizes the idea that the change in candidates' selection could be explained by parties learning about women's competence by being forced to experience female councilors after the introduction of the quota. With females holding only 2.2% of seats before the quota and more than 60% of the population agreeing with the statement that men make better political leaders than women do (see Figure A.2), it is quite likely that party leaders might have started with imperfect information and biased beliefs regarding the competence of women as politicians.

In this section, we present the empirical evidence that supports this hypothesis. We start by checking that the model predictions are confirmed in the data in sections VII.A.-VII.D.. Together, these sections paint a convincing picture of the learning mechanism. Then we rule out three alternative mechanisms. Firstly, the increase in the number of new women cannot be completely reconciled with the supply of available qualified female candidates growing faster in treated municipalities compared to control municipalities. Secondly, the evidence is not consistent with parties responding to a change in voters' preferences for female candidates. Thirdly, initial taste-based discrimination and parties growing out of their distaste for women faster in treated municipalities is not a mechanism supported by the evidence.

For this part of the analysis, we focus on candidates from the two major parties – the Conservative Party and the Progressive Party. These are the only two parties that we can track over time

slightly different, although capturing the same idea. It is: Updating is faster the higher the signal of female councilors (unconditional on the ability)

$$\frac{d(\tilde{\mu}_{g,t+1} - \tilde{\mu}_{g,t})}{ds_i} = \frac{\partial(\tilde{\mu}_{g,t+1} - \tilde{\mu}_{g,t})}{\partial \hat{\mu}_g} \left[\frac{\partial \hat{\mu}_g}{\partial s_i} + \frac{\partial \hat{\mu}_g}{\partial a_i} \frac{da_i}{ds_i}\right] > 0 \tag{5}$$

in each municipality. As a matter of fact, they dominate South Korean local elections, producing at least 74% of ward councilors and 82% of PR councilors in each municipality every election (Appendix Table A.2).

VII.A. Learning is faster with more new information on women

The model predicts that the process of belief updating is faster the greater the number of newly elected female councilors. In this section, we check if this prediction is empirically met by looking at the effect of being above the threshold on the number of elected rookie and incumbent female councilors. A candidate or a councilor is defined as incumbent if they have been elected in at least one of the previous election cycles.

Table X shows that the quota was 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. Comparing columns (2) and (5), we can clearly see that the additional women elected through the PR arm due to the stronger intensity of quota in treated municipalities are predominantly rookie women. In fact, up until cycle 5, these additional women are solely rookie women. As a consequence, despite parties' counteraction of the quota resulting in a lower number of female rookie ward councilors (column (4)) in cycle 4, the *total* number of female rookie councilors in treated municipalities is higher overall (column (6)), even if not significantly so. Hence, the quota was successful in forcing parties to experience new female politicians in action.

[Table X here]

VII.B. Learning is faster the better the women experienced

The second prediction of the model indicates that if parties are learning about the competence of females, then this learning process takes place at a faster rate if they are exposed to more competent women. To provide evidence in this direction, we perform a heterogeneity analysis based on the level of education of the first elected PR women of cycle 4 and track the evolution after cycle 4. As shown in the previous section, the quota promoted the election of a higher number of rookie female councilors through the PR arm in treated municipalities. We now check whether the competence of these PR women matters.

Following an approach commonly used in the literature, we exploit information on the education of the candidates as a proxy for competence[22]. 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

[22]For example, Baltrunaite et al., 2014

above or below the median of all municipalities. We next examine if the evolution over time of the treatment effect (effect of an additional PR seat, and hence an additional woman) on the selection of ward candidates differ in the two groups.

Table XI displays the results of equation (2) for the sample of councils in which the female PR councilors elected in cycle 4 have below-median and above-median years of schooling, respectively. To ensure that any difference in the evolution of the treatment effect over time cannot be attributed to ex-ante differences in the overall pool of women available, columns (2), (4), (6), and (8) add controls for the average education level of all female candidates affiliated with the two main parties in cycle 4 and for the total number of ward female candidates affiliated to two main parties in the municipality in cycle 4. The analysis is again restricted to the main two parties, which are the only parties that we can follow over time.

In line with the prediction of the model, we find that the shift towards female ward candidates is more apparent and stronger when the first elected PR women are more educated (column (7)). This is confirmed also when we control for ex-ante characteristics of the pool of women in the two groups of municipalities (column (8)). This evidence points to the story of learning about the competence of females over time, and not one of a growing taste for women that would occur irrelevantly of ability.

[Table XI here]

VII.C. Parties with greater gender bias learn more about elected women

The previous sections show evidence consistent with the story of learning through exposure; the gradual increase in female candidates is stronger where there is more new information about women's competence. Up to now, the learning story was documented at the municipality level. This section further corroborates the story by unpacking the dynamic learning process at the level of parties. In doing so, we highlight how parties with different ex-ante favorability towards women respond differently to the election of women.

To conduct this *party*-level analysis, 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. This comparison gives us the causal effect of experiencing a woman from one's own party in action. In close electoral races in which the outcome of the election is uncertain, the winner is typically determined by factors that are beyond the control of parties and candidates, so which party wins the seat can be considered random (Lee, 2008).

We take marginal parties to be the *two* parties that either marginally won or lost a PR seat for the municipality. In order to differentiate marginal winners from losers, we measure how far off the vote share received by a party was, from the share it needed to win that seat. For party p in

municipal council c at election cycle t, this value is given by $v_{cpt} \equiv (\text{vote share})_{cpt} - \bar{v}_{cpt}$, where $\bar{v}$ denotes the verdict-determining vote share. As the simplest example of $\bar{v}$, when two parties are competing for one PR seat, $\bar{v} = 0.5$ for both parties. The precise way we compute $\bar{v}$ for all possible contest scenarios is detailed in Appendix Section E.1.. Figure VII shows the distribution of the vote shares received by the two marginal parties competing for the last PR seat in a municipality. The histogram shows that there are plenty of parties that received a vote share close to the share needed to win that seat.

[Figure VII here]

To focus on the effect of experiencing a *woman* from within the party, the marginal parties in our sample are restricted to those whose marginal candidate was the number-1 candidate in the party list.[23] Thus, we compare parties that marginally got their first (female) PR candidate elected in the previous election cycle with parties that marginally failed by random chance.

We employ a regression discontinuity design of the following form:

$$Y_{cpt} = \alpha_t + \beta \times Winner_{cp,t-1} + f(v_{cp,t-1}) + X'_{cpt}\gamma + \epsilon_{cpt} \tag{6}$$

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, including the number of ward seats and the total council size for the *contemporaneous* election, i.e. election cycle t. A further factor to note is that the sample includes only the two major parties in South Korea, in order to track the parties over time. X_{cpt} also includes a dummy that indicates which of the two major parties is party p.

Critically, we distinguish how the $Winner$ effect varies between two different types of parties: those that placed men as the number-2 candidate in the party list in the previous election, and those that did not. This is important for two reasons. First, as parties can place a candidate of any gender in even positions in their lists, the parties that place women in even positions can be expected to have more gender-equal attitudes ex-ante. Hence, by comparing the effect of marginally winning a woman for parties that placed a woman or a man in the second PR position, we can test whether the evidence is consistent with the prediction of the model that, if learning takes place, belief updating should be faster the larger is the (downward) bias in prior beliefs. Second, the comparison allows us to net out other potential reasons why party strategies change when parties win a seat in general, that affect both types of parties.

Table XII reports the result of specification (6) where the outcome variable is whether the number-1 PR candidate in cycle $t-1$ is one of the ward candidates in cycle t. The outcome

[23] To clarify, these include parties in municipalities with more than 1 PR seat. For example, let's assume that there are 2 PR seats in the council and the contest is whether the most popular party wins both seats or the second-most popular party wins one, too. In this case, only the second-most popular party is in the sample. Its marginal candidate is the first PR candidate on the party list, while the marginal candidate for the most popular party is the second.

variable tells us whether the PR candidate gets moved "up" to the ward arm where she has to win elections on her own account, and where her selection is no longer legally imposed. The results are provided for all parties (Panel A), parties for which the second PR candidate was a man (Panel B), and parties where the second PR candidate was a woman (Panel C).[24]

The evidence is consistent with parties learning about a woman's competence by experiencing her in action. Columns (1)-(4) of Panel A show that the probability that the number-1 PR candidate in cycle $t-1$ runs in the ward arm in cycle t is significantly higher for parties where she actually won. Comparing Panel B to C, we can see that the effect is completely driven by parties that placed a man in the second position on the party list. Hence, this cannot be reconciled with elected women being selected again as candidates because she has acquired experience as a councilor or visibility among voters, as the same is true for the PR woman elected from parties that placed a woman in the second position. Rather, the result shows that more gender-equal parties move women to the ward arm whether or not they were elected previously in the PR arm, whereas less gender-equal parties only do so once she has proven herself after the election. We take this result to be consistent with the third prediction of the model: parties with larger (downward) bias in prior beliefs about the competence of women respond more – update their beliefs more – to new information about a woman's capability that gets revealed once she serves as councilor.[25]

[Table XII here]

VII.D. Learning takes place for women as a whole

The evidence discussed so far is consistent with parties starting with imperfect information and biased beliefs regarding women as political leaders and subsequently learning about the competence of elected women. The previous section, in particular, focused on how parties respond to new information about the capabilities of individual women that get revealed after they get elected. We argue in this section that parties not only learn about the elected women but also about the group of women as a whole.

We return to the specification of (2) to analyze the effect of being above the threshold on the number and gender composition of incumbent and rookie ward candidates. Table XIII shows the results for the number of incumbents (columns (1)-(3)) and rookies (columns (4)-(6)) respectively. Columns (1) and (3) present the results for male candidates, columns (2) and (4) present the results

[24]The effect of marginally winning a PR woman is estimated also using different functional forms for $f(v_{cp,t-1})$. Results are very consistent and can be found in Table A.11 in Appendix.

[25]To be precise, the third model prediction is about the updating speed about the value of μ_g, i.e. learning about the competence of women as a whole, as opposed to learning about individual councilors. But the same prediction would hold for learning about individual councilors if we relax the model simplification that the true ability of councilors is fully revealed after the election.

for female candidates, while the results in columns (3) and (6) can be interpreted as the change in the share of women keeping the total number of candidates constant.

We can clearly see that parties being able to access a larger pool of known and verified experienced female candidates is one of the explanations for the different evolution in the composition of ward candidates in treated councils. As shown in columns (1) to (3), parties put forward a higher number of incumbent women among ward candidates over time.

However, this cannot be the only mechanism in place. The evidence is consistent with parties learning about the competence of women as a group. Columns (4)-(6) of Table XIII show that parties in treated municipalities also start putting forth an increasing number of rookie women over time. These are women whom the party has not experienced in action and for whom information regarding competence is imprecise. Hence, this points towards a change in the prior regarding the competence of women as a whole. In line with the last prediction of the model, the smaller is the difference in the party's prior regarding the competence of men and women, the greater the female share is among selected candidates[26]

[Table XIII here]

VII.E. Alternative mechanisms

Change in the supply of qualified women Even if there is absolutely no learning, the patterns that we see in the number of female candidates and councilors could be consistent with the initial shortage and gradual growth in the supply of qualified and experienced women. We provide evidence that this mechanism cannot be the whole story.

First of all, for the treatment effect of fewer female ward candidates in cycle 4 to be explained by a shortage of women, we should find that parties in treatment municipalities have greater trouble finding female candidates. We test this hypothesis. A party is defined as unconstrained if the number of female candidates in its party list is greater than the number of women it needs to list as candidates due to quotas.[27] Table XIV shows that parties below the threshold are not more unconstrained in the number of women they can list as candidates, particularly in cycle 4.

[Table XIV here]

Secondly, if the only reason for the treatment effect of rising number of female ward candidates over cycles 5 through 7 was the greater availability of experienced female candidates, then there

[26] In the next section we provide evidence that there is no differential evolution in the gender gap in education in municipalities above and below the threshold, which might be an alternative mechanism.

[27] For example, the 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. In election cycle 4, the quota, while legislated, did not have an enforcement system, so a small number of parties listed fewer women than stipulated.

should be no shift in the female share among rookie candidates with zero experience. This stands contrary to the results in Table X. In addition, the number of female councilors in cycle 4 was still too small to account for all the rise in the number of female candidates over time.

Lastly, the quota did not improve the relative quality of female candidates faster in treated municipalities, as measured by the gender gap in education. We estimate an individual-level version of equation (2):

$$Y_{icbt} = \alpha_b + \alpha_t + \sum_{s=4}^{7} \beta_s \cdot Treat_{cb4} + \sum_{s=4}^{7} \pi_s \cdot (Treat_{cb4} \times Female_{icbt}) + \sum_{s=4}^{7} \kappa_s \cdot Female_{icbt} + f(x_{cb4}) + X'_{cbt}\gamma + X'_{icbt}\delta + \epsilon_{cbt} \quad (7)$$

where $Treat_{cb4}$ is treatment defined based on treatment status at 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 cycles fixed effects, while X_{icpt} indicates individual-level controls, including the party of affiliation, whether one's occupation is related to politics, whether one was previously elected, and age and age squared. The outcomes we consider are i) a categorical variable for the level of education,[28] ii) years of schooling, iii) whether the candidate holds a bachelor degree or more, iv) whether the candidate has received tertiary education in the top 20 universities in Korea.[29]

Table XV shows that the treatment does not affect the gender gap in candidates' education. The coefficient of the interaction between the treatment dummy and the female dummy is never statistically significantly different from zero. We do observe an increase in the education levels of both men and women over time, but it does not occur differentially between treatment and control municipalities.

[Table XV here]

Change in voter preference for women The observed gradual increase in the number of female candidates could be explained by parties responding to a change in voters' attitudes toward women. Voters might be the ones learning about women's competence, or might simply become more favorable towards women after experiencing female councilors. Hence, parties could nominate female candidates for reasons not directly related to them learning about their competence, but to strategically adapt their strategies to follow voters' preferences.

In order to test whether this is the case, we follow Esteve-Volart and Bagues (2012) and we compare the gender gap in votes received by candidates in treated and control municipalities over time. We estimate equation (7) with the vote share a candidate obtained in the ward election as the

[28] Ranging from 0 to 12 based on final education degree enrolled in and degree completion status.

[29] A university belongs to the top 20 if it was in the top 20 in the University Rankings in any year between 1995 and 2019 according to JoongAng Ilbo, one of the three biggest newspapers in Korea.

outcome variable. Columns (1)-(5) of Table XVI display the estimates of the specification as we gradually add controls. Column (1) includes only the number of ward seats for the *contemporaneous* election. Column (2) includes also the position on the ballot list and the party of affiliation, while in column (3) we additionally control for individual characteristics. Lastly, column (4) includes a control for the number of ward candidates in the municipality, and column (5) includes list fixed effects. A list is defined over a given election cycle, for a given municipality, and for a given political party.

If the quota induced a change in voters' attitudes towards women, female ward candidates would get higher vote shares relative to males with comparable characteristics and ballot positions in treated compared to control municipalities. The only exception is the unlikely event in which parties are able to preempt voter preferences perfectly and put forward just the right number of females in the right position every election cycle.[30] Looking at columns (1)-(5), we can see that this is not the case. There is no evidence of a treatment effect on the gender gap in vote share or a different evolution of the gender gap over time in treated compared to control municipalities.

[Table XVI here]

Change in parties' taste for women There is an additional mechanism that would deliver observationally equivalent results. Parties in treated councils may have initially selected a lower number of female ward candidates due to taste-based discrimination. The quota could then have then been successful in forcing parties in treated councils to experience a higher number of women, and as a consequence grow out of their distaste for them faster than control municipalities.

However, Table XIII shows that there is no counteraction for incumbent ward candidates (columns (2), (3)) in cycle 4, but only for rookie ward candidates (columns (5), (6)). This suggests that general distaste for women is probably not the main reason why we see parties initially putting forth fewer women among ward candidates. Lack of information regarding their competence seems a more plausible explanation.

Moreover, two additional results point to a story of learning about the competence of females over time, and not one of a growing taste for women. First, the results of the heterogeneity analysis based on the education of the first PR-elected women displayed in Table XI show that the shift towards female candidates is more apparent and stronger when the first women are more educated. This would not be the case if parties' distaste for women was becoming weaker over time, as this would occur irrelevantly of ability. Second, Table VIII shows that the increase in the number of women over time is concentrated in "unsafe" wards, where the party does not have a stronghold and political competition is stronger. This, too, is consistent with parties learning about the competence

[30] If this was the case, we would see no gender gap in vote share. However, XVI shows that this is not the case.

of women over time. Not selecting the best candidates might be more costly in races that are expected to be close. Hence the quality of the candidate becomes more important as a selection factor in unsafe wards, as opposed to favoritism or taste (Esteve-Volart and Bagues, 2012).

VIII. CONCLUSION

This paper highlights that with time, affirmative action policies can still be effective despite an initial backlash, as long as the policies are not completely undone. Moreover, such is the case even in settings where the target group consists of a very small minority among the incumbents. Through exposure to the minority group, the policies provide incumbents with an opportunity to learn about the competence of the minority group. Once the learning takes off, the policy itself might not be needed.

Gender quotas are needed not for equal representation's sake, but also from an efficiency standpoint. If informational failure leads to suboptimally low numbers of female politicians, quotas play a role in rectifying this source of inefficiency.

Although gender quotas in parliaments have been adopted broadly worldwide, there are still many countries that have none in place, such as Egypt, India, Liberia, Mauritius, Sao Tome and Principe, Sierra Leone, and Sri Lanka. Unsurprisingly, these countries also suffer from low levels of female representation in national parliaments. The South Korean setting of this paper is unique in that it studies the effect of a gender quota in the legislative body from a starting point of practically zero women. Therefore, this paper is informative about the effect of gender quotas where they are most needed.

What remains to be crystallized is exactly which aspect of women's competence parties are learning about. As of yet, we do not know whether it is their election campaign skills, their loyalty to the party, their keenness as legislators, or their ability to meet the demands of the electorate. Further evidence is needed in this direction.

This paper is part of a bigger agenda that attempts to study how a gender quota might trigger a gradual process of learning in favor of women. To tackle the precise mechanisms through which the learning takes place, we plan to study in future work the specific interactions among councilors recorded in the transcripts of council meetings.

STOCKHOLM UNIVERSITY, CEP (LSE)
TRINITY COLLEGE DUBLIN, TRiSS, TIME

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IX. TABLES

Table I
Amendments to Legislation on Municipal Council Elections

First applicable election year	Amendment
2006	[PR] Proportional representation introduced [W] Single-member plurality vote → Multi-member plurality vote [PR] Odd-number candidates in party lists must be female (not enforced) [W] Subsidies to parties for nominating female candidates
2010	[PR] Odd-number candidates in party lists must be female (enforced) [W] At least one female candidate per general election district

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

Table II
Descriptive Statistics on Municipal Councils' Gender Composition

	Election cycle (year)						
	1 (1995)	2 (1998)	3 (2002)	4 (2006)	5 (2010)	6 (2014)	7 (2018)
Total number of councilors							
Min.	7	7	7	7	7	7	7
Mean	19.9	15.0	15.0	12.6	12.6	12.8	12.8
Max.	50	40	41	36	34	43	44
Number of PR councilors							
Min.	-	-	-	1	1	1	1
Mean	-	-	-	1.63	1.63	1.67	1.70
Max.	-	-	-	4	4	5	5
Gender ratio							
Min.	0	0	0	0	0.06	0.08	0.10
Mean	0.01	0.01	0.02	0.15	0.21	0.25	0.29
Max.	0.43	0.22	0.28	0.46	0.57	0.86	0.64
Gender ratio among PR councilors							
Min.	-	-	-	0*	0*	0.50	0.50
Mean	-	-	-	0.87	0.96	0.97	0.98
Max.	-	-	-	1	1	1	1
Minimum number of women required							
Min.	-	-	-	0	1	1	1
Mean	-	-	-	1.12	1.12	1.13	1.13
Max.	-	-	-	2	2	3	3

Notes: The table provides information regarding the total number of councilors and the councilors elected through the party-list proportional representation arm across election cycles. The gender ratio is calculated as the share of women over the overall number of councilors. The minimum number of required women indicates the minimum number of women that must be elected in each council due to the quota. The quota imposed that all odd-number candidates in the party list for the proportional-representation arm needed to be female. At least 10% of the councilors need to be elected through party-list proportional representation. Hence, the number of councilors elected through the PR arm, and as a consequence the minimum number of required women, depend on council size. *Gender quotas were introduced in 2005. However, during the election of 2006, they remained merely a strong recommendation, so it was still legal to place a male in slot 1 of party lists. Most municipalities complied, but 14 of them had no female PR councilors. In election year 2010, the minimum of the gender ratio among PR councilors is 0 because in one council the elected woman was invalidated for being a member of multiple parties.

Table III
The Effect of An Additional PR Seat at Cycle 4 on The Number of Female PR Councilors

	Number of female PR councilors		
	Bin 1	Bin 2	Bin 3
	(1)	(2)	(3)
Treat at cycle 4 x Cycle 4	0.84***	0.52***	-0.23
	(0.09)	(0.18)	(0.54)
Treat at cycle 4 x Cycle 5	0.84***	0.32*	0.44
	(0.07)	(0.19)	(0.37)
Treat at cycle 4 x Cycle 6	0.77***	0.58***	0.04
	(0.08)	(0.18)	(0.39)
Treat at cycle 4 x Cycle 7	0.77***	0.57***	0.16
	(0.08)	(0.16)	(0.39)
Running variable form	council	council	council
N	670	198	33

Notes: This table displays the effect of having an additional PR seat (treatment) on the number of female councilors elected through the party-list proportional representation ("PR"). It reports the results of regressing equation (2), separately for each bin. The sample includes all bins and all parties participating in municipal elections. Standard errors (in parenthesis) are clustered at municipality level.
* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table IV
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 at cycle 4 x Cycle 4	-23.97	0.01	-17.22	-7.84	-9.38	-5.59	0.01
	(30.88)	(0.02)	(22.54)	(11.20)	(11.37)	(11.07)	(0.02)
Running variable form	council	council	council	council	council	council	council
N	219	219	219	219	219	219	219

***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 at cycle 4 x Cycle 4	1.30	-0.31	86940.60	42556.87	18867.18	54934.05
	(1.39)	(3.22)	(241854.26)	(141170.28)	(124931.31)	(246316.15)
Running variable form	council	council	council	council	council	council
N	219	219	219	219	219	219

***Panel C*: Education**

	Elementary School or less		Middle School		High School	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Treat at cycle 4 x Cycle 4	8835.58	4324.18	5113.39	2762.45	35035.82	24315.10
	(10497.51)	(15200.97)	(15053.35)	(11853.95)	(92990.19)	(59395.49)
Running variable form	council	council	council	council	council	council
N	219	219	219	219	219	219

	Tech. University		University		Graduate Studies	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Treat at cycle 4 x Cycle 4	10063.70	3714.14	21383.83	6028.32	6508.27	1412.68
	(30382.16)	(21548.29)	(82013.52)	(40201.11)	(20396.75)	(7645.36)
Running variable form	council	council	council	council	council	council
N	219	219	219	219	219	219

***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 at cycle 4 x Cycle 4	0.00	-0.00	54.16	0.02	-0.23	0.17
	(0.07)	(0.07)	(86.15)	(0.05)	(0.18)	(0.11)
Running variable form	council	council	council	council	ward	ward
N	219	219	219	219	219	219

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

Table V
The Effect of Being Past The Threshold on The Number of Councilors

	All political parties								
	Ward			PR			All		
	Male	Female	Female	Male	Female	Female	Male	Female	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treat at cycle 4 x Cycle 4	0.45*	-0.34	-0.36*	0.09	0.76***	0.76***	-0.29	0.29	0.29
	(0.26)	(0.22)	(0.22)	(0.08)	(0.09)	(0.08)	(0.33)	(0.28)	(0.28)
Treat at cycle 4 x Cycle 5	-0.13	0.31	0.28	0.10	0.71***	0.71***	-0.87**	0.88***	0.88***
	(0.29)	(0.23)	(0.23)	(0.06)	(0.08)	(0.08)	(0.35)	(0.29)	(0.28)
Treat at cycle 4 x Cycle 6	-0.22	0.52*	0.47*	0.08	0.71***	0.70***	-0.97**	1.09***	1.06***
	(0.33)	(0.27)	(0.26)	(0.06)	(0.08)	(0.08)	(0.38)	(0.32)	(0.31)
Treat at cycle 4 x Cycle 7	-0.28	0.82***	0.73**	0.04	0.72***	0.69***	-1.08***	1.41***	1.33***
	(0.36)	(0.29)	(0.29)	(0.06)	(0.08)	(0.08)	(0.41)	(0.35)	(0.33)
N. of ward councilors			0.17*						
			(0.09)						
N. of councilors						0.09***			0.24***
						(0.02)			(0.09)
Running variable form	ward	ward	ward	council	council	council	council	council	council
N	868	868	868	868	868	868	868	868	868

Notes: This table reports the effect of being above the threshold (defined based on cycle 4 council size) on councils' gender composition across election cycles. The regression specification is given by equation (2). The sample includes only 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 - plurality vote in the municipality's constituent wards ("ward warm") and party-list proportional representation ("PR arm") arms, by gender in each municipality in each election cycle. In columns (3), (6), and (9), we report how the number of female ward candidates compares between municipalities above and below the threshold, when we control for the number of ward councilors (column (3)), and total councilors (columns (6) and (9)). This is done to control for the change in councils size across election cycles and will constitute the specification used in the following tables. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table VI
The Effect of Being Past The Threshold on The Number of Candidates

	All political parties					
	Ward		PR		All	
	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)
Treat at cycle 4 x Cycle 4	3.70***	-0.24	0.94***	0.96***	1.89***	0.51
	(1.16)	(0.35)	(0.22)	(0.22)	(0.28)	(0.49)
Treat at cycle 4 x Cycle 5	0.56	0.49	0.63***	1.20***	1.83***	1.51***
	(0.91)	(0.36)	(0.17)	(0.22)	(0.28)	(0.49)
Treat at cycle 4 x Cycle 6	-1.39*	0.91**	0.25*	1.02***	1.28***	1.76***
	(0.84)	(0.42)	(0.15)	(0.22)	(0.25)	(0.54)
Treat at cycle 4 x Cycle 7	-2.23**	1.10**	0.21	1.27***	1.49***	2.22***
	(1.00)	(0.44)	(0.16)	(0.22)	(0.24)	(0.58)
Running variable form	ward	ward	council	council	council	council
N	868	868	868	868	868	868

Notes: This table reports the effect of being above the threshold (defined based on cycle 4 council size) on the gender composition of candidates across election cycles. The regression specification is given by equation (2). The sample includes only bins 1 and 2, and all parties participating in municipal elections. The outcome variable is the number of candidates put through by parties overall and separately in the two arms - PR and ward arms, by gender in each municipality in each election cycle. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table VII
The Effect of Being Past The Threshold on The Number of Candidates Likely To Be Elected

	Main political parties								
	All ward candidates			Useful positions			Rank 1 candidates		
	Male	Female	Female	Male	Female	Female	Male	Female	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Treat at cycle 4 x Cycle 4	1.43*	-0.28	-0.43*	0.63	-0.40**	-0.44**	0.80*	-0.39**	-0.47***
	(0.76)	(0.23)	(0.22)	(0.46)	(0.18)	(0.17)	(0.47)	(0.18)	(0.17)
Treat at cycle 4 x Cycle 5	0.39	0.48*	0.36*	-0.47	0.43**	0.43**	-0.25	0.42**	0.38**
	(0.65)	(0.25)	(0.22)	(0.48)	(0.18)	(0.17)	(0.48)	(0.18)	(0.17)
Treat at cycle 4 x Cycle 6	0.57	0.76**	0.59**	-0.02	0.44*	0.36*	0.07	0.45*	0.35*
	(0.64)	(0.29)	(0.27)	(0.45)	(0.23)	(0.20)	(0.45)	(0.23)	(0.20)
Treat at cycle 4 x Cycle 7	-0.54	1.17***	1.09***	-0.20	0.70***	0.61**	-0.13	0.68***	0.58**
	(0.65)	(0.32)	(0.31)	(0.46)	(0.25)	(0.23)	(0.46)	(0.25)	(0.23)
N. of ward candidates			0.13***						
			(0.02)						
N. of ward candidates in useful positions						0.19***			
						(0.02)			
N. of rank 1 candidates									0.19***
									(0.02)
Running variable form	ward	ward	ward	ward	ward	ward	ward	ward	ward
N	867	867	867	867	867	867	867	867	867
N. relevant ward candidates	No	No	Yes	No	No	Yes	No	No	Yes

Notes: This table reports the effect of being above the threshold (defined based on cycle 4 council size) on the gender composition of ward-candidates likely to be elected across election cycles. The regression specification is given by equation (2). The sample includes only bins 1 and 2 and is restricted to the two main parties - Liberal Korean party and Democratic party. In columns (1) to (3), the outcome variable is the total number of candidates put forward by the two main parties in the ward arm by gender in each municipality in each election cycle. In columns (4) to (6), the outcome variable concerns the number of candidates put forward in useful positions in the ward arm by the two main parties by gender. Useful positions refer to candidates in the 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). In columns (7) to (9), the outcome variable concerns "rank 1 candidates". Rank 1 candidates refer to solo candidates or the first candidate for the party in each ward. The number of observations is 867 instead of 868 since in one municipality main parties only have proportional candidates. In columns 3, 6, and 9, we control for the total number of ward candidates in the considered positions – column (3): total number of ward candidates, column (6): number of ward candidates in useful position, column (9): number of rank 1 ward candidates. As the total number of candidates equals the sum of the number of male and female candidates, columns (3), (6), and (9) inform us on whether the additional woman is placed in the ballot list as a substitute for men or in addition to men. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table VIII
The Effect of Being Past The Threshold at Election Cycle 4 on The Number of Ward Candidates in Safe and Unsafe Wards

	Main political parties, (locality×party)-level regressions											
	All ward candidates				Useful ward candidates				Rank 1 ward candidates			
	Female Safe (1)	Female Safe (2)	Female Unsafe (3)	Female Unsafe (4)	Female Safe (5)	Female Safe (6)	Female Unsafe (7)	Female Unsafe (8)	Female Safe (9)	Female Safe (10)	Female Unsafe (11)	Female Unsafe (12)
Treat at cycle 4 x Cycle 4	-0.16	-0.18	-0.07	-0.09	-0.21*	-0.23**	-0.14	-0.14	-0.20*	-0.20*	-0.14	-0.14
	(0.15)	(0.15)	(0.12)	(0.12)	(0.12)	(0.12)	(0.10)	(0.10)	(0.12)	(0.12)	(0.10)	(0.10)
Treat at cycle 4 x Cycle 5	0.16	0.21	0.39***	0.34**	0.05	0.03	0.39***	0.39***	0.03	0.03	0.39***	0.39***
	(0.17)	(0.17)	(0.14)	(0.14)	(0.15)	(0.14)	(0.11)	(0.11)	(0.15)	(0.15)	(0.11)	(0.11)
Treat at cycle 4 x Cycle 6	0.10	0.08	0.43***	0.42***	0.10	0.08	0.22*	0.22*	0.12	0.12	0.22*	0.22*
	(0.21)	(0.21)	(0.15)	(0.15)	(0.17)	(0.17)	(0.11)	(0.11)	(0.17)	(0.17)	(0.11)	(0.11)
Treat at cycle 4 x Cycle 7	0.35*	0.32	0.62***	0.66***	0.08	0.08	0.44***	0.44***	0.09	0.09	0.42***	0.42***
	(0.21)	(0.20)	(0.15)	(0.16)	(0.17)	(0.17)	(0.13)	(0.13)	(0.17)	(0.17)	(0.13)	(0.13)
Running variable form	ward	ward	ward	ward	ward	ward	ward	ward	ward	ward	ward	ward
N	542	542	1171	1171	542	542	1171	1171	542	542	1171	1171
N. relevant party ward candidates	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes
Party fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N. of safe wards	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N. of unsafe wards	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Average past margin of victory	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports the effect of being above the threshold (defined based on cycle 4 council size) on the gender composition of ward-candidates put forward in different wards across election cycles. The regression specification is given by equation (2). The sample includes only bins 1 and 2 and is restricted to the two main parties. The level of observation is party ward. In columns (1) to (4), the outcome variable is the total number of female candidates put forward by each of the two main parties in the ward arm in each municipality in each election cycle. In columns (5) to (8), the outcome variable concerns the number of female candidates put forward in useful positions in the ward arm by each of the two main parties. Useful positions refer to candidates in the high-up positions on the ballot for the party in each ward (position 1 if the ward elects 1-2 councilors, and positions 1 and 2 if the ward elects 3-4 councilors). In columns (9) to (12), the outcome variable concerns "rank 1 candidates". Rank 1 candidates refer to solo candidates or the first candidate for the party in each ward. Columns (1), (2), (5), (6), (9), and (10) consider candidates put forward by the party in safe wards. A ward is considered as safe for a party if the party won the greatest vote share in the PR arm in the ward in the previous election cycle, and it got over 10 percentage points more vote share than the next popular party (margin of victory). Columns (3), (4), (7), (8), (11), and (12) consider candidates put forward by the party in unsafe wards, which are all the other wards. In even columns, we control for the total number of ward candidates in the considered positions – columns (2) and (4): number of ward candidates for the party in safe and unsafe wards respectively, column (6) and (8): number of ward candidates in useful position for the party in safe and unsafe wards respectively, column (10) and (12): number of rank 1 ward candidates for the party in safe and unsafe wards respectively. In each column we add a control for the number of safe and unsafe wards for the party, the average margin of victory for the party in the past election cycle, and party fixed effects. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table IX
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 at cycle 4 x Cycle 1	1.07	0.05	0.03	0.10
	(1.29)	(0.26)	(1.31)	(0.30)
Treat at cycle 4 x Cycle 2	0.57	-0.04	-0.51	0.04
	(1.12)	(0.23)	(1.01)	(0.30)
Treat at cycle 4 x Cycle 3	1.29	0.08	0.16	0.16
	(1.03)	(0.27)	(0.91)	(0.31)
Treat at cycle 4 x Cycle 4	3.31***	0.73**	2.96**	0.60**
	(1.20)	(0.28)	(1.14)	(0.27)
Treat at cycle 4 x Cycle 5			-0.68	1.30***
			(0.83)	(0.31)
Treat at cycle 4 x Cycle 6			-2.24***	1.59***
			(0.80)	(0.42)
Treat at cycle 4 x Cycle 7			-2.74***	1.58***
			(0.99)	(0.44)
Running variable form	ward	ward	ward	ward
N	914	914	1592	1592

Notes: This table reports the result of a placebo check where we estimate the effect of being above the threshold (defined based on cycle 4 council size) on the gender composition of candidates before the introduction of the quota in cycle 4. The outcome variable is the number of candidates elected through plurality voting in each municipality in each election cycle by gender. This include all candidates before election cycle 4, as up to the third election in 2002, all councilors were directly elected through plurality voting in single-member constituent wards. From cycle 4 onward, the outcome variable includes only candidates put forward by parties in the ward arm. The regression specification is given by equation (1). The sample includes all bins. As council size is larger in election cycles 1,2, and 3 compared to the following election cycles, restricting the sample only to bin 1 and 2 would imply selecting different municipalities before and after the reform. The running variable and treatment status are defined contemporaneously. While municipality size and divisions remained almost unchanged from cycle 4 onward, they changed dramatically during the first three election cycles. Thus, it would be inaccurate to define treatment for the first three cycles using cycle 4 municipality characteristics. The sample include all parties to be able to compare election cycles before and after the introduction of the quota. It was extremely rare to find candidates affiliated with a political party before election cycle 4. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table X
The Effect of Being Past The Threshold on Rookie and Incumbent Female Councilors

	Main political parties					
	Incumbent Councilors			Rookie Councilors		
	Ward Female	PR Female	All Female	Ward Female	PR Female	All Female
	(1)	(2)	(3)	(4)	(5)	(6)
Treat at cycle 4 x Cycle 4	-0.10	0.00	-0.16	-0.24*	0.44***	0.19
	(0.11)	(0.02)	(0.13)	(0.12)	(0.11)	(0.20)
Treat at cycle 4 x Cycle 5	0.14	0.02	0.09	0.11	0.41***	0.50**
	(0.14)	(0.02)	(0.16)	(0.13)	(0.10)	(0.20)
Treat at cycle 4 x Cycle 6	0.41**	-0.00	0.34*	0.07	0.68***	0.74***
	(0.18)	(0.02)	(0.19)	(0.14)	(0.10)	(0.20)
Treat at cycle 4 x Cycle 7	0.39**	-0.00	0.32*	0.38**	0.63***	1.00***
	(0.17)	(0.02)	(0.18)	(0.18)	(0.10)	(0.22)
Running variable form	ward	council	council	ward	council	council
N	867	865	868	867	865	868

Notes: This table reports the effect of being above the threshold (defined based on cycle 4 council size) on the gender composition of councilors of different experience across election cycles. The outcome variable is the number of councilors elected through both arms (ward arm and PR arm) in each municipality in each election cycle, by gender and previous experience. The regression specification is given by equation (2). The sample includes only bins 1 and 2 and is restricted to councilors affiliated with the two main parties. The number of observations is 867 instead of 868 in columns (1) and (4) since in one municipality main parties only have proportional candidates, and 865 in columns (2) and (5) as in 3 municipality main parties only have ward candidates. A candidate is defined as incumbent if they have been elected in at least one of the previous election cycles. Rookies are the remaining candidates. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table XI
The Effect of Being Past The Threshold by Years of Schooling of The First Female PR Councilors

	Main political parties							
	Ward candidates							
	Below Median Education				Above Median Education			
	Male	Male	Female	Female	Male	Male	Female	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat at cycle 4 x Cycle 5	0.09	-0.04	-0.20	-0.04	-0.20	0.09	0.86**	0.92***
	(1.07)	(1.04)	(0.49)	(0.47)	(0.97)	(1.00)	(0.38)	(0.34)
Treat at cycle 4 x Cycle 6	0.07	-0.07	0.22	0.38	0.10	0.39	0.98**	1.04**
	(0.93)	(0.90)	(0.50)	(0.43)	(0.95)	(1.00)	(0.45)	(0.41)
Treat at cycle 4 x Cycle 7	-1.02	-1.15	0.74	0.90*	-0.63	-0.34	1.04**	1.10***
	(1.04)	(1.02)	(0.56)	(0.49)	(0.91)	(0.95)	(0.45)	(0.39)
Running variable form	ward	ward	ward	ward	ward	ward	ward	ward
N	272	272	272	272	269	269	269	269
Cycle 4 female candidates avg. education	No	Yes	No	Yes	No	Yes	No	Yes
N. ward cycle 4 female candidates	No	Yes	No	Yes	No	Yes	No	Yes

Notes: This table reports the effect of being above the threshold (defined based on cycle 4 council size) on the gender composition of ward-candidates put forward in different type of municipalities across election cycles. The outcome variable is the number of candidates put forward by the two main parties in the unconstrained ward arm in each municipality in each election cycle, by gender. 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 (1)-(4), and (5)-(8) display the results of equation (2) for the sample of councils in which the female PR councilors elected in cycle 4 have below-median and above-median years of schooling, respectively. Columns (2), (4), (6), and (8), include a control for the average education level of all female candidates affiliated with the two main parties in cycle 4 and for the total number of ward female candidates affiliated to two main parties in the municipality in cycle 4. The sample includes only bins 1 and 2 and cycles 5, 6, and 7. The analysis is restricted to municipalities with at least one PR elected woman among main party candidates in cycle 4 for which we have information on education. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table XII
The Effect of Marginally Winning a PR Woman in The Previous Election

Main political parties				
$\mathbb{1}$(Number-1 PR candidate in $t-1$ is a ward candidate in t)				
Bandwidth ($\lvert v_{cpt} \rvert$)	0.20	0.15	0.10	0.05
	(1)	(2)	(3)	(4)
Panel A: All parties				
$Winner_{t-1}$	0.41***	0.42***	0.35***	0.42***
	(0.07)	(0.08)	(0.09)	(0.13)
N	414	313	216	114
Panel B: 2nd PR candidate = Man				
$Winner_{t-1}$	0.44***	0.49***	0.40***	0.45***
	(0.08)	(0.08)	(0.10)	(0.14)
N	308	241	165	90
Panel C: 2nd PR candidate = Woman				
$Winner_{t-1}$	0.35*	0.21	0.07	-0.21
	(0.19)	(0.20)	(0.23)	(0.37)
N	106	72	51	24

Notes: This table reports the effect of marginally winning a PR-woman in the previous election cycle. The table reports the result of specification (6) on the probability that the number-1 PR candidate for the party in cycle $t-1$ is one of the ward candidates for the party in cycle t. The sample includes all election cycles after the introduction of the quota (4,5,6,7). The unit of analysis is a party in election cycle t. The results are provided for all parties (Panel A), parties for which the second PR candidate in cycle $t-1$ was a man (Panel B), and parties where the second PR candidate was a woman (Panel C). Each column shows the coefficient of the $Winner_{t-1}$ dummy (equal to 1 if the party won the election of its first PR candidate in cycle $t-1$) considering different margins of victory (bandwidths). The analysis is restricted to candidates put forward by the two main parties. The standard errors are clustered at the municipality $\times$ party level. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table XIII
The Effect of Being Above The Threshold for 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 at cycle 4 x Cycle 4	0.67*	-0.00	-0.09	0.76	-0.28*	-0.33**
	(0.40)	(0.13)	(0.12)	(0.62)	(0.17)	(0.15)
Treat at cycle 4 x Cycle 5	1.04***	0.47***	0.26	-0.65	0.01	0.08
	(0.38)	(0.17)	(0.16)	(0.60)	(0.16)	(0.14)
Treat at cycle 4 x Cycle 6	0.86**	0.61***	0.41**	-0.30	0.15	0.16
	(0.37)	(0.21)	(0.19)	(0.50)	(0.18)	(0.16)
Treat at cycle 4 x Cycle 7	-0.08	0.79***	0.69***	-0.46	0.38*	0.39*
	(0.40)	(0.20)	(0.19)	(0.52)	(0.21)	(0.20)
N. ward incumbent candidates			0.14***			
			(0.02)			
N. ward rookie candidates						0.12***
						(0.01)
Running variable form	ward	ward	ward	ward	ward	ward
N	867	867	867	867	867	867

Notes: This table reports the effect of being above the threshold (defined based on cycle 4 council size) on the gender composition of ward-candidates of different experience across election cycles. The outcome variable is the number of candidates put forward by the two main parties in the unconstrained ward arm in each municipality in each election cycle, by gender and previous experience. The regression specification is given by equation (2). The sample includes only bins 1 and 2 and is restricted to the two main parties. The number of observations is 867 instead of 868 since in one municipality main parties only have proportional candidates. A candidate is defined as incumbent if they have been elected in at least one of the previous election cycles. Rookies are the remaining candidates. In columns (3) and (6), we control for the total number of incumbent and rookie ward candidates respectively. As the total number of incumbent (rookie) candidates equals the sum of the number of male and female incumbent (rookie) candidates, columns (3), and (6) inform us on whether the additional incumbent (rookie) woman is placed in the ballot list as a substitute or in addition to an incumbent (rookie) man. Standard errors (in parenthesis) are clustered at municipality level; *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

Table XIV
Probability of Being Constrained in The Number of Female Candidates

	Main political parties (party x municipality)	
	Pr(constrained)	
	All parties	Ward candidates>0
	(1)	(2)
Treat at cycle 4 x Cycle 4	0.088	0.093
	(0.075)	(0.074)
Treat at cycle 4 x Cycle 5	-0.089	-0.119*
	(0.073)	(0.071)
Treat at cycle 4 x Cycle 6	-0.020	-0.041
	(0.065)	(0.064)
Treat at cycle 4 x Cycle 7	-0.072	-0.086
	(0.068)	(0.069)
Running variable from	council	council
N	1557	1520

Notes: This table reports the effect of being above the threshold (defined based on cycle 4 council size) on the probability that the party is constrained in the selection of candidates. The outcome variable is a dummy equal to 1 if a party is constrained in the selection of candidates in a given election cycle. A party is defined as constrained if the number of female candidates in the party's list is smaller or equal to the number of women the party must place in its list due to quotas (this number is equal to 1 if 1 or 2 seats are elected through the PR arm, and 2 if 3 seats are elected through the PR arm - all odd-number candidates in the party list for the PR arm need to be female due to the quota). The regression specification is given by equation (2). The unit of analysis is party by municipality. The sample includes only bins 1 and 2, and only the two main parties. In column (2), the sample is restricted to only the main parties in municipalities where each party has at least one ward candidate. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table XV
The Effect of Being Above The Threshold on The Gender Gap in Education

	Main political parties			
	Education level	Years of schooling	Bachelor or more	Attended top 20 uni
	(1)	(2)	(3)	(4)
Female	-0.119	-0.224	0.002	-0.006
	(0.110)	(0.183)	(0.027)	(0.015)
Female × Cycle 5	0.089	0.141	-0.020	0.021
	(0.119)	(0.194)	(0.032)	(0.017)
Female × Cycle 6	-0.015	0.010	-0.003	-0.016
	(0.141)	(0.230)	(0.038)	(0.019)
Female × Cycle 7	0.372***	0.566***	0.002	-0.006
	(0.127)	(0.209)	(0.034)	(0.020)
Treat at cycle 4	-0.150	-0.262	-0.017	0.059**
	(0.152)	(0.247)	(0.034)	(0.026)
Treat at cycle 4 × Cycle 5	-0.054	-0.085	-0.036	-0.006
	(0.086)	(0.140)	(0.022)	(0.012)
Treat at cycle 4 × Cycle 6	-0.108	-0.165	-0.018	-0.029**
	(0.094)	(0.154)	(0.025)	(0.014)
Treat at cycle 4 × Cycle 7	-0.063	-0.117	-0.028	-0.022
	(0.099)	(0.160)	(0.027)	(0.017)
Treat at cycle 4 × Female	0.127	0.235	-0.020	-0.033
	(0.171)	(0.282)	(0.043)	(0.025)
Treat at cycle 4 × Female × Cycle 5	0.073	0.064	0.065	-0.019
	(0.171)	(0.283)	(0.052)	(0.026)
Treat at cycle 4 × Female × Cycle 6	0.102	0.099	0.017	0.032
	(0.202)	(0.324)	(0.055)	(0.029)
Treat at cycle 4 × Female × Cycle 7	-0.150	-0.283	0.011	0.035
	(0.201)	(0.327)	(0.055)	(0.031)
Cycle 5	0.595***	0.992***	0.167***	-0.005
	(0.052)	(0.083)	(0.015)	(0.008)
Cycle 6	1.080***	1.763***	0.272***	0.026***
	(0.058)	(0.093)	(0.016)	(0.010)
Cycle 7	1.244***	2.075***	0.348***	0.019*
	(0.058)	(0.093)	(0.016)	(0.011)
N	13235	13235	13235	13235
Running variable form	council	council	council	council
Age polynomials	Yes	Yes	Yes	Yes
Party affiliation	Yes	Yes	Yes	Yes
Rookie vs Incumbent	Yes	Yes	Yes	Yes
Political Experience	Yes	Yes	Yes	Yes

Notes: This table reports the effect of being above the threshold (defined based on cycle 4 council size) on the gender gap in education of candidates across election cycles. The outcome variables are the candidates' level of education (0-12), years of schooling (0-22), a dummy equal to one if the candidate has a bachelor degree or more, and a dummy equal to one if the candidate has received tertiary education from a top 20 university in Korea. The regression specification is given by equation (7). The analysis is performed at the individual level. The sample includes only bins 1 and 2, and only candidates from the two main parties for which we have education information. "Age polynomials" refers to age and age squared. "Party affiliation" is a dummy equal to one if the candidate is affiliated with the Democratic 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 of the previous election cycles. "Political experience" is a dummy equal to one if the candidate has has political experience outside the municipal council. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table XVI
Evolution of Voter Preferences

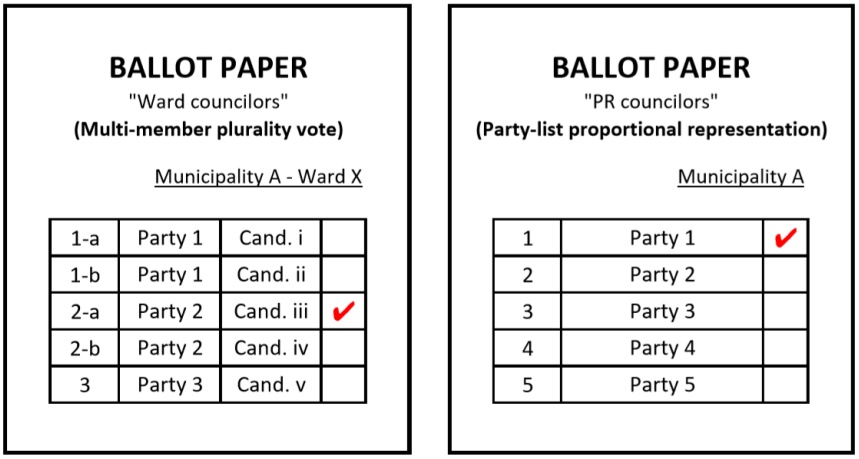
	Main political parties				
	Candidate's vote share in the ward election arm (%)				
	No controls (1)	Ballot position (2)	Individual characteristics (3)	N. ward candidates (4)	List fixed effects (5)
Female	0.478	-0.708	-0.045	0.454	-2.000**
	(1.061)	(0.972)	(1.015)	(1.020)	(0.867)
Cycle 5 x Female	-0.677	-1.593	-2.650**	-3.089***	-0.996
	(1.317)	(1.130)	(1.194)	(1.171)	(0.993)
Cycle 6 x Female	-1.457	-1.743*	-2.934***	-3.469***	-1.452*
	(1.169)	(0.996)	(1.031)	(1.036)	(0.873)
Cycle 7 x Female	1.688	1.612	0.145	-0.675	-0.100
	(1.222)	(1.154)	(1.191)	(1.164)	(0.972)
Treat at cycle 4	-2.124**	-1.982**	-2.190***	-0.846	
	(1.014)	(0.796)	(0.804)	(0.672)	
Treat at cycle 4 x Cycle 5	0.063	0.187	0.231	-0.467	
	(0.610)	(0.545)	(0.543)	(0.557)	
Treat at cycle 4 x Cycle 6	0.828	0.883	0.904	-0.450	
	(0.722)	(0.623)	(0.628)	(0.667)	
Treat at cycle 4 x Cycle 7	1.256	1.147*	1.190*	-0.349	
	(0.782)	(0.632)	(0.631)	(0.624)	
Treat at cycle 4 x Female	-1.213	0.428	-0.168	-0.448	0.434
	(1.867)	(1.540)	(1.614)	(1.524)	(1.149)
Treat at cycle 4 x Cycle 5 x Female	2.100	-0.595	-0.334	-0.216	-1.154
	(2.086)	(1.649)	(1.737)	(1.665)	(1.370)
Treat at cycle 4 x Cycle 6 x Female	1.579	-0.435	0.192	0.561	-0.110
	(1.880)	(1.527)	(1.597)	(1.531)	(1.297)
Treat at cycle 4 x Cycle 7 x Female	0.599	-0.941	-0.165	0.098	0.161
	(2.088)	(1.722)	(1.749)	(1.684)	(1.422)
N	11246	11246	10791	10791	10719
Running variable form	ward	ward	ward	ward	ward
Ballot Position	No	Yes	Yes	Yes	Yes
Schooling (0-22)	No	No	Yes	Yes	Yes
Rookie vs Incumbent	No	No	Yes	Yes	Yes
Political Experience	No	No	Yes	Yes	Yes
Age polynomials	No	No	Yes	Yes	Yes
N. ward candidates	No	No	No	Yes	Yes
List Fixed Effects	No	No	No	No	Yes

* p<.10, ** p<.05, *** p<.01

Notes: This table reports the effect of being above the threshold (defined based on cycle 4 council size) on the gender gap in the vote share obtained by candidates across election cycles (0-100). The regression specification is given by equation (7). The analysis is performed at the individual level. The sample includes all candidates put forward in municipalities included in bins 1 and 2 by the two main parties. "Ballot position" refers to a dummy equal to one for each position in the ballot list. "Schooling" refers to the years of schooling obtained by the candidate. "Age polynomials" refers to age and age squared. "Party affiliation" is a dummy equal to one if the candidate is affiliated with the Democratic party. "Rookie vs incumbent" refers to a dummy equal to one if the candidate is an incumbent - they have been elected in at least one of the previous election cycles. "Political experience" is a dummy equal to one if the candidate has political experience outside the municipal council. "N. ward candidates" refers to the total number of candidates competing in the municipality, independently on their party affiliation. "List fixed effects" refers to party by municipality by election cycle fixed effects - a fixed effect for the party list in the municipality in the election cycle. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

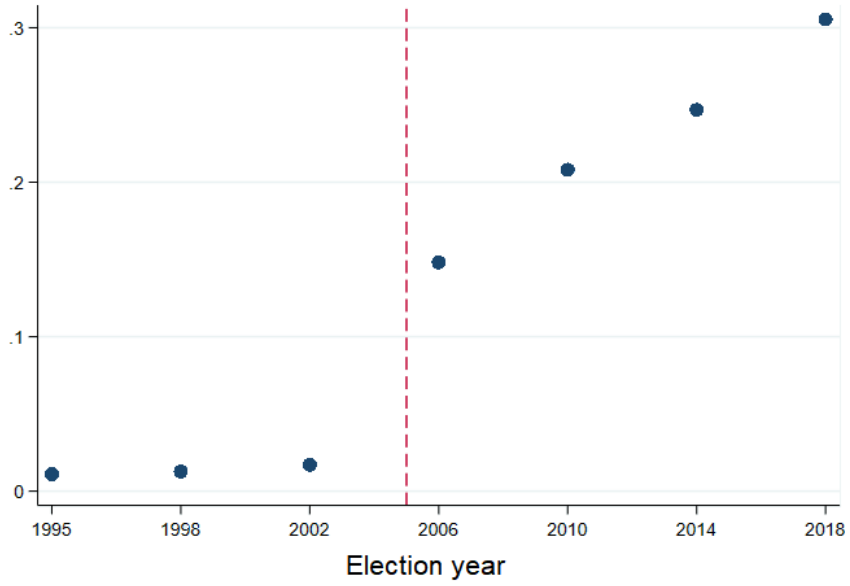
X. FIGURES

Figure I
Ballot Papers in Municipal Council Elections



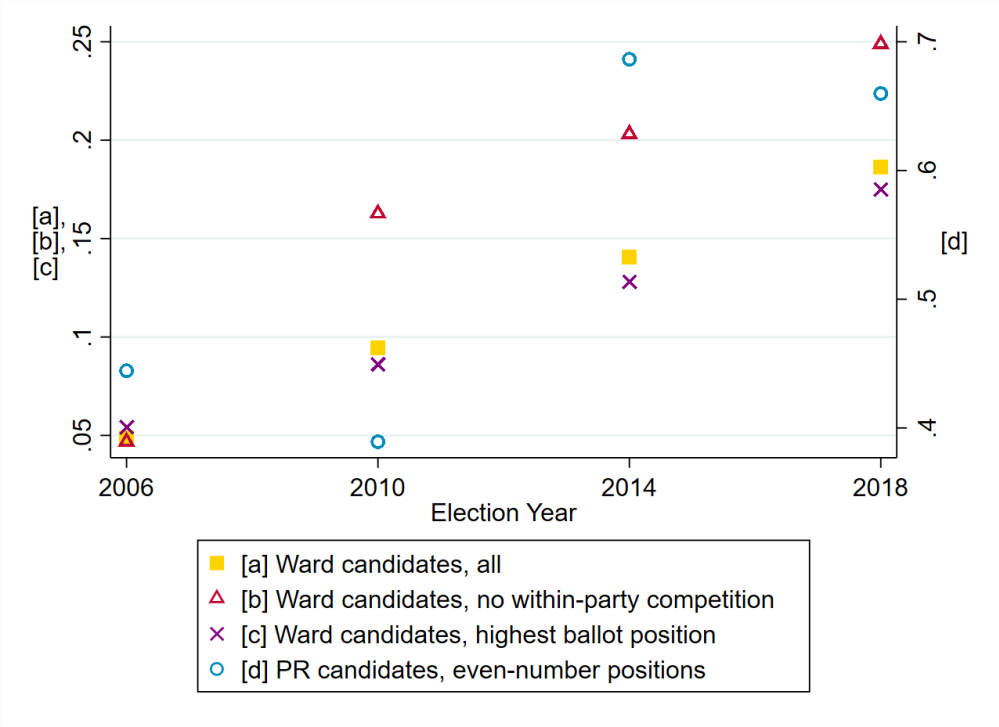
Notes: This figure illustrates the ballot papers that a voter residing in ward X of municipality A receives for the municipal council elections. The one on the left is used to vote for ward councilors and the one on the right is used to vote for PR councilors. The red ticks indicate how the voter might vote.

Figure II
Proportion of Females in Municipal Councils, Nationwide Average



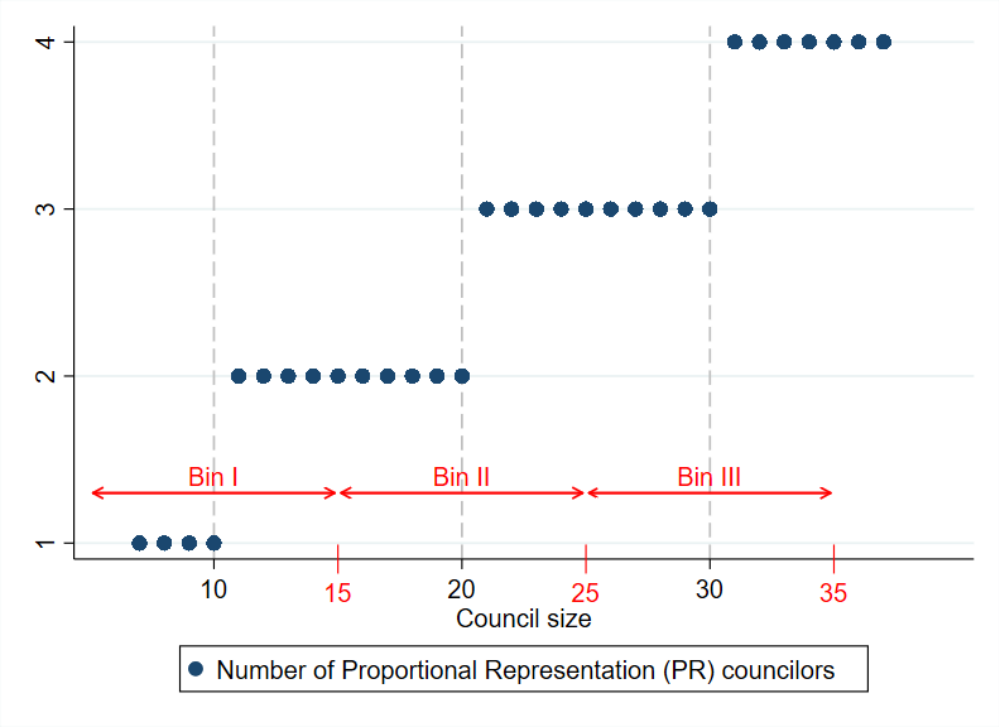
Notes: This figure illustrates the nationwide average of the gender ratio in municipal councils, for every election cycle since their emergence. The red dotted line indicates the year of the major reform that instituted the gender quota. The sample includes all councilors and municipal councils.

Figure III
The Share of Females Among Non-Quota Candidates



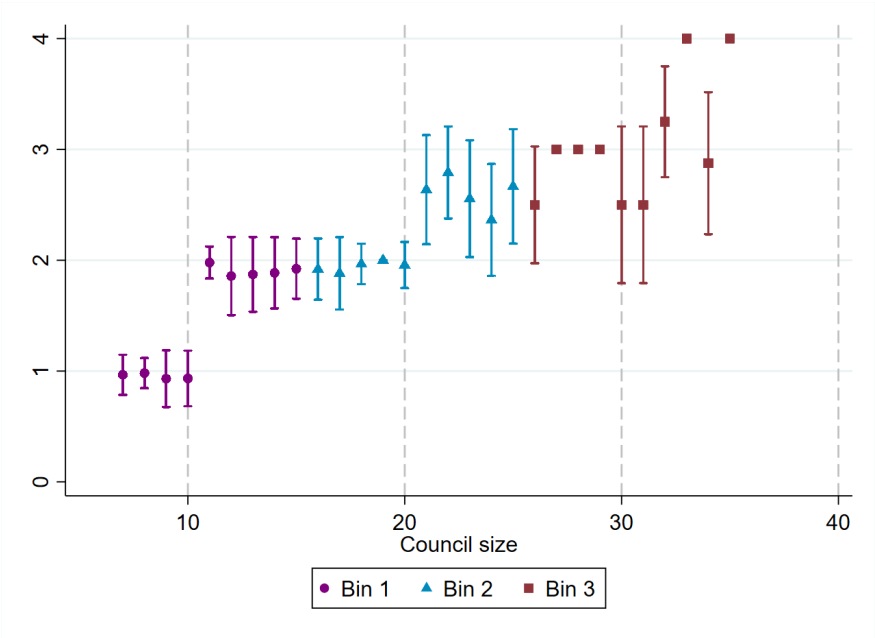
Notes: This figure plots the share of females among [a] all ward candidates, [b] ward candidates with no within-party competition, [c] ward candidates that have within-party competition but is ranked the highest, and [d] PR candidates in even-number party list positions. The left-hand vertical axis corresponds to [a], [b], and [c], whereas the right-hand one corresponds to [d]. The sample includes all councilors and municipal councils.

Figure IV
Councils by Bins Around Each Threshold



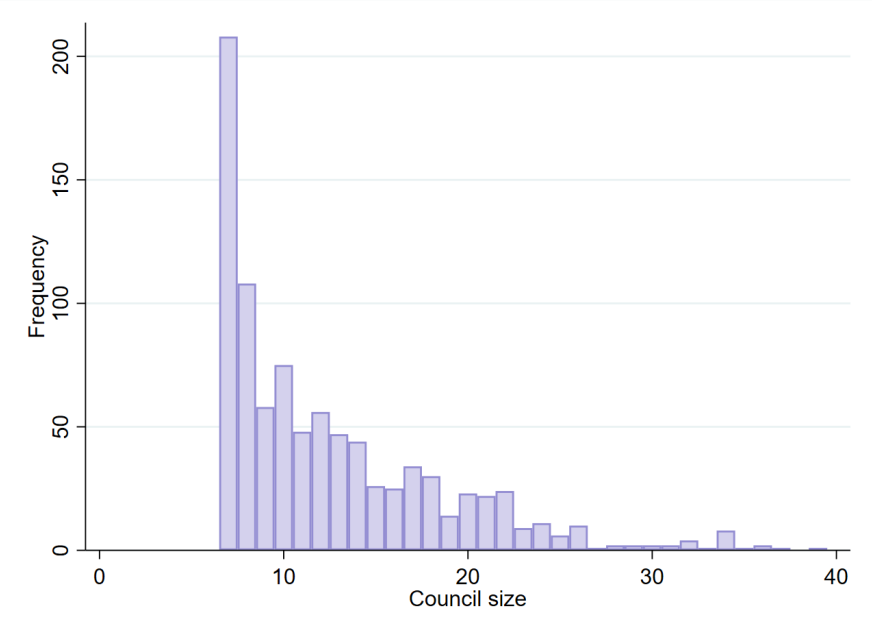
Notes: This figure depicts how the number of seats reserved for the proportional representation arm increases as a step function of the total number of councilors in a municipality. The figure depicts how a council is categorized into a bin based on its most proximate threshold. The thresholds for each bin are indicated by the grey dashed lines, and indicate the maximum council size for which the same number of seats are elected through the proportional arm. The bins division and the threshold definition are those used in the empirical strategy. Councils within the same bin above and below the threshold are assigned to treatment and control groups respectively. There are municipalities that do not correspond to the step function, because they are formed by the union of multiple municipalities *after* the election took place. The municipalities pre- and post-union are all excluded from the sample as outliers and are not shown in this figure.

Figure V
The Average Number of Female PR Councilors by Council Size



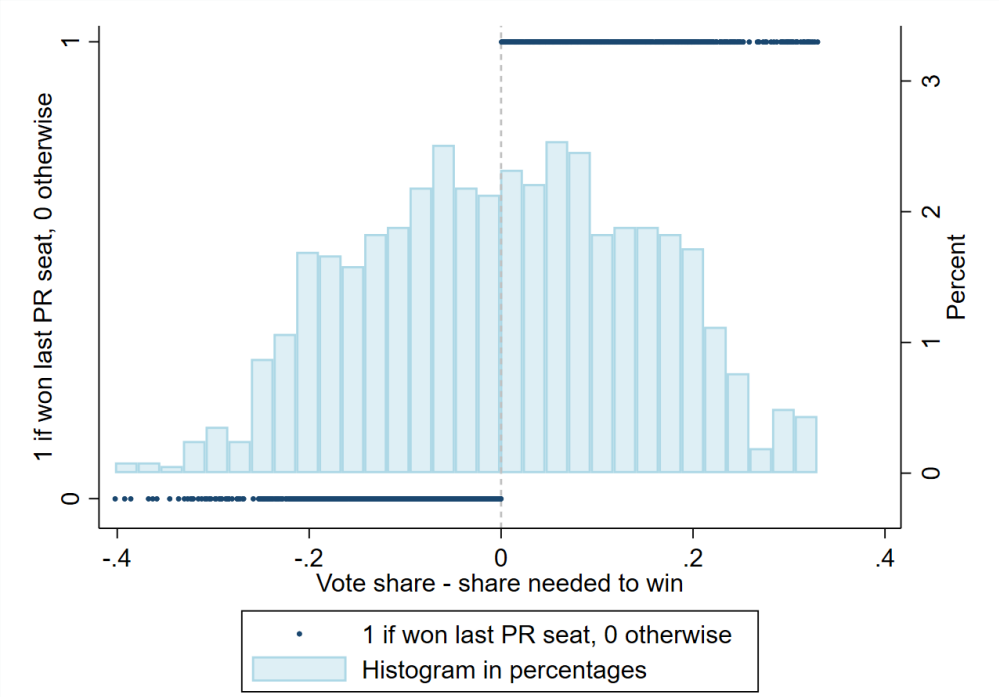
Notes: This figure plots the average number of female PR councilors by council size. The error bars indicate the standard deviation in the number of female PR councilors by council size. A council is categorized into a bin based on its most proximate threshold. The thresholds for each bin are indicated by the grey dashed lines, and indicate the maximum council size for which the same number of seats are elected through the proportional arm. Municipal councils belonging to the same bin are indicated with the same color. The bins division and the threshold definition are those used in the empirical strategy. Councils within the same bin above and below the threshold are assigned to treatment and control groups respectively. Where the error bars are missing, there is only one municipality for that council size. Only a small number of municipal councils belong to bin 3.

Figure VI
Histogram of Council Size



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

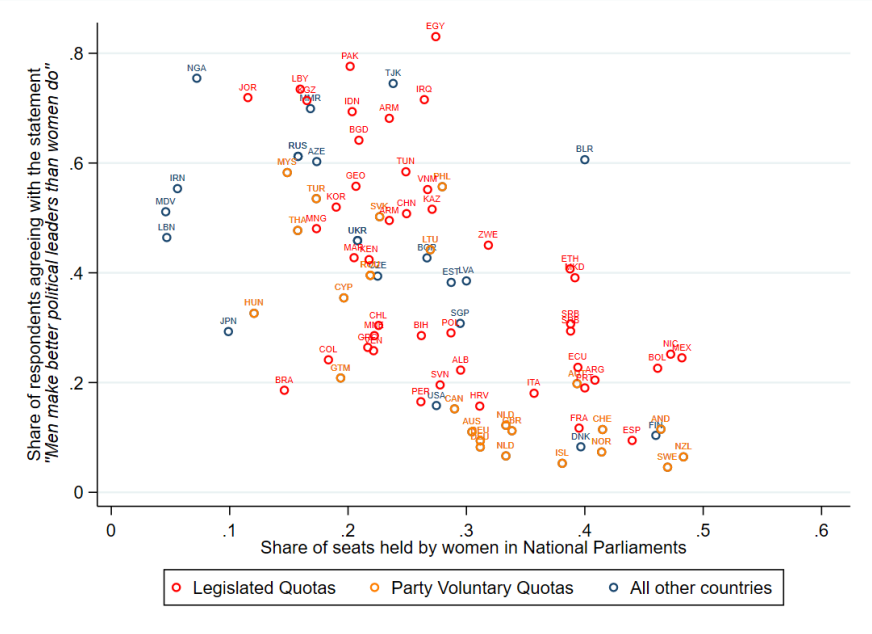
Figure VII
Marginal Winners and Losers of The Last PR Seat



Notes: This figure shows the distribution of the vote shares received by the two marginal parties competing for a PR seat in a municipality. The vote share is computed to be the share of votes received among qualifying parties, i.e. parties that received more than 5% of the raw votes in the PR election arm. The sample includes all election cycles and municipalities. The x-axis displays the difference between the vote share obtained by the party and the vote share the party needed to win the seat, i.e. the party's margin of victory. When the margin of victory is positive, the party won the seat. When the margin of victory is negative, the party lost the seat. The light blue bars display the share (in percentage points) of parties that obtained each margin of victory - indicated on the y-axis on the right side of the graph. The blue dots display the election outcomes for the party. The outcome is equal to 1 if the party won the seat, and 0 otherwise, as indicated in the y-axis on the left side of the graph.

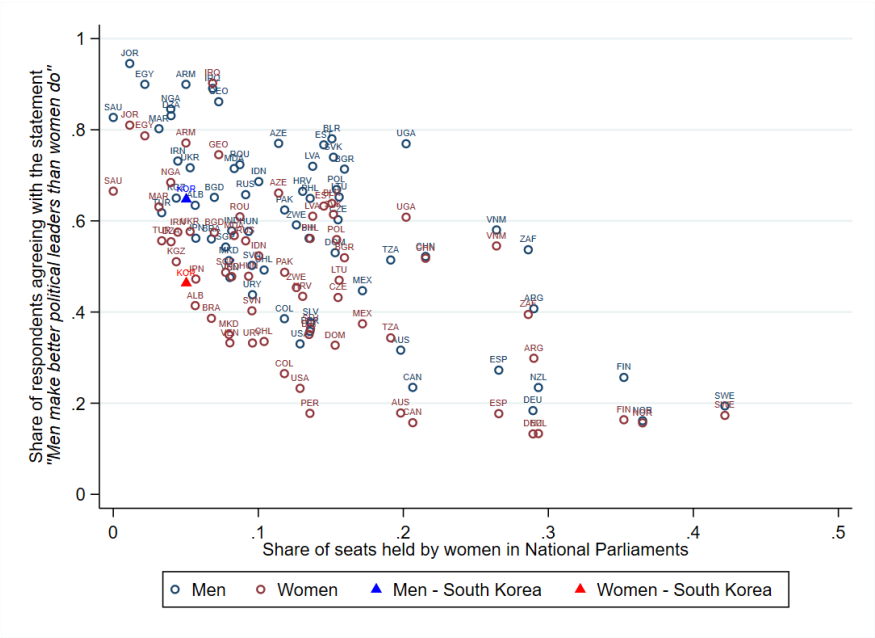
Appendix A. FIGURES

Figure A.1
Female Share in National Parliaments and Attitudes Towards Women (2017-2022)



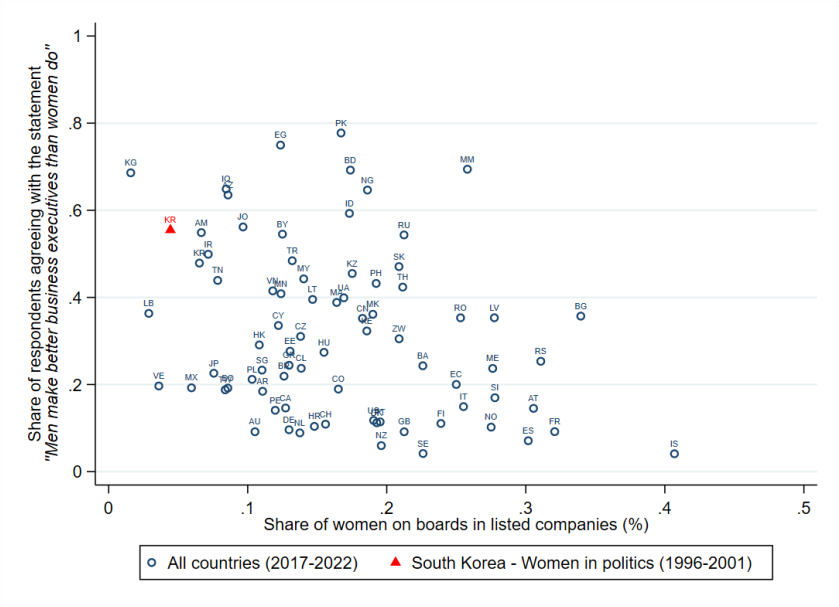
Notes: The graph depicts the correlation between contemporaneous attitudes towards women as political leaders and female representation in National Parliaments for multiple countries around the world, depending on whether the country ever introduced quotas in National Parliaments. On the y-axis, attitudes towards women are measured as the share of respondents that agree with the statement "Men make better political leaders than women do". Higher values indicate attitudes more favorable towards men. The x-axis displays the share of seats held by women in National Parliaments (between 0 and 1). Red and orange dots indicate countries that introduced a quota in national parliaments, whether legislated quotas or party voluntary quotas. Blue dots indicate countries that never introduced quotas. Sources:(i) Attitudes towards women – World Values Survey, 2017-2021 European Values Survey, 2017-2022; (ii) Share of seats held by women in national parliaments – World Bank Gender Statistics, latest data available between 2021-2018; (iii) Gender quotas in national parliaments – International IDEA Gender Quotas Database, last updated June 2022

Figure A.2
Female Share in National Parliaments and Attitudes Towards Women (1995-2004)



Notes: The graph depicts the correlation between attitudes towards women as political leaders and female representation in National Parliaments for multiple countries around the world 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 that agree with the statement "Men make better political leaders than women do". Higher values indicate attitudes more favorable towards men. Blue dots indicate the share of men agreeing with the statement, while red dots indicate the share of women. The x-axis displays the share of seats held by women in National Parliaments (between 0 and 1). South Korean respondents are indicated with a triangle. Sources – Attitudes towards women: World Values Survey waves 3 (1995-1998) and 4 (1999-2004); Share of seats held by women in national parliaments: World Bank Gender Statistics, average years 1995-2004.

Figure A.3
Female Representation on Boards in Listed Companies and Attitudes Towards Women (2017-2022)



Notes: The graph depicts the correlation between attitudes towards women as leaders and female representation in listed companies' boards for multiple countries around the world in the second decade of years 2000s. On the y-axis, attitudes towards women are measured as the share of respondents that agree with the statement "Men make better business executives than women do". Higher values indicate attitudes more favorable towards men. The x-axis displays the share of seats held by women in listed companies' boards (between 0 and 1). The status quo regarding attitudes towards women as leaders and the representation of women in boards is compared to the situation of women in South Korea just before the introduction of the quota in municipal councils. The red triangle indicates attitudes towards women as political leaders and female representation in National Parliaments in South Korea just before the introduction of the quota in 2005. Attitudes towards women are measured as the share of respondents that agree with the statement "Men make better political leaders than women do". Higher values indicate attitudes more favorable towards men. Female representation in politics is measures as the share of seats held by women in the South Korean National Parliament (between 0 and 1). Sources: All countries – Attitudes: World Values Survey, wave 7 (2017-2022); Share of women on boards in listed companies: ORBIS, 2022. South Korea – Attitudes: World Values Survey, waves 3 (1996) and 4 (2001); Share of women in national parliaments: World Bank Gender Statistics, average years 1997-2001.

Appendix B. TABLES

Table A.1
The Allocation of Proportional Representation Seats Across Parties

	Councils by the number of PR seats					
	1 PR seat		2 PR seats		3 PR seats	
	N.	Percent.	N.	Percent.	N.	Percent.
Election Cycle 4						
1 Party	117	100%	15	17.86%	0	0
2 Parties	0	0	69	82.14%	15	83.33%
3 Parties	0	0	0	0	3	16.67%
Election Cycle 5						
1 Party	117	100%	5	6.02%	0	0
2 Parties	0	0	78	93.98%	13	72.22%
3 Parties	0	0	0	0	7	27.78%
Election Cycle 6						
1 Party	110	100%	18	20.22%	0	0
2 Parties	0	0	71	79.78%	17	100%
3 Parties	0	0	0	0	0	0%
Election Cycle 7						
1 Party	105	100%	9	9.89%	1	4.35%
2 Parties	0	0	82	90.11%	18	94.74%
3 Parties	0	0	0	0	1	5.26%
Total	**449**		**347**		**72**	

Notes: This table illustrates the allocation of proportional representation seats across parties. For each election cycle and number of seats elected through proportional representation ("PR") within each council, it indicates the number (N.) and share (Percent.) of councils where councilors are affiliated with 1,2, or 3 parties. If one seat is elected through proportional representation in the council, only one councilor gets elected. Hence, mechanically all proportional representation seats are won by one party. When the council size increases, the councilors elected through proportional representation can be affiliated to more than one party. In the vast majority of such councils, two parties win one seat each. The sample is restricted to bins 1 and 2, i.e. to municipal councils with up to 25 councilors.

Table A.2
Candidates and Councilors by Party Affiliation

		Candidates				Councilors			
		Ward		PR		Ward		PR	
	N	Mean	Std	Mean	Std	Mean	Std	Mean	Std
Election Cycle 1									
Independent	226	1	0			1	0		
Election Cycle 2									
Independent	228	1	0			1	0		
Election Cycle 3									
Independent	228	1	0			1	0		
Election Cycle 4									
Independent	230	0.41	0.15	0	0	0.11	0.14	0	0
Progressive party	230	0.16	0.08	0.29	0.17	0.20	0.18	0.18	0.25
Conservative party	230	0.25	0.13	0.47	0.30	0.54	0.31	0.64	0.38
Election Cycle 5									
Independent	228	0.32	017	0	0	0.14	0.16	0	0
Progressive party	228	0.21	0.16	0.31	0.29	0.33	0.27	0.41	0.39
Conservative party	228	0.33	0.18	0.49	0.31	0.43	0.25	0.44	0.40
Election Cycle 6									
Independent	227	0.34	0.16	0	0	0.13	0.15	0	0
Progressive party	227	0.24	0.16	0.38	0.27	0.37	0.25	0.40	0.37
Conservative party	227	0.36	0.18	0.55	0.30	0.49	0.26	0.59	0.38
Election Cycle 7									
Independent	226	0.20	0.16	0	0	0.09	0.14	0	0
Progressive party	226	0.32	0.12	0.43	0.20	0.54	0.21	0.66	0.33
Conservative party	226	0.29	0.16	0.38	0.25	0.35	0.20	0.33	0.33

Notes: This table illustrates the party affiliation of candidates and councilors in each municipal council and election cycle. The statistics reported are mean and standard deviation of councils for each cycle. The affiliation is reported separately for candidates/councilors put forward in the two different arms - ward and PR. Three affiliations are reported: the two main parties - Progressive and Conservative party - and independent affiliation, i.e. candidates that run with no party affiliation. The residual category (omitted) includes all the other parties. The vast majority of councilors (>70%) is affiliated with either one of two main parties.

Appendix C. EMPIRICAL STRATEGY

C.1. Confirming that the number of female 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

$$\text{(number of female PR councilors)}_{cbt} = \beta \times TreatOne_{cbt} + \delta_b + \gamma_t + \epsilon_{cbt} \tag{8}$$

$$\text{where } TreatOne_{cbt} = \begin{cases} 1, & \text{if (council size)}_{cbt} = \text{Threshold}_{bt} + x \\ 0, & \text{if (council size)}_{cbt} = \text{Threshold}_{bt} + x - 1 \end{cases}$$

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 (8), 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 A.3 reports the results. It confirms that there is a positive effect only at the threshold.

Table A.3
The Effect of an Increase in Council Size on the Number of Female PR Councilors

	x value								
	-4	-3	-2	-1	0	1	2	3	4
Coefficient ($\hat{\beta}$)	-0.03	0.03	-0.03	-0.01	0.92***	-0.01	-0.03	-0.03	0.09
Standard error	(0.09)	(0.02)	(0.03)	(0.04)	(0.06)	(0.08)	(0.07)	(0.08)	(0.09)
N	267	380	210	170	168	150	136	111	87

Notes: This table reports the results of the coefficient of $TreatOne_{cbt}$ in regression equation (8). $TreatOne_{cbt}$ is a dummy equal to one if council size is equal to the threshold council size, in the bin the council belongs to, minus x, for different values of x. When x is equal to zero, $TreatOne_{cbt}$ corresponds to the treatment definition used in the main identification strategy. It illustrates whether the number of female councilors elected through proportional representation discontinuously increases at council sizes different from the one used to define treatment status. The sample includes only bins 1 and 2. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

C.2. Robustness to bandwidth choice

Table A.4
Robustness: The Effect of Being Past the Threshold on the Number of Candidates and Councilors, for Various Bandwidths

	Candidates				Councilors					
	Ward		PR		Ward		PR		All	
	Male (1)	Female (2)	Male (3)	Female (4)	Male (5)	Female (6)	Male (7)	Female (8)	Male (9)	Female (10)
***Panel A*: distance$^{\dagger} \leq 4$**										
Treat	0.37	0.31	0.58***	1.23***	-0.15	0.15	0.09**	0.91***	-0.06	1.06***
	(0.46)	(0.94)	(4.64)	(8.29)	(-0.74)	(0.74)	(1.97)	(19.58)	(-0.26)	(4.78)
N	868	868	868	868	868	868	868	868	868	868
***Panel B*: distance ≤ 3**										
Treat	0.14	0.33	0.51***	1.24***	-0.13	0.13	0.08	0.92***	-0.04	1.04***
	(0.16)	(0.99)	(3.77)	(7.95)	(-0.59)	(0.59)	(1.57)	(17.77)	(-0.19)	(4.48)
N	811	811	811	811	811	811	811	811	811	811
***Panel C*: distance ≤ 2**										
Treat	0.89	0.37	0.54***	1.29***	-0.13	0.13	0.08	0.92***	-0.06	1.06***
	(0.99)	(1.07)	(3.59)	(7.50)	(-0.59)	(0.59)	(1.33)	(16.07)	(-0.23)	(4.16)
N	514	514	514	514	514	514	514	514	514	514
***Panel D*: distance ≤ 1**										
Treat	0.34	0.44	0.61***	1.25***	-0.24	0.24	0.09	0.91***	-0.15	1.15***
	(0.34)	(1.17)	(3.55)	(6.66)	(-0.94)	(0.94)	(1.36)	(14.03)	(-0.53)	(4.02)
N	320	320	320	320	320	320	320	320	320	320
***Panel E*: distance $= 0$**										
Treat	0.38	0.42	0.58***	1.23***	-0.24	0.24	0.08	0.92***	-0.16	1.16***
	(0.37)	(1.10)	(3.26)	(6.53)	(-0.91)	(0.91)	(1.25)	(15.00)	(-0.55)	(3.99)
N	168	168	168	168	168	168	168	168	168	168

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

C.3. Robustness to sample selection

Table A.5
Robustness: The Effect of Being Past The Threshold
(Balanced Panel)

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

Notes: This table tests the robustness of the estimated treatment effect using regression equation (2) to the sample definition. The sample in this table includes only municipalities for which we can observe all election cycles (balanced panel). This sample excludes 2 municipalities that merge in election cycle 6 and 1 municipality that becomes a district level council in election cycle 6. The sample includes only bins 1 and 2. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.6
Robustness: The Effect of Being Past the Threshold
(All Municipalities)

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

Notes: This table tests the robustness of the estimated treatment effect using regression equation (2) to the sample definition. The sample in this table includes all existing municipalities. The excluded municipalities were 2 municipalities that were annexed to a third one in election cycle 5, generating a discrepancy between ward and PR arms in cycle 5. The sample includes only bins 1 and 2. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

C.4. Robustness to choice of $f(x)$

Table A.7
Robustness: The Effect of Being Past The Threshold ($f(x)$: Linear Interaction)

	All political parties							
	Candidates				Councilors			
	Ward		PR		Ward		PR	
	Male (1)	Female (2)	Male (3)	Female (4)	Male (5)	Female (6)	Male (7)	Female (8)
Treat at cycle 4 x Cycle 4	3.90***	-0.45	0.95***	0.93***	0.51**	-0.51**	0.09	0.77***
	(1.22)	(0.38)	(0.22)	(0.21)	(0.23)	(0.23)	(0.08)	(0.09)
Treat at cycle 4 x Cycle 5	0.75	0.29	0.65***	1.18***	-0.13	0.13	0.10	0.71***
	(1.00)	(0.39)	(0.17)	(0.22)	(0.24)	(0.24)	(0.07)	(0.08)
Treat at cycle 4 x Cycle 6	-1.20	0.70	0.27*	1.00***	-0.32	0.32	0.08	0.70***
	(0.96)	(0.43)	(0.15)	(0.22)	(0.27)	(0.27)	(0.06)	(0.08)
Treat at cycle 4 x Cycle 7	-2.04*	0.89*	0.23	1.25***	-0.58*	0.58*	0.04	0.70***
	(1.11)	(0.47)	(0.16)	(0.21)	(0.30)	(0.30)	(0.06)	(0.08)
Running variable form	ward	ward	council	council	ward	ward	council	council
N	868	868	868	868	868	868	868	868

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

Table A.8
Robustness: The Effect of Being Past the Threshold ($f(x)$: Quadratic)

	All political parties							
	Candidates				Councilors			
	Ward		PR		Ward		PR	
	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat at cycle 4 x Cycle 4	3.90***	-0.39	0.98***	0.88***	0.46**	-0.46**	0.10	0.77***
	(1.20)	(0.37)	(0.23)	(0.21)	(0.22)	(0.22)	(0.08)	(0.09)
Treat at cycle 4 x Cycle 5	0.75	0.35	0.67***	1.12***	-0.18	0.18	0.10	0.71***
	(0.97)	(0.38)	(0.18)	(0.23)	(0.23)	(0.23)	(0.07)	(0.08)
Treat at cycle 4 x Cycle 6	-1.20	0.76*	0.29*	0.95***	-0.37	0.37	0.09	0.70***
	(0.93)	(0.43)	(0.16)	(0.22)	(0.27)	(0.27)	(0.07)	(0.08)
Treat at cycle 4 x Cycle 7	-2.03*	0.95**	0.25	1.19***	-0.63**	0.63**	0.04	0.70***
	(1.08)	(0.46)	(0.17)	(0.21)	(0.30)	(0.30)	(0.06)	(0.08)
Running variable form	ward	ward	council	council	ward	ward	council	council
N	868	868	868	868	868	868	868	868

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

Table A.9
Robustness: The Effect of Being Past the Threshold ($f(x)$: Quadratic Interaction)

	All political parties							
	Candidates				Councilors			
	Ward		PR		Ward		PR	
	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat at cycle 4 x Cycle 4	3.77***	-0.15	0.74**	0.85**	0.47	-0.47	-0.00	0.71***
	(1.39)	(0.42)	(0.30)	(0.33)	(0.29)	(0.29)	(0.11)	(0.13)
Treat at cycle 4 x Cycle 5	0.63	0.59	0.44*	1.10***	-0.17	0.17	0.00	0.66***
	(1.18)	(0.44)	(0.26)	(0.33)	(0.29)	(0.29)	(0.10)	(0.13)
Treat at cycle 4 x Cycle 6	-1.32	1.01**	0.06	0.92***	-0.36	0.36	-0.01	0.65***
	(1.11)	(0.47)	(0.24)	(0.33)	(0.31)	(0.31)	(0.10)	(0.13)
Treat at cycle 4 x Cycle 7	-2.16*	1.20**	0.02	1.17***	-0.62*	0.62*	-0.06	0.64***
	(1.27)	(0.51)	(0.26)	(0.32)	(0.34)	(0.34)	(0.10)	(0.13)
Running variable form	ward	ward	council	council	ward	ward	council	council
N	868	868	868	868	868	868	868	868

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

Appendix D. MODEL OF PARTY LEARNING

D.1. Validity of the assumptions on the party's choice of candidates

In this section, we provide evidence of the validity of the model assumptions by studying election probabilities for the candidates elected before the introduction of the quota. Municipal elections were introduced in 1995, so we can exploit three rounds of elections and information for a total of 26,924 male candidates[31]. 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 without the potential confounding factors such as unobserved preferences for parties, differences in parties strategic behaviors across wards, or the influence of ballot list position.

Table A.10 displays the results of this analysis. The probability of being elected and the candidates' vote share are regressed on municipality $\times$ election cycle fixed effects, and candidates' characteristics – age, education, a dummy for whether the candidate works in politics, and a dummy for whether the candidate was ever elected before. The table shows that an incumbency premium exists, older candidates have a higher probability of being elected (probably capturing social networks and the influence of the candidate in the community), and candidates with political experience get more votes. More relevantly for our modeling assumption, voters value the education of candidates. We can see that having a high school degree is associated with a 2.3 percentage points higher probability of being elected and 1 percentage point higher vote share compared to an elementary school certificate (omitted category), all else constant. In fact, the coefficients on the education degrees show that election outcomes improve monotonically with higher levels of education.

[31] We restrict the analysis to male candidates as women were rare and very selected.

Table A.10
What Do Voters Care About?

	Pr(Elected) (1)	Vote Share (2)
Middle School	0.015	0.518
	(0.014)	(0.402)
High School	0.023**	0.884***
	(0.012)	(0.338)
Undergraduate Degree	0.053***	1.566***
	(0.012)	(0.353)
Graduate Degree	0.103***	2.817***
	(0.016)	(0.457)
Incumbent	0.165***	6.082***
	(0.010)	(0.284)
Age	0.043***	1.648***
	(0.004)	(0.109)
Age squared	-0.000***	-0.016***
	(0.000)	(0.001)
Political experience	0.040***	1.582***
	(0.011)	(0.328)
N	25507	24204
Locality × Cycle FEs	Yes	Yes

Notes: 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 by the candidate), a dummy for whether the candidate works in politics, and a dummy for whether the candidate was ever elected before. The sample consists of the universe of male candidates for the three municipal elections before the introduction of the quota in 1995, 1998, and 2002 (26,924 male candidates), for which we could retrieve occupation, education (95%), and vote share information (90%). Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

D.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

$$v_i|s_i \sim N\left(\mu_g + \frac{\sigma^2}{\sigma_s^2+\sigma^2}s_i, \sigma_v^2 + \frac{\sigma^2\sigma_s^2}{\sigma_s^2+\sigma^2}\right) \tag{9}$$

Let's call $\bar{\sigma}_1^2 = \sigma_1^2 + \frac{\sigma^2\sigma_s^2}{\sigma_s^2+\sigma^2}$ 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

$$\hat{\mu}_g = \frac{\bar{\sigma}_2^2\sum_{i\in N_1}\big(v_i - cs_i\big) + \bar{\sigma}_1^2\sum_{i\in N_2}\big(v_i - cs_i\big)}{\bar{\sigma}_2^2 n_1 + \bar{\sigma}_1^2 n_2} \tag{10}$$

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

$$\hat{\mu}_g \sim N\left(\mu_g, \frac{\bar{\sigma}_1^2\bar{\sigma}_2^2}{\bar{\sigma}_2^2 n_1 + \bar{\sigma}_1^2 n_2}\right) \tag{11}$$

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

Appendix E. EVIDENCE ON LEARNING

E.1. Computing the running variable in the regression discontinuity design of Section VII.C.

The purpose of the regression discontinuity design of Section VII.C. is to compare the strategies of parties that marginally won a PR councilor to those that marginally lost a PR councilor in the previous election. Thus, we are interested in the causal effect of having won a female PR councilor. We take marginal parties to be the *two* parties that either marginally won or lost the *last* PR seat. In order to differentiate marginal winners from losers, we measure how far off the vote share received by a party was, from the share it needed to win that seat. The running variable for party p in municipal council c at election cycle t equals $v_{cpt} = voteshare_{cp,t-1} - \bar{v}_{cp,t-1}$, where $\bar{v}$ denotes the

verdict-determining vote share.

To compute $\bar{v}$, we first need to describe the rules by which PR seats get allocated:

Rules for allocating PR seats

1. Among parties running for prop rep in a municipality, only the parties getting >=5% of votes qualify.
2. Of the qualifying parties, first compute X =(number of prop MP seats in the municipality)×(vote share of each qualifying party).
3. Allocate to each qualifying party the number of seats equal to the integer part of X.
4. Allocate the remaining seats by the ranking of the decimal part of X.

E.g. Municipal council A has 3 PR seats. There are 3 parties (1, 2, and 3) running for proportional representation. The vote shares of the parties are: party 1: 60%, 2: 38%, and 3: 2%. Party 3 got less than 5%, so it does not qualify. Among the qualifying parties, the vote shares are then party 1: $60/(60+38) \approx 61.22\%$, and 2: $38/(60+38) \approx 38.77\%$. The values of X's are party 1: $3 \times 0.6122 \approx 1.83$, and 2: $3 \times 0.3877 \approx 1.16$. Parties 1 and 2 both have 1 in the integer part of X, so they first get one PR councilor each. The last PR seat goes to party 1, because $0.83 > 0.16$.

Below, we compute $\bar{v}$ for all possible contest scenarios.[32] While doing so, we distinguish whether the marginal candidate that won – or nearly won – the last PR seat corresponds to the first, second, or third PR candidate in a party's list. For notational convenience, we call s the position in the party list of the marginal candidate of a party, and V the sum of the vote shares (among qualifying parties) received by the two marginal parties.

1 When there is one PR seat in the municipality

i) The two most popular parties contest over the only PR seat. Marginal parties: ranks 1 and 2

- Rank 1: $\bar{v} = \frac{V}{2}$, $s = 1$
- Rank 2: $\bar{v} = \frac{V}{2}$, $s = 1$

[32] An example is when there are three PR seats in a municipality, and the rank-1 and rank-2 parties contest over the last seat. Let v_n denote the vote share (among qualifying parties) received by the rank-n party. Rank 1 wins if $3v_1 - 2 > 3v_2 \iff v_1 > v_2 + \frac{2}{3}$. Therefore, $\bar{v}$ for the rank-1 party equals $v_2 + \frac{2}{3}$. On the other hand, $\bar{v}$ for the rank-2 party equals $v_1 - \frac{2}{3}$.

2 When there are two PR seats in the municipality

i) The contest is over whether the rank-2 party wins the second PR seat. Marginal parties: ranks 1 and 2

- Rank 1: $\bar{v} = \frac{2V+1}{4}$, $s = 2$
- Rank 2: $\bar{v} = \frac{2V-1}{4}$, $s = 1$

3 When there are three PR seats in the municipality

i) The contest is over whether the third PR seat goes to the rank-1 party or the rank-2 party. Marginal parties: ranks 1 and 2

- Rank 1: $\bar{v} = \frac{3V+2}{6}$, $s = 3$
- Rank 2: $\bar{v} = \frac{3V-2}{6}$, $s = 1$

ii) Where the rank-2 party wins a seat for sure, the contest is over whether the third PR seat goes to the rank-1 party or the rank-3 party. Marginal parties: ranks 1 and 3

- Rank 1: $\bar{v} = \frac{3V+1}{6}$, $s = 2$
- Rank 3: $\bar{v} = \frac{3V-1}{6}$, $s = 1$

4 When there are four PR seats in the municipality

i) The contest is over whether the fourth PR seat goes to the rank-1 party or the rank-2 party. Marginal parties: ranks 1 and 2

- Rank 1: $\bar{v} = \frac{4V+3}{8}$, $s = 4$
- Rank 2: $\bar{v} = \frac{4V-3}{8}$, $s = 1$

ii) Where the rank-1 party wins two seats for sure and the rank-2 party wins a seat for sure, the contest is over whether the fourth PR seat goes to the rank-1 party or the rank-2 party. Marginal parties: ranks 1 and 2

- Rank 1: $\bar{v} = \frac{4V+1}{8}$, $s = 3$
- Rank 3: $\bar{v} = \frac{4V-1}{8}$, $s = 2$

iii) Where the rank-1 party wins two seats for sure and the rank-2 party wins a seat for sure, the contest is over whether the fourth PR seat goes to the rank-2 party or the rank-3 party. Marginal parties: ranks 2 and 3

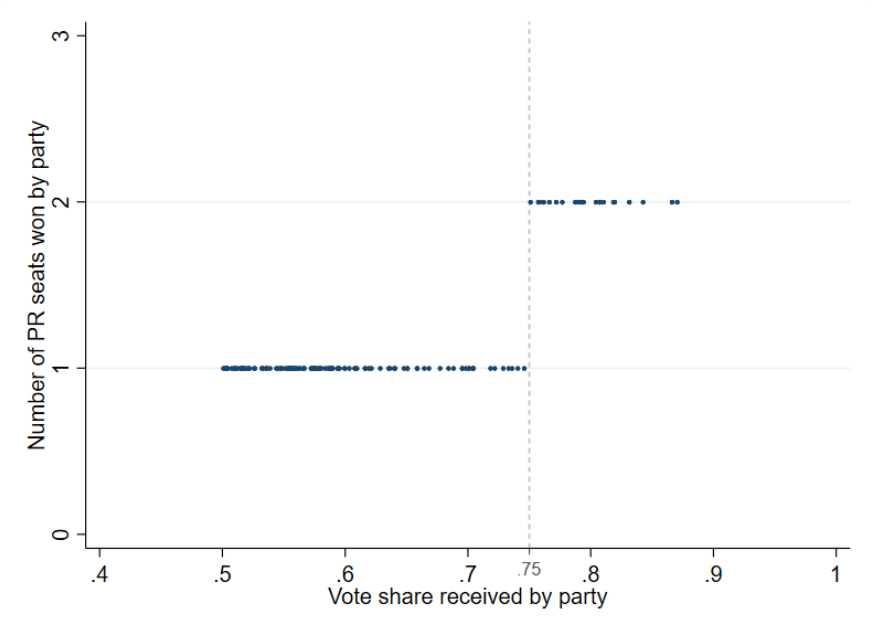
- Rank 2: $\bar{v} = \frac{4V+1}{8}$, $s = 2$
- Rank 3: $\bar{v} = \frac{4V-1}{8}$, $s = 1$

iv) Where the rank-2 and rank-3 parties win a seat each for sure, the contest is over whether the fourth PR seat goes to the rank-1 party or the rank-4 party. Marginal parties: ranks 1 and 4

- Rank 1: $\bar{v} = \frac{4V+1}{8}$, $s = 2$
- Rank 4: $\bar{v} = \frac{4V-1}{8}$, $s = 1$

As an example, take the case of the rank-1 party in a municipality with two PR seats and two qualifying parties. The party's $\bar{v} = 0.75$, according to the computation given above. Indeed, Figure A.4 shows that among such rank-1 parties, those receiving a vote share greater than 0.75 win two PR councilors whereas those receiving a vote share below 0.75 win one PR councilor.

Figure A.4
Marginal Winners and Losers of The Last PR Seat, Among Rank-1 Parties in Municipalities With Two PR Seats and Two Qualifying Parties



Notes: This figure shows that in municipalities with two PR seats and two qualifying parties, the rank-1 parties must receive a vote share greater or equal to 0.75 in order to win both PR seats. The reason the vote share received is always greater than 0.5 is because these parties are the rank-1 parties. Note that the vote share is the share of votes among qualifying parties only.

E.2. Robustness to the choice of $f(x)$ in the regression discontinuity design of Section VII.C.

Table A.11
Robustness: The Effect Of Marginally Winning a PR Woman In The Previous Election

Main political parties				
$\mathbb{1}$(Number-1 PR candidate in $t-1$ is a ward candidate in t)				
Bandwidth ($\lvert v_{cpt} \rvert$)	0.20	0.15	0.10	0.05
	(1)	(2)	(3)	(4)
Panel A: All parties				
$f(x) = x$	0.44***	0.43***	0.35***	0.42***
	(0.08)	(0.08)	(0.10)	(0.13)
$f(x) = x + x^2$	0.40***	0.41***	0.36***	0.43***
	(0.07)	(0.08)	(0.09)	(0.13)
$f(x) = (x + x^2) \times Treat$	0.39***	0.39***	0.55***	0.75***
	(0.09)	(0.11)	(0.13)	(0.16)
N	414	313	216	114
Panel B: 2nd PR candidate = Man				
$f(x) = x$	0.47***	0.52***	0.40***	0.47***
	(0.08)	(0.09)	(0.11)	(0.16)
$f(x) = x + x^2$	0.44***	0.49***	0.41***	0.47***
	(0.08)	(0.08)	(0.10)	(0.14)
$f(x) = (x + x^2) \times Treat$	0.47***	0.46***	0.58***	0.72***
	(0.10)	(0.12)	(0.15)	(0.20)
N	308	241	165	90
Panel C: 2nd PR candidate = Woman				
$f(x) = x$	0.37*	0.20	0.11	0.03
	(0.20)	(0.20)	(0.24)	(0.35)
$f(x) = x + x^2$	0.23	0.22	0.12	-0.07
	(0.19)	(0.19)	(0.22)	(0.37)
$f(x) = (x + x^2) \times Treat$	0.02	0.12	-0.25	-0.46
	(0.24)	(0.32)	(0.39)	(0.61)
N	106	72	51	24

Notes: This table tests the robustness of the estimated treatment effect using regression equation (6) on the probability that the number-1 PR candidate for the party in cycle $t-1$ is among the party ward candidates in cycle t. Three different specifications are considered for the functional form of $f(v_{cp,t-1})$. The first row reports the coefficient of the $Winner_{t-1}$ dummy assuming $f(x) = x$. The second row assumes $f(x) = (x + x^2)$. The third row assumes $f(x) = (x+x^2) \times Treat$. The results are provided for all parties (Panel A), parties for which the second PR candidate in cycle $t-1$ was a man (Panel B), and parties where the second PR candidate was a woman (Panel C). Each column shows the coefficient of the $Winner_{t-1}$ dummy (equal to 1 if the party won the election of its PR candidate in cycle t 1) considering different margins of victory (bandwidths).The sample includes all election cycles after the introduction of the quota (4,5,6,7) and only the two main parties. The unit of analysis is a party in election cycle t. The standard errors are clustered at the municipality $\times$ party level. Standard errors (in parenthesis) are clustered at municipality level; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.