

Learning by Experiencing?

Evidence from South Korean Municipal Councils

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Abstract

In 2005, the South Korean government introduced a gender quota in the *party-list proportional representation* tier of municipal council elections. The minimum number of female councilors as regulated by the quota increased as a step function of council size. We analyze the effect of the quota on parties' selection of candidates to be directly elected in the *first past the post* tier of elections, which is unaffected by the quota. We find that municipalities stipulated to elect more females initially get around the quota by substituting away from female candidates in the unaffected tier, but over time the number of these female candidates increases. Moreover, the rate of growth of female direct candidates is higher in municipalities where the first proportionally elected females had higher education. Textual data on the council meeting minutes from a subsample of municipalities show that females speak more frequently and at greater length over time within election cycle. These results paint a story of learning: males learn about the competency of female colleagues, and females learn about the job.

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1 Introduction

Affirmative action policies are widely implemented to mitigate long-standing imbalances in many contexts. However, as they favor certain groups over others by nature, it is difficult to find affirmative action policies that garner universal support. In particular, the disfavored group that comprise the existing majority may actively attempt to undermine the policy objective. In such environments, the extent to which affirmative action policies can correct existing imbalances might be limited.

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 channels in which a councilor is elected. In South Korea’s parallel voting system, the first group of councilors (“ward councilors”) is elected through a plurality vote in the municipality’s constituent wards, and the second group (“PR councilors”) is elected by party-list proportional representation. As the gender quota affected only the proportional representation channel, we can study parties strategically respond in the plurality vote channel.

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 proportional seats increases as a step function of a municipality’s council size, which is centrally determined based on the municipality’s population size and regional representativeness. We study the characteristics of ward candidates that political parties champion, comparing locally the municipalities on each side of the step function’s thresholds, while controlling for council size.

We find that municipalities stipulated to elect more females initially get around the quota by substituting away from female candidates in the unaffected tier, but over time the number of these female candidates increases. Moreover, the rate of growth of female direct candidates is higher in municipalities where the first proportionally elected females had higher education. Textual data on the council meeting minutes from a subsample of municipalities show that females speak more frequently and at greater length over time within election cycle. These results paint a story of learning: males learn about the competency of female colleagues, and females learn about the job.

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 unaffected. Furthermore, the unaffected 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).

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 proportional party list arm, because one cannot be elected without being a member of a party in that arm. However, also in the plurality vote 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. Moreover, as not just one but two to four councilors are elected per constituent ward, multiple candidates from the same party may run in the same ward. Therefore, parties first determine who runs in which election arm, and if in the proportional representation arm, under which position on the party list. If in the plurality vote 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, while Section ?? reports the empirical results. In Section ??, we discuss the pieces of evidence that point towards learning as an explanation for the results in Section ?. 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.¹ 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

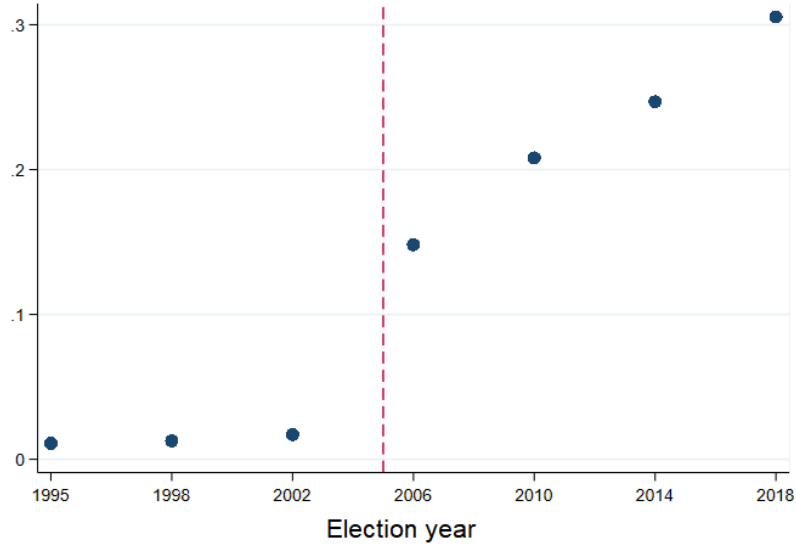
1	Party 1	✓
2	Party 2	
3	Party 3	
4	Party 4	
5	Party 5	

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.

¹The 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



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.

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.² 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.

²General 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.

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.

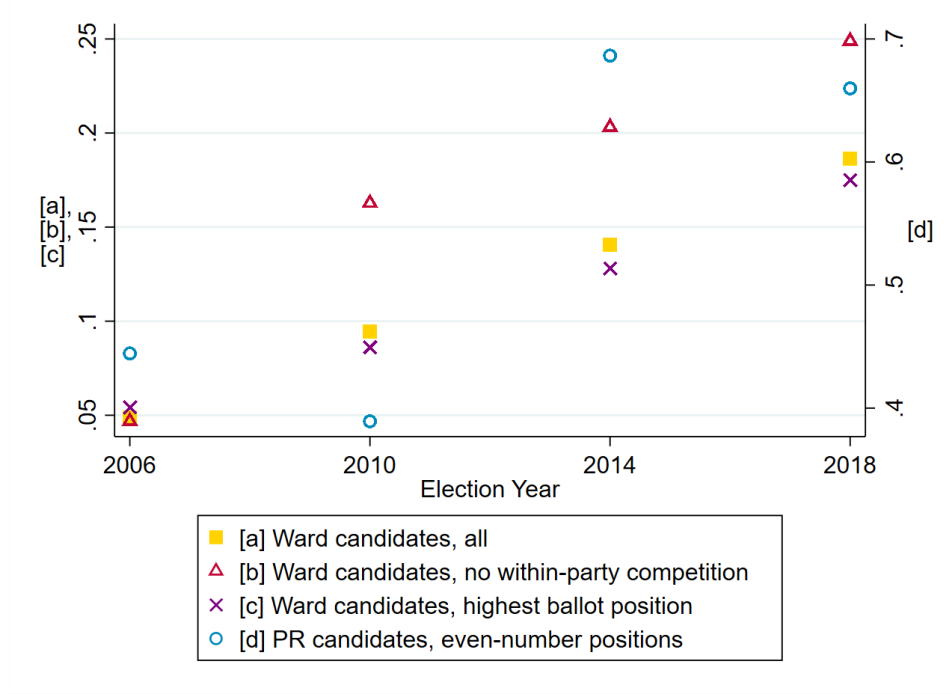
3.2 Candidates

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.

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.³

³In 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.

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].

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 Budget allocation

A chief function of municipal councils is to approve of the municipal government’s budget plan prior to a fiscal year and to review its expenditures afterwards. The councilors vet government officials and suggest detailed modifications if they believe the budget allocation to be unreasonable. Thus, to examine the consequence of the municipal councils’ legislative activities, we use the data on municipal governments’ expenditures by category (2008-2019). The 52 categories are broadly in the realms of a) general public administration, b) environmental protection, c) industrial and small business support, d) legislative activities and election management, e) public order and safety, f) social welfare, g) transportation, h) education, i) culture and tourism, j) land development, k) health, l) agriculture and fisheries, and finally, m) reserves.

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

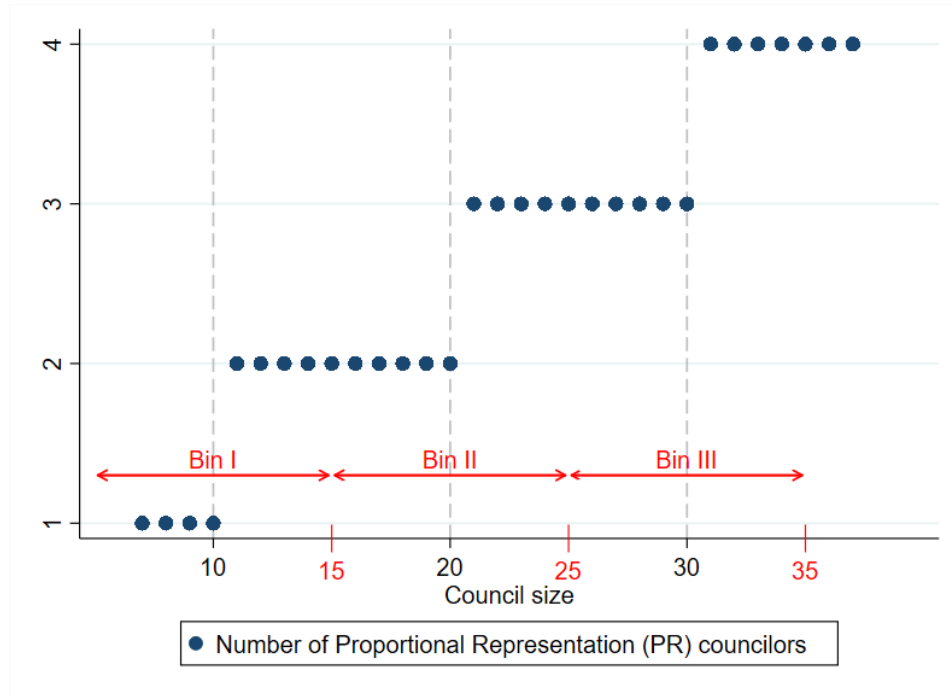
appropriating large sums of the local budget for their private use (Local Decentralization Bureau, 2019). For instance, they would go on international policy-research trips where the itinerary largely consists of sightseeing. Another example is of councilors ordering member pins made of pure gold. As 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.⁴ 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.⁵ We also check in Section 4.2 that an additional PR councilor strongly implies an increase in the number of female PR councilors.

The regression discontinuity specification is given by:

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

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. Specifically, $f(x_{cbt}) = \psi_0 \cdot x_{cbt} + \psi_1 \cdot Treat_{cbt} \cdot x_{cbt}$ in order to allow for differential trends to the left and right of the threshold.⁶

The outcome variables we consider are the number, position on the ballot paper, and vote share, of ward and PR candidates by gender.⁷

4.2 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 (1) with the number of female PR councilors as the outcome variable, separately for each bin. While having an additional PR councilor significantly increases the number of female PR councilors at bins 1 and 2, there is no such effect at bin 3.

⁴Table 2 shows that among PR councilors, 87% to 98% are female each election.

⁵Appendix Table A1 shows that it is relatively rare to find multiple PR seats getting allocated to the same party.

⁶Making f quadratic barely makes a difference.

⁷When the outcome variable relates to the ward elections, then we change the running variable to $\tilde{x}_{cbt} \equiv (\text{number of ward councilors})_{cbt} - (\text{number of ward councilors at the threshold})_b$. The reason is that 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 running variable is based on the number of ward councilors, 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.

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. 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 on the number of female PR councilors

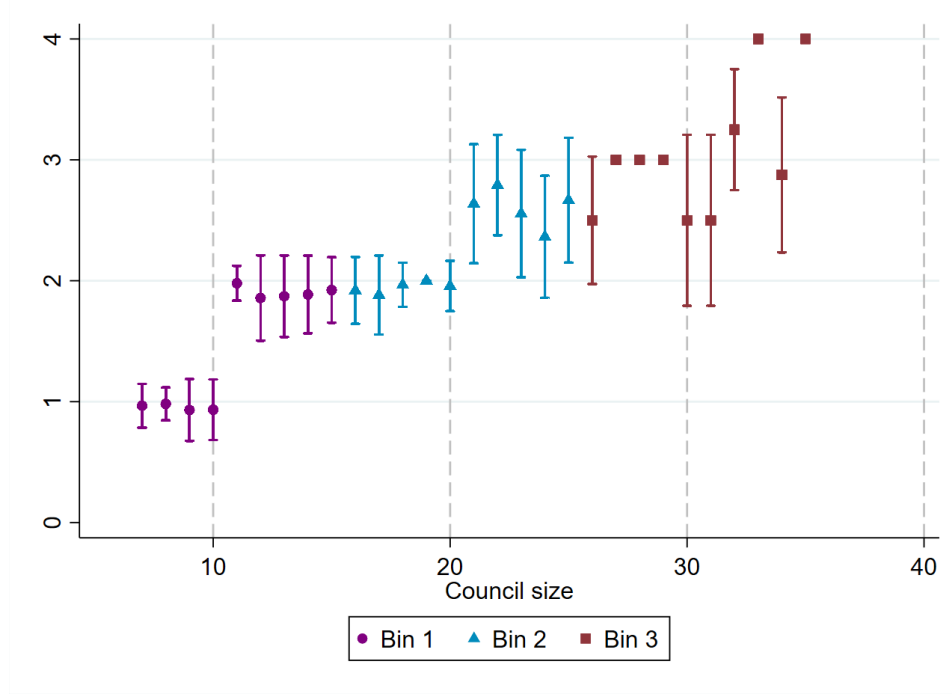
	Number of female PR councilors		
	Bin 1 (1)	Bin 2 (2)	Bin 3 (3)
Treat \times Cycle 4	0.99*** (13.28)	0.70*** (3.83)	-0.060 (-0.09)
Treat \times Cycle 5	1.02*** (22.78)	0.52*** (3.02)	-0.53 (-1.11)
Treat \times Cycle 6	0.96*** (19.42)	0.82*** (5.00)	-0.088 (-0.19)
Treat \times Cycle 7	0.98*** (22.42)	0.79*** (6.07)	0.55 (1.05)
<i>N</i>	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 (1), 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 error 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.

4.3 Reduced-form results

The results of regressing equation (1) are reported in Table 4. The most interesting result is captured by columns (1) and (2). In response to *Treat*, 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.⁸ 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

⁸Due 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.

become statistically significant.

Table 4: The effect of being past the threshold 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 \times Cycle 4	3.89*** (3.28)	-0.41 (-1.22)	0.98*** (4.56)	1.02*** (4.88)	0.46** (2.22)	-0.46** (-2.22)	0.09 (1.16)	0.91*** (12.10)	-0.39 (-1.47)	0.39 (1.47)
Treat \times Cycle 5	0.57 (0.61)	0.35 (0.98)	0.68*** (4.18)	1.43*** (6.16)	-0.14 (-0.62)	0.14 (0.62)	0.11* (1.80)	0.89*** (14.82)	-0.97*** (-3.68)	0.97*** (3.68)
Treat \times Cycle 6	-1.09 (-1.35)	0.56 (1.42)	0.31** (2.23)	1.19*** (5.72)	-0.36 (-1.48)	0.36 (1.48)	0.09 (1.53)	0.91*** (16.09)	-1.21*** (-4.33)	1.21*** (4.33)
Treat \times Cycle 7	-1.77* (-1.87)	0.72* (1.70)	0.26* (1.81)	1.29*** (6.05)	-0.54** (-2.04)	0.54** (2.04)	0.08 (1.59)	0.92*** (19.18)	-1.40*** (-4.60)	1.40*** (4.60)
<i>N</i>	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 (1). The sample includes only bins 1 and 2.

Table 5: 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 \times Cycle 4	4.14*** (3.29)	-0.38 (-0.97)	0.95*** (4.25)	0.93*** (4.35)	0.63** (2.27)	-0.48** (-2.04)	0.09 (1.16)	0.77*** (8.98)	-0.23 (-0.82)	0.23 (0.82)
Treat at cycle 4 \times Cycle 5	1.09 (1.01)	0.38 (0.93)	0.65*** (3.76)	1.18*** (5.27)	0.04 (0.14)	0.17 (0.69)	0.10 (1.50)	0.71*** (9.14)	-0.83*** (-3.00)	0.83*** (3.00)
Treat at cycle 4 \times Cycle 6	-0.68 (-0.68)	0.85* (1.87)	0.27* (1.73)	1.00*** (4.58)	-0.05 (-0.14)	0.38 (1.35)	0.08 (1.31)	0.70*** (8.89)	-1.01*** (-3.28)	1.01*** (3.28)
Treat at cycle 4 \times Cycle 7	-1.13 (-1.00)	1.15** (2.25)	0.23 (1.38)	1.25*** (5.82)	-0.11 (-0.29)	0.68** (2.23)	0.04 (0.63)	0.70*** (9.10)	-1.27*** (-3.81)	1.27*** (3.81)
<i>N</i>	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 (1). The sample includes only bins 1 and 2.

What is driving the changing reaction to the gender quota? Table 5 reports the same results as Table 4, except for the fact that it looks at the effect of the initial treatment at election cycle 4. We can see that the regression results in the two tables are very similar. Therefore, it appears that the changing reaction is not due to a change in the selection into treatment. Rather, 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 although parties countered the gender quota initially, the quota was not completely undone. Then, the consequent experience of female councilors induced parties to become more favorable towards female councilors. Section 5 delves deeper into this learning story.

4.4 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 6 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 6: The effect of being past the threshold on the number of male ward candidates

	Number of male ward candidates		
	(1)	(2)	(3)
Treat \times Cycle 1	1.71 (1.24)	0.80 (0.66)	1.81 (1.56)
Treat \times Cycle 2	0.29 (0.25)	-0.50 (-0.50)	0.45 (0.47)
Treat \times Cycle 3	0.84 (0.73)	0.05 (0.06)	1.07 (1.18)
Treat \times Cycle 4	3.08*** (2.79)	3.05*** (2.75)	3.22*** (3.00)
Treat \times Cycle 5	-0.52 (-0.64)	-0.57 (-0.71)	-0.13 (-0.16)
Treat \times Cycle 6	-2.18*** (-2.79)	-2.15*** (-2.75)	-1.60** (-2.11)
Treat \times Cycle 7	-2.90*** (-3.02)	-2.87*** (-2.97)	-2.30** (-2.49)
Running variable	2.27*** (13.40)	2.11*** (14.85)	1.98*** (14.40)
Treat \times Running variable	-0.36 (-1.39)		
Bins	1,2,3	1,2,3	1,2
N	1544	1544	1440

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).

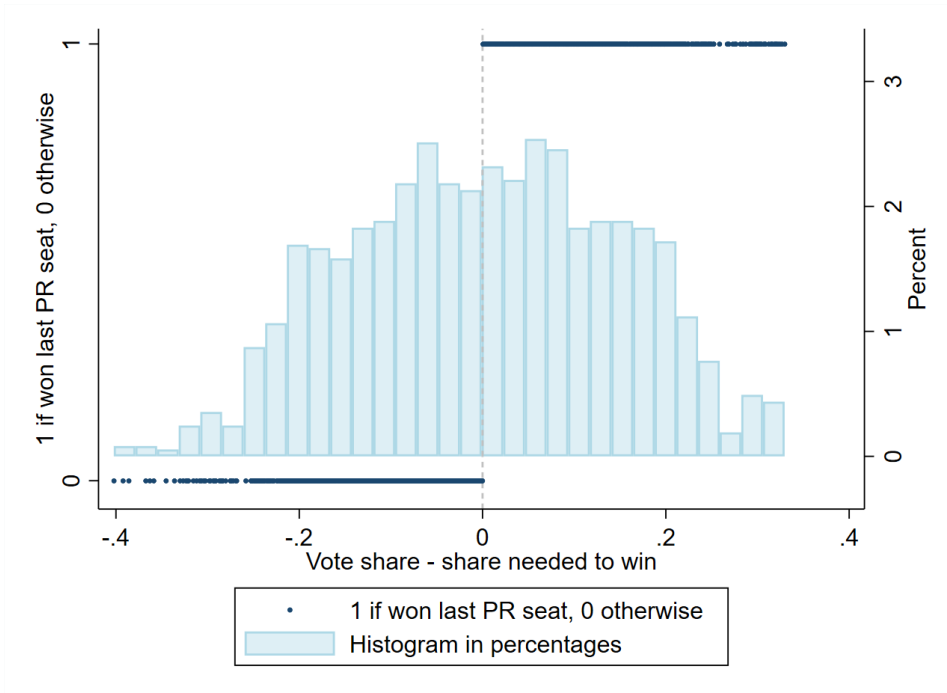
5 Channels

In this section, we delve deeper in the explanations for the changing reaction to the gender quota. First, we explore how parties that marginally won a PR councilor behave differently from those that marginally lost.

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 B.2.

Figure 6: 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 6 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:

$$Y_{cpt} = \beta \times Winner_{cp,t-1} + f(v_{cp,t-1}) + X_{cpt} + \delta_n + \gamma_t + \epsilon_{cpt} \quad (2)$$

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.⁹ $f(v_{cp,t-1})$ 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 7 reports the results of the regression discontinuity design in equation (2) 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 Tables 4 and 5. 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.

⁹There 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 7: Estimating the effect of the quota by OLS - placebo check

	Female share among party's ward candidates				
	(1)	(2)	(3)	(4)	(5)
<i>Winner</i>	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
<i>N</i>	741	485	256	118	138

Notes: t statistics from standard errors clustered by municipality \times party in parentheses; * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The regression specification is given by equation (2). 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 7 highlights the importance of having the *first* female councilor, we next focus precisely on such parties. In Table 8, 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 the sole candidate in a ward (column (3)), running as either the sole or the number-1 candidate in a ward (column (4)), and running as either the sole or up to the number-2 candidate in a ward (column (5)) – we still see a positive effect on the female share. The findings in columns (3) to (5) show that the increase in the female share of ward candidates stems from the top of the pile.

Table 8: Estimating the effect of the quota by OLS - placebo check

	PR candidates	Ward candidates			
	All (1)	All (2)	Solo (3)	Rank 1 (4)	Ranks 1&2 (5)
<i>Winner</i>	-0.08*	0.17***	0.21***	0.16*	0.17***
	(-1.84)	(2.65)	(3.01)	(1.77)	(2.65)
Sample restrictions					
Council size in previous election	≤ 25	≤ 25	≤ 25	≤ 25	≤ 25
Position of marginal candidate in party list	1	1	1	1	1
<i>N</i>	485	498	266	485	485

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

6 Conclusion

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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 $x \in \{-4, -3, \dots, 3, 4\}$ i.e. distance from the threshold,

$$(\text{number of female PR councilors})_{cbt} = \beta \times TreatOne_{cbt} + \delta_b + \gamma_t + \epsilon_{cbt} \quad (3)$$

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

Equation (3), therefore, estimates the change in the number of female PR councilors when the council size increases by 1, for all points around the threshold. Table 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

	<i>x</i> 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)
<i>N</i>	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 (3). The sample includes only bins 1 and 2.

B.2 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 $\geq 5\%$ of votes qualify.
2. Of the qualifying parties, first compute $X = (\text{number of prop MP seats in the locality}) \times (\text{vote share of each qualifying party})$.
3. Allocate to each qualifying party the number of seats equal to the integer part of X .
4. The remaining seats are allocated 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.¹⁰ 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: $\bar{v} = \frac{V}{2}$, $s = 1$

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

¹⁰An 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 $v_1 - \frac{2}{3}$.

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

yy

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

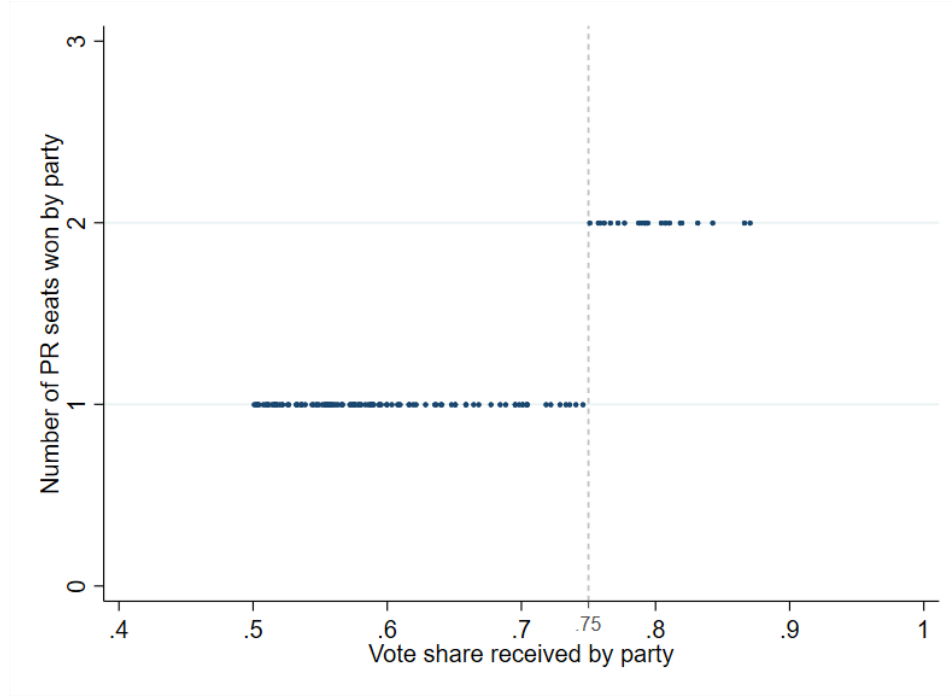
- Rank 2: $\bar{v} = \frac{4V+1}{8}$, $s = 2$
- Rank 3: $\bar{v} = \frac{4V-1}{8}$, $s = 1$

- 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.