How do political parties respond to gender quotas? Manipulation and learning in South Korean municipal councils

Jay Euijung Lee[*]   Martina Zanella[†]

June 2, 2020 – [Latest version here](#)

Preliminary and incomplete - please do not cite

Abstract

While gender quotas are often employed to fight entrenched customs that bar talented women from entering politics, quotas may prove ineffectual if they suffer from active resistance by the incumbent males. The South Korean municipal council elections provide us with a novel setting to study the response of the highly male-dominant political parties to gender quotas in unusually rich ways. Specifically, gender quotas were implemented in only one of the two election arms, so we are able to observe what happened in the unconstrained arm. We analyze the effect of the quota on how parties select their election candidates, by exploiting the discontinuity in the bite of the quota at certain cutoffs of council size. We find that municipalities stipulated to elect more females initially counter the quota by putting forth fewer female candidates in the unconstrained arm, but over time this pattern gradually overturns. The changing reaction to the quota stems from parties learning about the competency of females after having experienced a female councilor. This paper suggests that affirmative action policies can still be effective as long as they are not completely undone, even in settings where the target group consists a very small minority among incumbents.

---

[*]Department of Economics, London School of Economics; email: E.Lee13@lse.ac.uk.

[†]Department of Economics, London School of Economics; email: M.Zanella1@lse.ac.uk.

1 Introduction

Affirmative action policies are widely implemented to mitigate long-standing imbalances in many contexts, but by their very nature they often provoke a backlash from the people who lose out. In particular, the disfavored group that comprise the existing majority may actively attempt to undermine the policy objective. In such environments, well-intended affirmative action policies can be rendered ineffective or even, counterproductive.

In this paper, we study the reaction of highly male-dominated political parties to the introduction of gender quotas in South Korean municipal council elections, over four subsequent election cycles. The South Korean setting provides a unique opportunity to study the reactions of affected politicians due to the fact that the gender quota is imposed on only one of the two independent election arms in which a councilor is elected. In South Korea's parallel voting system, the first group of councilors is elected through a plurality vote in the municipality's constituent wards, and the second group is elected by party-list proportional representation. As the gender quota affected only the proportional representation arm ("PR arm"), we can study how parties strategically respond in the ward-level plurality vote arm ("ward arm").

To this end, we use the cross-sectional variation in the number of seats reserved for proportional representation as a measure of intensity of exposure to the gender quota. The number of PR seats increases as a step function of a municipality's council size, creating discontinuities in the quota's bite at certain cutoffs of council size. Using a regression discontinuity framework, we study the effect of the quota on how political parties select candidates in the ward election arm.

In the treated municipalities where the quota bit more intensely, parties initially put forth fewer female candidates in the unconstrained ward arm. Hence, fewer female ward councilors get elected, but these municipalities also experience a greater number of female PR councilors as a direct consequence of the quota. Putting the PR and ward arms together, these municipalities experience on net a greater number of female councilors. We track municipalities over the next three election cycles, and find that the treatment group gradually increase the number of female ward candidates. By the last election cycle, the treated municipalities have completely reversed their initial reaction and have a *greater* number of female ward candidates.

What is driving this gradual change in the response to the quota? We delve deeper into the dynamic linkages in the strategies of parties by studying parties that marginally won a female councilor in the previous election. This inspection suggests that the changing reaction stems from parties favoring female candidates more after having experienced a female councilor. Moreover, the shift in the selection towards female candidates occurs faster and stronger when the first elected female PR councilors are highly educated. Therefore, parties seem to gradually learn about the competency of female councilors, and particularly so upon exposure to more able women.

A large literature exists on the consequences of political gender quotas, studied in numerous contexts. This paper's main contribution lies on the fact that the South Korean setting enables us to

study the strategic responses of parties in unusually rich ways. The parallel voting system with the quota only applying to the proportional representation arm implies that there is a whole other arm that 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, 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, Scoppa, and Lombardo, 2010; Esteve-Volart and Bagues, 2012; Baltrunaite et al, 2014).[1] In South Korean municipal councils, parties first determine who runs in which election arm, and if in the PR arm, under which position on the party list. If in the ward election, parties determine who runs in which constituent ward, as well as under which position on the ballot paper for each ward.

Our second contribution is that we study empirically the strategic selection of candidates by political parties when two electoral systems – the plurality vote and proportional representation – coexist. While there are theoretical and empirical studies that compare political selection in these two electoral systems, they focus on *contrasting* the consequences of the two systems (Myerson, 1993; Myerson, 1999; Norris, 2004; Gagliarducci et al, 2011; Iaryczower and Mattozzi, 2013; Galasso and Nannicini, 2014). In our setting, parties would choose different election strategies across the two electoral systems, for candidates of different characteristics – such as gender, political experience, and favorability within the party – and for areas with different voter preferences. To illustrate, take a loyal male party member, whose popularity among voters is uncertain, but whom the party wants elected. He may be placed to run under the plurality vote arm in a ward where the party has a stronghold, with no competitors from within the party, such that his victory is nearly guaranteed.

The third contribution is that we can study learning. Certain types of quotas, such as those that mandate a minimum share of women in candidate lists, do not ensure that women end up elected. Therefore, these quotas are likely to be limited in increasing female representation to appreciable levels. For example, Bagues and Campa (2020) find that Spain's adoption of such a quota led to only a small increase in female councilors immediately afterwards and that no further gains were achieved in the medium run. Moreover, Dahlerup and Freidenvall (2013) review that among eight European countries with legislated quotas, France, Greece, Ireland, and Slovenia have no rules on the placement of females in winnable seats. On the other hand, South Korea's quota warranted a substantial change in female representation, from a starting point of practically no women at all.

The remainder of the paper is organized as follows. Section 2 provides a background on the institutional setting of South Korea's municipal council elections. We then describe the data in Section 3. Section 4 lays out our empirical strategy and discusses the results. In Section 5, we

---

[1]Before describing the richness of the ways in which parties can respond to quotas, it must first be made clear that parties 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 will he or she win.

discuss the pieces of evidence that point towards learning as an explanation for the results in Section 4. Finally, Section 6 concludes.

2   Institutional setting

2.1   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).

2.2   Electoral rules and gender quotas

Municipal councils were established during the mid-1990s, and from then, elections have taken place every four years. Seven elections were held so far, with 2018 being the latest 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 1. First, the parallel voting system was introduced, where at least 10% of the councilors needed to be elected through party-list proportional representation. Among a total of 7 to 35 seats in a council, the number of proportional seats increased as a step function of the total council size: 1 for councils with up to 10 seats, 2 for those with 11 to 20 seats, 3 for those with 21 to 30 seats, and so on.

Table 1: 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: Adapted from Lim (2018). [PR] indicates rules relating to propotional representation councilors and [W] to ward councilors.

Second, 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.[2] Figure 1 illustrates what the ballot papers look like for the two arms of the municipal council elections.

Figure 1: Ballot papers in municipal council elections

BALLOT PAPER
"Ward councilors"
(Multi-member plurality vote)

Municipality A - Ward X

1-a	Party 1	Cand. i	
1-b	Party 1	Cand. ii	
2-a	Party 2	Cand. iii	✔
2-b	Party 2	Cand. iv	
3	Party 3	Cand. v	

BALLOT PAPER
"PR councilors"
(Party-list proportional representation)

Municipality A

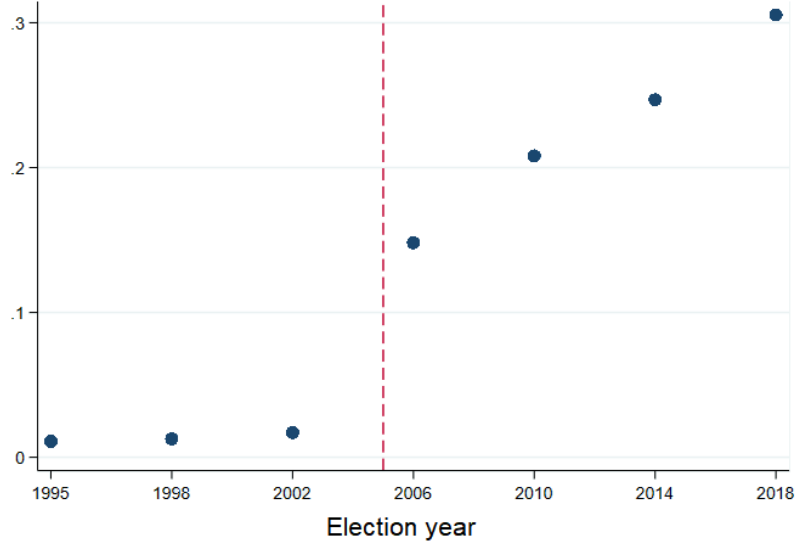| 1	Party 1	✔
2	Party 2	
3	Party 3	
4	Party 4	
5	Party 5	

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.

Third, a gender quota was put in place: all odd-number candidates in the proportional party list 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 3% 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 2 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.

---

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

Figure 2: The proportion of females in municipal councils, nationwide average

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 have been criticized for being too low to effectively expand female nomination (Jin, 2018; Kim et al, 2003; Lee, 2003). Indeed, they account for only around 5 to 6% of the total value of election subsidies (National Election Commission, 2019). Therefore, the presence of the subsidies are 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.[3] Legislative Impact Analysis Reports indicate that most parties chose to satisfy this rule in the municipal council elections, due to the larger number of candidates (Lee, 2019). Selecting which ward to place the female candidate would have been a strategic concern for the political parties.

2.3 Background behind the adoption of gender quotas

If some parties had led the move 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,

---

[3]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.

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.[4] As females constitute half the voters, it was in the interest of political parties to put gender quotas forward amongst their election pledges. Moreover, there are views that the adoption of the quota was also a political tactic (Jeon, 2013). 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, 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.

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

3.1 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.

---

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

3.2 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 3 illustrates how the female share among candidates have 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.[5]

Figure 3: The share of females among non-quota candidates
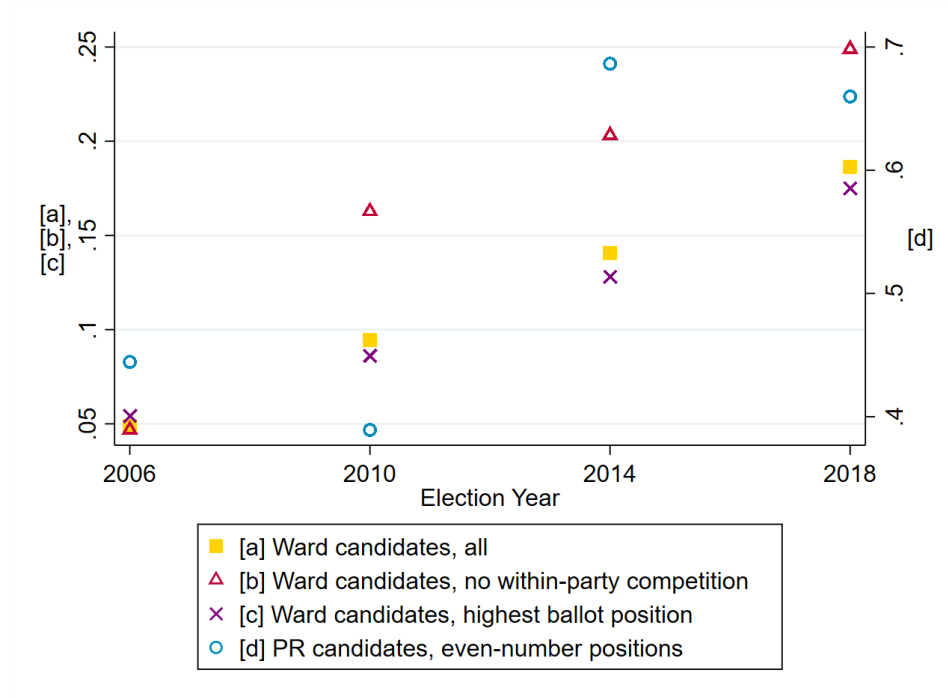
Notes: This figure plots the share of females among [a] all ward candidates, [b] ward candidates with no within-party competition, [c] ward candidates that have within-party competition but is ranked the highest, and [d] PR candidates in even-number party list positions. The left-hand vertical axis corresponds to [a], [b], and [c], whereas the right-hand one corresponds to [d].

---

[5]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.

3.3 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 in the perspective of the political parties. Parties would then allocate their favored and less favored candidates to different wards accordingly.

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 2 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 2: Descriptive statistics on the gender composition of municipal councils

	Election cycle (year)						
	1	2	3	4	5	6	7
	(1995)	(1998)	(2002)	(2006)	(2010)	(2014)	(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: *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.

3.4 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 a 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, 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 operation costs. Newspapers have traditionally included it in their assessments of councils (Jang, 2008).

4 Empirical Strategy and Results

4.1 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 proportion of the PR seats in the council. The number of PR seats increases as a step function of municipal 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 4.

Figure 4: Councils by bins around each threshold
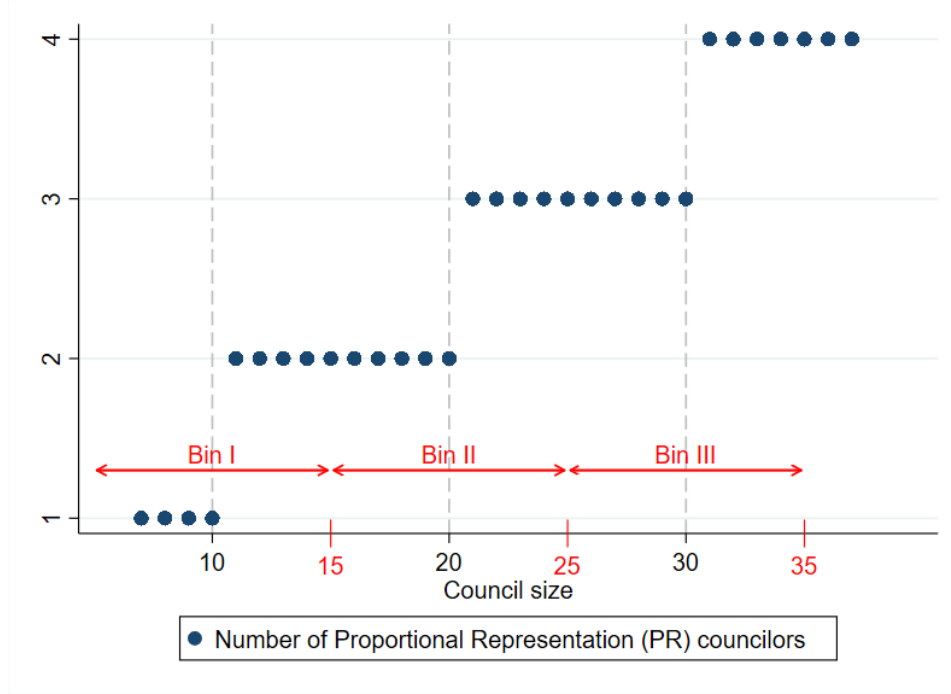
Notes: This figure depicts how the number of seats reserved for the proportional representation arm increases as a step function of the total number of councilors in a municipality. There are municipalities that do not correspond to the step function, because they are formed by the union of multiple 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. Moreover, the figure depicts how a council is categorized into a bin based on its most proximate threshold.

The regression discontinuity design compares the characteristics of ward and PR candidates in municipalities on each side of the step function's thresholds, while controlling for council size. In order to account for the fact that there is not just one but many thresholds, we categorize councils into bins based on the proximity to thresholds, as illustrated in Figure 4.

Therefore, this strategy estimates the effect of an additional PR councilor *in general*, rather than an additional *female* PR councilor. Nonetheless, while the gender quota does not necessitate that the second PR councilor be male, in practice almost all PR councilors end up being female.[6] This fact is due to PR candidates even in even-number positions frequently being female, and also due to PR councilors frequently being the number-1 candidates of multiple parties.[7] We also check in Section 4.3 that an additional PR councilor strongly implies an increase in the number of female PR councilors.

The regression discontinuity specification is given by:

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

---

[6]Table 2 shows that among PR councilors, 87% to 98% are female each election.
[7]Appendix Table A1 shows that it is relatively rare to find multiple PR seats getting allocated to the same party.

where Y_{cbt} denotes the outcome variable for municipal council c belonging to bin b in election cycle t. 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 threshhold. 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.

Another specification, based on treatment status at election cycle 4, is:

$$Y_{cbt} = \sum_{s=4}^{7} \beta_s \times (\text{Treat at cycle 4})_{cb} + f(x_{cb4}) + X_{cbt} + \delta_b + \gamma_t + \epsilon_{cbt} \tag{2}$$

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

The outcome variables we consider are the number, position on the ballot paper, and vote share, of ward and PR candidates by gender. A factor to note is that when the outcome variable relates to the ward elections, we change the running variable to $\tilde{x}_{cbt} \equiv (\text{number of ward councilors})_{cbt} - (\text{number of ward councilors at the threshold})_b$, for ease of interpretation.[8]

4.2 Contemporaneous treatment vs. treatment at cycle 4

Equations (1) and (2) estimate the effects of contemporaneous treatment and initial treatment, respectively. In practice, there is barely any difference which specification we use, because the treatment status changes after election cycle 4 for only 3.7% of the councils. We settle on equation (2) as our main specification, though. The first reason is that the initial treatment assignment is more exogenous. Upon the first treatment, the treated and control municipalities may evolve on different paths, which would make them no longer balanced at the subsequent election cycles. Secondly, measuring the effect of the initial treatment maintains the same composition of treated municipalities. If the effect of contemporaneous treatment, specified by equation (1), varies over time, then it is unclear whether it is due to the small number of councils that are changing their treatment status, or due to the same councils reacting differently to the treatment over time. With equation (2), we can safely conclude that it is the latter.

---

[8]If we keep the running variable based on council size, then the regression estimates the effect of $Treat = 1$, i.e. having one more PR councilor, while controlling for council size. Then in the regression, the councils with $Treat = 1$ effectively have one fewer ward councilor than those with $Treat = 0$. Therefore, it becomes more difficult to interpret the sign of the coefficient on $Treat$ when the outcome variable relates to ward elections, e.g. the number of female ward councilors or candidates. When the running variable is based on the number of ward councilors, however, we are free from this problem. 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.

4.3 First-stage results

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 3 reports the results of regressing (2) with the number of female PR councilors as the outcome variable, separately for each bin. While 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, there is no such effect at bin 3. Moreover, there are very few observations at bin 3. The regression results of Table 3 are echoed by Figure 5, 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.

We next focus on the treatment effect over time. In both columns (1) and (2) of Table 3, the effect of the treatment at cycle 4 remains similar over the election cycles. Because the vast majority (96.3%) of the initially treated municipalities continue to get treated each cycle, the constancy in the coefficients implies that first-stage effect of the treatment - increasing the number of female PR councilors - is constant, too. This constancy implies that the effects on other outcome variables, i.e. the reduced-form treatment effects, should also be constant over time unless the initial treatment leads treatment and control groups on different paths.

The standard errors are clustered by municipality for two reasons. First, the variation of the initial treatment variable is at the level of the municipality. Second, parties 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.

As a way to buttress the validity of the regression discontinuity design, Appendix Section B.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 3: The effect of an additional PR seat at election 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× Cycle 4	0.84***	0.52***	-0.23
	(9.35)	(2.82)	(-0.42)
Treat at cycle 4 × Cycle 5	0.84***	0.32*	0.44
	(12.28)	(1.71)	(1.21)
Treat at cycle 4 × Cycle 6	0.77***	0.58***	0.04
	(10.18)	(3.33)	(0.10)
Treat at cycle 4 × Cycle 7	0.77***	0.57***	0.16
	(9.61)	(3.68)	(0.40)
Running variable form	council	council	council
N	670	198	33

Notes: t statistics from standard errors clustered by municipality in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

This table reports the results of regressing (2), separately for each bin, with the number of female PR councilors as the outcome variable.

Figure 5: The average number of female PR councilors by council size
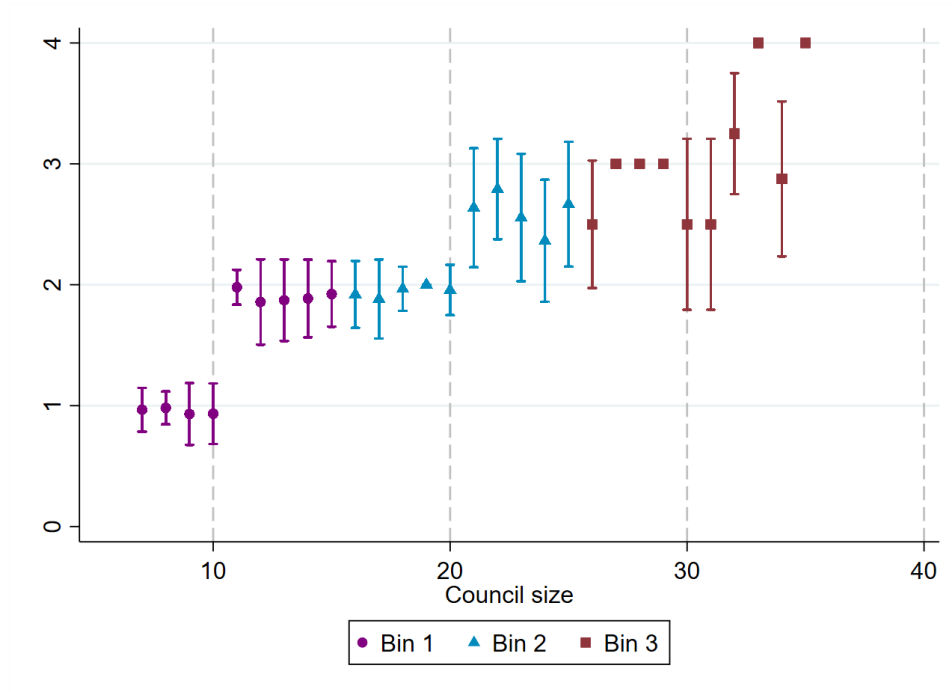
Notes: The error bars indicate standard deviation of the number of female PR councilors by council size. Where the erroe bars are missing, there is only one municipality for that council size. Therefore, we can tell that there are only a small number of municipal councils belonging to bin 3.

4.4 Reduced-form results

The results of regressing equation (2) are reported in Table 4. The most interesting result 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 of male ward candidates. Eventually, at election cycle 7, the parties in the treated municipal councils put up 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) to positive. Thus, the way parties select candidates in reaction to the gender quota is changing over time.

Focusing next on the columns for the councilors, we can see that similarly, the number of female ward councilors in the treated municipalities is lower in the beginning but is higher at the end.[9] Moreover, the higher number of female PR councilors in the treated municipalities at election cycle 4 more than compensates for the lower number of female ward councilors. Consequently, column (10) shows that there are statistically insignificantly more female councilors as a whole at election cycle 4 in the treated municipalities. Then, the coefficients for the later cycles grow in magnitude and become statistically significant.

**Table 4: The effect of being past the threshold at election cycle 4
on the number of candidates and councilors**

	Candidates						Councilors					
	Ward		PR				Ward		PR		All	
	Male	Female	Male	Female			Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)			(5)	(6)	(7)	(8)	(9)	(10)
Treat at cycle 4 × Cycle 4	3.70***	-0.24	0.94***	0.96***			0.36*	-0.36*	0.09	0.76***	-0.29	0.29
	(3.19)	(-0.69)	(4.27)	(4.39)			(1.65)	(-1.65)	(1.16)	(9.01)	(-1.03)	(1.03)
Treat at cycle 4 × Cycle 5	0.56	0.49	0.63***	1.20***			-0.28	0.28	0.10	0.71***	-0.88***	0.88***
	(0.61)	(1.37)	(3.77)	(5.36)			(-1.24)	(1.24)	(1.52)	(9.23)	(-3.17)	(3.17)
Treat at cycle 4 × Cycle 6	-1.39*	0.91**	0.25*	1.02***			-0.47*	0.47*	0.08	0.70***	-1.06***	1.06***
	(-1.66)	(2.18)	(1.70)	(4.66)			(-1.76)	(1.76)	(1.31)	(8.89)	(-3.45)	(3.45)
Treat at cycle 4 × Cycle 7	-2.23**	1.10**	0.21	1.27***			-0.73**	0.73**	0.04	0.69***	-1.33***	1.33***
	(-2.23)	(2.49)	(1.35)	(5.83)			(-2.50)	(2.50)	(0.61)	(9.04)	(-3.99)	(3.99)
Running variable form	ward	ward	council	council			ward	ward	council	council	council	council
N	868	868	868	868			868	868	868	868	868	868

Notes: t statistics from standard errors clustered by municipality in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
The regression specification is given by equation (2). The sample includes only bins 1 and 2.

What is driving the changing reaction to the gender quota? The parties in municipalities that got the initial treatment are changing their behaviors, becoming more female-friendly in their endorsement of candidates over time. A possible explanation is that that although parties countered the

---

[9]Due to the addition of the running variable in the regression, mechanically the coefficients of columns (5) and (6), as well as those of columns (9) and (10), are of opposite signs. Also mechanically, the coefficients of columns (7) and (8) add up to 1.

gender quota initially, the quota was not completely undone, as signified by the positive coefficient for cycle 4 in column (10). Then, the consequent experience of female councilors induced parties to become more favorable towards female councilors. Section 5 delves deeper into this learning story.

4.5 Robustness

Because the analysis is at the municipality level, it is not straightforward to pin down where the effects are coming from. Many parties operate in a municipality, and each party puts forth a large number of ward candidates per ward. The changes in the coefficients may not mean much, if the change in the candidate selection pattern is driven by parties or candidates in positions that have no hope in getting elected. This concern is partially addressed by the fact that the change in the coefficients for the elected councilors mirror that in the coefficients for the candidates. Nonetheless, to explain the source of the changing candidate selection with greater clarity, we point to Table 5.

Table 5 shows that even when we restrict our attention to candidates for whom election is probable, we see the same patterns of (a) the initial preference for males, and (b) the shift in the preference for females. Columns (3) and (4) focus on the ward candidates belonging to the two main parties only, from which 83% of all elected ward councilors originate. Columns (5) and (6) are even more selective; they are the candidates of the main parties, running as the solo candidate or the candidate in the highest position on the ballot for the party in a ward. These candidates have a great chance of getting elected. Lastly, columns (7) and (8) are for candidates of the main parties running in wards where the party had a stronghold in the previous election.[10]

Table 5: The effect of being past the threshold at election cycle 4 on the number of ward candidates that are likely to get elected

	All		Main parties		Useful positions		Safe wards	
	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treat at cycle 4 × Cycle 4	3.70***	-0.24	1.52**	-0.27	0.85*	-0.39**	-0.72	-0.18
	(3.19)	(-0.69)	(1.99)	(-1.20)	(1.81)	(-2.18)	(-0.84)	(-1.23)
Treat at cycle 4 × Cycle 5	0.56	0.49	0.41	0.48*	-0.24	0.42**	-1.69*	0.18
	(0.61)	(1.37)	(0.63)	(1.93)	(-0.49)	(2.31)	(-1.85)	(1.00)
Treat at cycle 4 × Cycle 6	-1.39*	0.91**	0.59	0.76***	0.08	0.45*	-1.70**	-0.02
	(-1.66)	(2.18)	(0.93)	(2.60)	(0.19)	(1.93)	(-2.15)	(-0.10)
Treat at cycle 4 × Cycle 7	-2.23**	1.10**	-0.52	1.17***	-0.12	0.68***	-1.66**	0.43*
	(-2.23)	(2.49)	(-0.79)	(3.69)	(-0.26)	(2.69)	(-2.01)	(1.72)
N	868	868	868	868	868	868	868	868

Notes: t statistics from standard errors clustered by municipality in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
The regression specification is given by equation (2). The sample includes only bins 1 and 2.

---

[10]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.

4.6   Validation of the identification strategy

Balance tests

A critical part of the identification strategy is that there are no confounders associated with the treatment status at election cycle 4. We regress equation (2) for various pre-determined characteristics, to check that they are balanced to the left and right of the threshold. The sample consists of councils at election cycle 4, and the regression results are presented in Table 6.

Panel (A) confirms that the population characteristics are 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. In Panel B, columns (8) and (9) refer to the vote share received by each main party in the previous election's PR arm. Columns (10) and (11) show that the initial treatment group is balanced in terms of economic prosperity and council performance. Columns (12) and (13) 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 6: Balance tests on pre-determined characteristics

***Panel A*: Population characteristics**

	Population		Voting age population			Households	
	Total	Foreign	Total	Male	Female	Total	Foreign
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Treat at cycle 4	-23.97	0.01	-17.22	-7.84	-9.38	-5.59	0.01
	(-0.78)	(0.78)	(-0.76)	(-0.70)	(-0.82)	(-0.50)	(0.83)
Running variable	31.49***	-0.00	23.22***	11.29***	11.94***	10.66***	-0.00
	(5.50)	(-0.84)	(5.47)	(5.38)	(5.55)	(5.15)	(-0.86)
Running variable form	council	council	council	council	council	council	council
N	219	219	219	219	219	219	219

***Panel B*: 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
	(8)	(9)	(10)	(11)	(12)	(13)
Treat at cycle 4	-0.02	-0.00	54.16	0.02	-0.23	0.17
	(-0.26)	(-0.12)	(0.63)	(0.36)	(-1.30)	(1.48)
Running variable	-0.00	0.00	19.04	0.06***	0.45***	-0.06**
	(-0.08)	(0.08)	(1.30)	(7.84)	(11.71)	(-2.53)
Running variable form	council	council	council	council	ward	ward
N	219	219	219	219	219	219

Notes: t statistics from standard errors clustered by municipality in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
The regression specification follows equation (2), and the sample consists of bins 1 and 2 at election cycle 4.

Bunching

Is there a possibility that there is gerrymandering? For example, a council may manipulate its constituent areas to manipulate the council's size and therefore, treatment status. If there is manipulation, one evidence of it would be bunching at the threshold. Figure 6 displays the histogram of the frequency of municipalities by council size. Visually, it is hard to say there is bunching around the thresholds of 11 and 12. In addition, it is difficult to formally test for bunching around the threshold, e.g. the McCray (2008) density test, due to the coarseness in the council size variable.[11] However, there are specific electoral rules against gerrymandering.

The division of election constituencies is determined by the Municipal Council Election Committee. The committee is set up in each district, and it consists of up to 11 members appointed by the district mayor among the individuals nominated by the media, legal community, academic community, civic groups, the district council, and District Election Committee. Municipal councilor or party member cannot be in the committee. The committee determines the council size based on population, administrative districts, topography, transportation, and other conditions. The committee cannot split the smallest administrative district and make it a part of another ward. In sum, there are rules preventing the membership of interested individuals in the committee and also rules circumscribing how the election constituencies are drawn up.

Figure 6: Histogram of council size
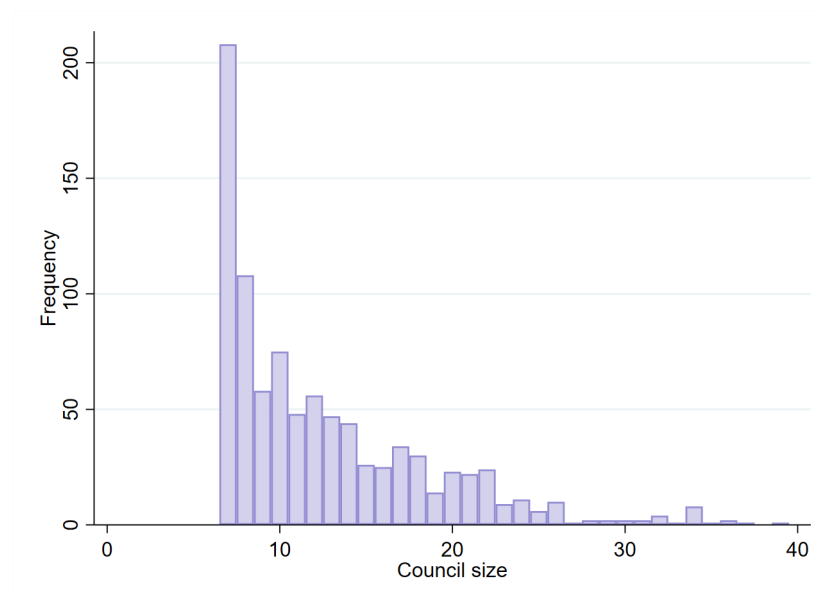
Notes: The sample includes all municipal councils of election cycles 4, 5, 6, and 7.

---

[11]No bunching is rejected for randomly selected cutoffs of council size.

Placebo test

As a placebo test, we check that the thresholds are meaningful only after, and not before, the reform to the election system. Before the reform, there were only ward councilors and 97% of them were male. Therefore, we test whether the number of male ward candidates changed at the threshold before and after the reform. Table 7 shows that up to election cycle 3, the effect of being past the threshold is not statistically significantly distinguishable from zero. It is at election cycle 4 that the treatment induces an effect, as expected.

Table 7: The effect of being past the threshold on the number of male ward candidates

	Number of male ward candidates	
	(1)	(2)
Treat × Cycle 1	0.92	0.03
	(0.70)	(0.02)
Treat × Cycle 2	0.40	-0.61
	(0.36)	(-0.61)
Treat × Cycle 3	1.06	0.01
	(1.04)	(0.01)
Treat × Cycle 4	3.22***	2.93**
	(2.66)	(2.55)
Treat × Cycle 5		-0.71
		(-0.86)
Treat × Cycle 6		-2.29***
		(-2.90)
Treat × Cycle 7		-2.79***
		(-2.83)
Running variable form	ward	ward
N	899	1577

Notes: t statistics from standard errors clustered by municipality in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
The regression specification is given by equation (1).

5 Channels

In this section, we delve deeper into learning as an explanation for the changing reaction to the gender quota. We first establish at the *party* level that parties change their candidate selection pattern after marginally winning a female PR councilor. We then provide evidence that points toward a story in which the attitudes of political parties for female candidates changed as they learned about the competency of females through exposure to female councilors.

5.1 Parties that marginally won vs. marginally lost a PR councilor

Do the parties that previously won more female councilors put forth more female candidates subsequently? We are interested in the causal effect of having previously won a female PR councilor. Thus, we compare the strategies of parties that marginally won a PR councilor to those that marginally lost a PR councilor in the previous election. We take marginal parties to be the *two* parties that either marginally won or lost the *last* 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 C.1.

Figure 7: Marginal winners and losers of the last PR seat
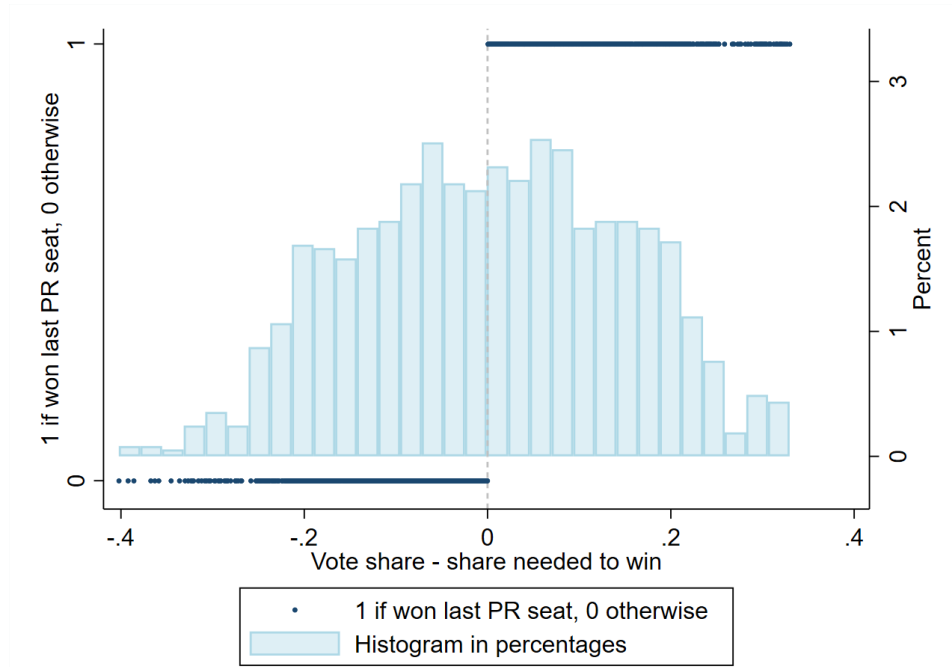
Notes: This figure shows the distribution of the vote shares received by the two marginal parties competing for the last PR seat in a municipality. The vote share is computed to be the share of votes received among qualifying parties, i.e. parties that received more than 5% of the raw votes in the PR election arm.

Figure 7 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. We employ a regression discontinuity design of the following form:

$$Y_{cpt} = \beta \times Winner_{cp,t-1} + f(v_{cp,t-1}) + X_{cpt} + \delta_n + \gamma_t + \epsilon_{cpt} \qquad (3)$$

where $Winner_{cp,t-1} \equiv \mathbb{1}(v_{cp,t-1} \geq 0)$. We denote by $n \in \{1,2\}$, whether the marginal candidate that won – or nearly won – the last PR seat corresponds to the first or second PR candidate in a party's list.[12] $f(v_{cp,t-1})$ 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. Due to frequent changes to party names, as well as frequent dissolutions and merges of small parties, parties other than the two major ones are difficult to follow over time. Therefore, X_{cpt} also includes a dummy that indicates which of the two major parties party p is.

Table 8 reports the results of the regression discontinuity design in equation (3) with the female share among ward candidates as the outcome variable. The many columns in the table report the results of different sample restrictions. First of all, the council size in the previous election is all smaller or equal to 25. The reason is to maintain consistency with the sample selection criteria for Table 4. Column (1) pools the data from parties whose marginal candidate is either in position 1 or 2 in the party list. Marginally winning one more PR councilor in the previous election induces a party to put forth a greater share of females among ward candidates. Columns (2) and (3) examine whether the finding differs by the position of the marginal candidate. The coefficient on $Winner$ is much larger when the marginal candidate is first on the party list, and it becomes negative when the marginal candidate is second. Hence, we can see from column (2) that having the first female councilor is really the chief factor behind a party's candidate selection becoming more female-friendly thereafter.

The negative coefficient in column (3) is puzzling. Contrary to the first candidate, there is no legal restriction on the gender of the second candidate in a party list. Thus, having the second candidate marginally win does not necessarily imply an addition of a female councilor. Nonetheless, the second candidate is often female, so the large negative coefficient appears contrary to the positive coefficient of column (2). Columns (4) and (5) separate out the sample by the gender of the second candidate. Column (5) shows that the bulk of the large coefficient is driven by the election of a *male* councilor. According to column (4), in contrast, When this second candidate is *female*, the coefficient is still negative but much smaller in magnitude and statistically insignificant.

---

[12] There are only five parties that won or nearly won a third PR councilor, so we exclude these parties. There is no party that won four PR councilors.

Table 8: The effect of marginally winning a PR councilor in the previous election

	Female share among party's ward candidates				
	(1)	(2)	(3)	(4)	(5)
Winner	0.08*	0.17***	-0.14***	-0.07	-0.26***
	(1.86)	(2.65)	(-3.76)	(-1.28)	(-6.74)
Sample restrictions					
Council size in previous election	≤ 25	≤ 25	≤ 25	≤ 25	≤ 25
Position of marginal candidate in party list	1 or 2	1	2	2	2
Gender of second PR candidate	-	-	-	Female	Male
N	741	485	256	118	138

Notes: t statistics from standard errors clustered by municipality×party in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The regression specification is given by equation (3). The Mean Square Error-optimal bandwidth is selected (Calonico, Cattaneo and Titiunik, 2014). The standard errors remain very similar when they are clustered at the municipality level.

As Table 8 highlights the importance of having the *first* female councilor, we next focus precisely on such parties. In Table 9, the sample used is parties that belonged to a council with size smaller than 25 in the previous election, and whose marginal candidate is first on the party list. We explore how the female share is affected by winning a female councilor, among various types of candidates. Column (1) shows that the female share falls among PR candidates. This finding is not surprising. There is a consensus that the PR election arm is the easy gateway to council membership, and so it is also considered the lesser election arm. Instead, the female share is increasing in the ward election arm. Even when we consider the more selective of ward candidates – running as either the sole or the number-1 candidate in a ward (column (3)), and running as either the sole or up to the number-2 candidate in a ward (column (4)) – we still see a positive effect on the female share. The findings in columns (3) and (4) show that the increase in the female share of ward candidates stems from the top of the pile.

Table 9: The effect of marginally winning a female PR councilor in the previous election

	PR candidates	ward candidates		
	All	All	Rank 1	Ranks 1&2
	(1)	(2)	(3)	(4)
Winner	-0.08*	0.17***	0.16*	0.17***
	(-1.84)	(2.65)	(1.77)	(2.65)
Sample restrictions				
Council size in previous election	≤ 25	≤ 25	≤ 25	≤ 25
Position of marginal candidate in party list	1	1	1	1
N	485	498	485	485

Notes: $*p < .10, **p < .05, ***p < .01$

5.2 Heterogeneous treatment effects

If political parties put forth more female candidates after the experience of female councilors, then why are they doing so? Here, we discuss some evidence that points toward a story in which the attitudes of political parties for female candidates changed as they learn about the competency of females through exposure to female councilors. The evidence is based on the identification strategy of Section 4.

Now, even if there is absolutely no learning by parties, the shift to more female ward candidates over time may be driven by the fact that there are more female councilors at cycle 4 in the initially treated municipalities than control municipalities, and therefore there is a greater availability of experienced and competitive female candidates in subsequent elections. However, even if this were the case, the number of female councilors in the initially treated municipalities are still very small and so cannot account for all the rise in the female candidates over time. Moreover, if it were the only reason driving the changing candidate selection, then there should be no shift in the gender preference among candidates who have zero councilor experience. However, Table 10 shows that the initial withdrawal of female candidates and the gradual reversal is present even for ward candidates who have never been elected before. Hence, the greater availability of experienced women cannot be the only reason driving the changing reaction.

**Table 10: The effect of being past the threshold at election cycle 4
on the number of rookie ward candidates**

	Rookie ward candidates	
	Male	Female
	(9)	(10)
Treat at cycle 4 × Cycle 4	0.82	-0.27*
	(1.33)	(-1.66)
Treat at cycle 4 × Cycle 5	-0.63	0.01
	(-1.05)	(0.05)
Treat at cycle 4 × Cycle 6	-0.29	0.15
	(-0.57)	(0.84)
Treat at cycle 4 × Cycle 7	-0.45	0.38*
	(-0.86)	(1.82)
N	868	868

Notes: t statistics from standard errors clustered by municipality in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
The regression specification is given by equation (2). The sample includes only bins 1 and 2.

If parties are learning about the competency of females, then the learning can be expected to take place at a faster rate if parties are exposed to more competent females. We next examine how the treatment effects are different by the education level of the first female councilors of cycle 4. Panels A and B of Table 11 reproduce Table 4 for councils in which the additional female PR councilor elected at cycle 4 as a result of the treatment has below-median and above-median education level,

respectively. It is clear to see that the shift towards female candidates is more apparent and stronger when the first women are more educated. Therefore, it does appear that parties are learning about the competency of females over time.

Table 11: The effect of being past the threshold at election cycle 4 by education level of the first PR female councilors

	Candidates				Councilors					
	Ward		PR		Ward		PR		All	
	Male	Female	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: Below-median education level										
Treat at cycle 4 × Cycle 4	2.46	-0.55	1.33***	0.67**	0.53	-0.53	0.21*	0.61***	0.06	-0.06
	(1.28)	(-0.94)	(4.36)	(2.06)	(1.33)	(-1.33)	(1.66)	(4.39)	(0.12)	(-0.12)
Treat at cycle 4 × Cycle 5	0.33	0.47	0.94***	1.22***	0.07	-0.07	0.11	0.67***	-0.46	0.46
	(0.22)	(0.75)	(3.49)	(3.34)	(0.16)	(-0.16)	(0.96)	(4.84)	(-0.84)	(0.84)
Treat at cycle 4 × Cycle 6	-1.04	0.63	0.54**	0.44	-0.17	0.17	0.18	0.56***	-0.59	0.59
	(-0.75)	(0.83)	(2.35)	(1.47)	(-0.36)	(0.36)	(1.51)	(3.77)	(-1.03)	(1.03)
Treat at cycle 4 × Cycle 7	-1.90	1.26	0.58*	1.08***	-0.57	0.57	0.09	0.61***	-1.05	1.05
	(-0.99)	(1.58)	(1.96)	(3.32)	(-0.94)	(0.94)	(0.80)	(4.33)	(-1.50)	(1.50)
N	387	387	387	387	387	387	387	387	387	387
Panel B: Above-median education level										
Treat at cycle 4 × Cycle 4	4.03***	0.16	0.75**	1.12***	0.11	-0.11	0.01	0.88***	-0.71**	0.71**
	(2.67)	(0.35)	(2.55)	(3.80)	(0.41)	(-0.41)	(0.06)	(8.06)	(-2.08)	(2.08)
Treat at cycle 4 × Cycle 5	0.49	0.72	0.56***	1.17***	-0.64**	0.64**	0.13*	0.71***	-1.30***	1.30***
	(0.39)	(1.56)	(2.72)	(4.09)	(-2.26)	(2.26)	(1.69)	(7.83)	(-3.87)	(3.87)
Treat at cycle 4 × Cycle 6	-1.75	1.27**	0.22	1.38***	-0.77**	0.77**	0.06	0.77***	-1.49***	1.49***
	(-1.48)	(2.40)	(1.17)	(4.55)	(-2.24)	(2.24)	(0.78)	(8.66)	(-3.87)	(3.87)
Treat at cycle 4 × Cycle 7	-2.44*	1.07*	0.14	1.28***	-0.88***	0.88***	0.04	0.71***	-1.57***	1.57***
	(-1.93)	(1.97)	(0.79)	(4.38)	(-2.66)	(2.66)	(0.55)	(7.68)	(-4.20)	(4.20)
N	481	481	481	481	481	481	481	481	481	481

Notes: t statistics from standard errors clustered by municipality in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
The regression specification is given by equation (2). The sample includes only bins 1 and 2.

6 Conclusion

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

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.

This paper is a 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.

References

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

Chattopadhyay, R. and E. Duflo (2004). Women as policy makers: Evidence from a randomized policy experiment in india. *Econometrica 72*(5), 1409–1443.

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

Iaryczower, M. and A. Mattozzi (2013). On the nature of competition in alternative electoral systems. *The Journal of Politics 75*(3), 743–756.

Jang, G. S. (2008). Busan Provincial Council "Poor Report Card".

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

Jin, J. W. (2018). Female nomination subsidy monopolized by two major parties. *Women News*.

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

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

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

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

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

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

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

Ministry of the Interior and Safety (2012). Municipal council operation guide. Publication Registration Number: 11-1311000-000437-01.

Ministry of the Interior and Safety (2018). Municipal councilor's activities guide. Publication Registration Number: 11-1741000-000101-15.

Myerson, R. B. (1993). Effectiveness of electoral systems for reducing government corruption: A game-theoretic analysis. *Games and Economic Behavior 5*(1), 118 – 132.

Myerson, R. B. (1999). Theoretical comparisons of electoral systems. *European Economic Review 43*(4), 671 – 697.

Norris, P. (2004). *Electoral Engineering: Voting Rules and Political Behavior*. Cambridge University Press.

Appendix A   Tables

Table A1: 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: The sample is restricted to bins 1 and 2, i.e. to municipal councils with up to 25 councilors.

Appendix B   Identification

B.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 regress, for each value of $x \in \{-4, -3, ..., 3, 4\}$ i.e. distance from the threshold,

$$(\text{number of female PR councilors})_{cbt} = \beta \times TreatOne_{cbt} + \delta_b + \gamma_t + \epsilon_{cbt} \tag{4}$$

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

Equation (4), 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 A2 reports the results. It confirms that there is a positive effect only at the threshold.

Table A2: 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	(-0.36)	(1.32)	(-0.99)	(-0.20)	(15.00)	(-0.14)	(-0.36)	(-0.35)	(1.04)
N	267	380	210	170	168	150	136	111	87

Notes: t statistics from standard errors clustered by municipality in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
This table reports the results of regression equation (4). The sample includes only bins 1 and 2.

B.2 Additional balance tests

B.3 Robustness to bandwidth choice

Table A3: 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	Female	Male	Female	Male	Female	Male	Female	Male	Female
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Panel A: distance† ≤ 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: t statistics from standard errors clustered by municipality in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
This table reports the results of regression equation (1). The sample includes only bins 1 and 2.
† Distance refers to the distance to the threshold. To illustrate, the council sizes for which distance equals 0 are 10, 11, 20, and 21, while the council sizes for which distance equals 1 are 9, 12, 19, and 22.

Appendix C   Computational details

C.1   Computing the running variable in the regression discontinuity design of section 5.1

The purpose of the regression discontinuity design of section 5.1 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 locality, only the parties getting $>=5\%$ of votes qualify.
>
> 2. Of the qualifying parties, first compute X =(number of prop MP seats in the locality)$\times$(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.[13] 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

---

[13]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 $v_1 - \frac{2}{3}$.

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.

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

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

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

$\boxed{4}$ 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 A1 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 A1: Marginal winners and losers of the last PR seat, among rank-1 parties in municipalities with two PR seats and two qualifying parties
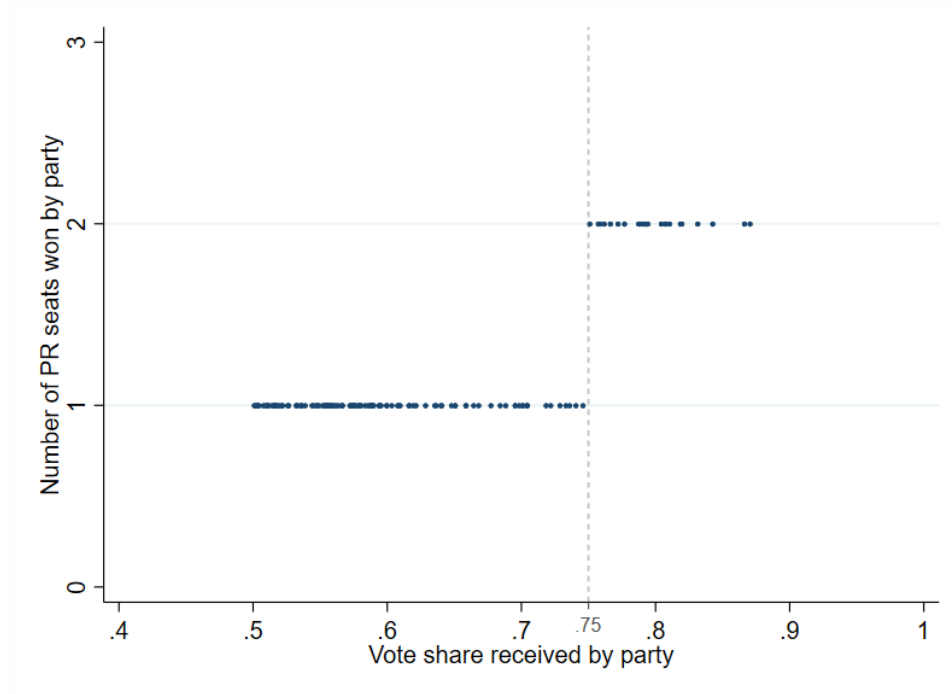
Notes: This figure shows that in municipalities with two PR seats and two qualifying parties, the rank-1 parties must receive a vote share greater or equal to 0.75 in order to win both PR seats. The reason the vote share received is always greater than 0.5 is because these parties are the rank-1 parties. Note that the vote share is the share of votes among qualifying parties only.