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TWO-BALLOT VERSUS PLURALITY RULE:
an empirical investigation on the number of candidates.

Prof. Dr. Mauro Rodrigues Junior

Av. Bandeirantes, 3900 - Monte Alegre - CEP: 14040-900 - Ribeirão Preto-SP
Fone (16) 3602-4331/Fax (16) 3602-3884 - e-mail: cebelima@usp.br site:www.fearp.usp.br

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Two-ballot versus plurality rule: an empirical investigation on the number of candidates*

Carlos Eduardo S. Gonçalves† Ricardo A. Madeira‡ Mauro Rodrigues§

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Abstract

Duverger claimed more than 50 years ago that the number of candidates in elections should be a function of electoral rules. Both his "law" and "hypothesis" suggest the number of candidates vying for seats in elections to be tightly linked to characteristics of the electoral process such as its degree of proportionality and the presence of runoffs. Here we test the validity of Duverger's claim using data from municipal elections in Brazil. Our study differs from others in the field in two important dimensions. First, by using municipal data we avoid the usual problems that plague statistical analysis using cross-country data. Secondly, we have a truly exogenous source of variation due to a change in electoral legislation introduced by the constitutional reform of 1988: simple plurality remained the rule only in municipalities with less than 200,000 voters, and a second-ballot became mandatory for the others above that threshold. This allows for a neat identification strategy using panel data. Our main finding is that elections with runoffs lure greater numbers of candidates in municipalities with sufficiently high levels of heterogeneity.

JEL: D70; D72

Key Words: Duverger's Law, Runoff, Heterogeneity.

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†University of Sao Paulo, Department of Economics, cesg@usp.br

‡University of Sao Paulo, Department of Economics, rmadeira@fipe.org.br

§University of Sao Paulo, Department of Economics, marodrigues@fipe.org.br

1 Introduction

That different electoral rules may yield different outcomes in terms of number of candidates and parties is a well known proposition in social sciences. More than fifty years ago, Duverger (1954) gave law status to this idea in a two-fold statement that Riker (1982) latter dubbed Duverger's Law, namely, "that simple-majority single ballot system favors the two-party system", and Duverger's Hypothesis - that "the simple majority system with second-ballot and proportional representation favors multipartyism". Since then, a large body of research has put these claims to test, with the majority of the papers upholding Duverger's informal claims.

In this paper, we use data from municipal elections in Brazil to test if the number of candidates in mayoral elections is sensitive to the existence of runoff[1]. Our paper differs from others in the literature because we are able to explore the change in Brazilian electoral law that accompanied the Constitutional reform of 1988. Before the reform, mayoral elections in all municipalities were governed by simple plurality. With the new law municipalities with more than 200,000 eligible voters were required to adopt a two-ballot system[2]. We thus have a quasi-natural experiment not found in other studies. Our identification strategy consists in exploring this exogenous change in legislation in a panel set framework. The fact that we have variations in both the time and cross-section dimensions generated by a shift in electoral law allows us to overcome endogeneity bias problems plaguing similar empirical works.

Though first elevated to law status by Duverger, the idea that different electoral rules affect the decisions of the political elite (say to form parties or enter a race) and the way individuals cast their votes was already being discussed long before. For instance, as quoted in Riker (1982), Henry Droop, an English advocate of proportional representation already claimed as early as 1881 that "the only explanation which seems to me to account for the two-party system in the United States, United Kingdom, etc is that the two opposing parties into which we find politicians divided in each of these countries have been formed and are kept together by majority voting". It is indeed no surprise that people begun to think about the consequences of different electoral rules when first discussing them in the late nineteenth century. Referring specifically to what latter became to be known as Duverger's Hypothesis, Holcombe (1910)

[1] In most cases, including Brazil, elections with runoffs are those in which the two most voted candidates have to dispute a second round if none of them obtains at least 50% of votes in the first stage.

[2] As in the literature, we use runoff and two-ballot interchangeably.

long ago argued that "one effect of the second ballot is to foster the independent existence of minor groups".

Duverger's propositions spawned two strands of research. On the theoretical front, a set of studies using game-theoretic approaches and endogenizing politicians' entry decision confirmed Duverger's suspicions that two candidate elections are indeed more likely under plurality rule and runoffs. Osborne and Slivinski (1996), for instance[3], focus on politicians' strategic considerations. More precisely, they show the combination of parameters yielding two-candidate elections is more stringent under runoff than plurality. They demonstrate that whereas in runoff systems an upper bound on the size of spoils of office is needed to avoid more than two candidates running for the seat, no such condition is necessary under plurality. Other papers, such as Feddersen (1992) point to voters' strategic behavior, stressing their unwillingness to squander their votes on "hopeless" candidates. Strategic voting is also emphasized in Cox (1997). Throughout his book, the author forcefully argues that votes get concentrated on a small number of candidates in one-seat and simple plurality elections (as opposed to proportional and runoff systems) because of strategic voting and strategic support by political elites. The argument is similar to Feddersen's: people avoid wasting their vote on hopeless candidates if the rule is first-past-the-pole, and so does the political elite having to allocate scarce resources to finance and endorse candidacies.

There are other two reasons why runoff elections may end up with more candidates in the first round when compared to simple plurality. First, in a runoff, politicians do not have to be the first-past-the-pole in the first round to wind up as the ultimate winner, a fact that increases his willingness to participate. Second, some candidates have incentives to enter the race even if they do not perceive a great chance of arriving among the first two because by garnering some unexpectedly high voters' support in the first round, politicians may be able to sell their endorsement to the front runners at a higher price. Clearly, this motivation for entry is absent in simple plurality elections.

On the empirical front, the effort has been to investigate the existence of a consistent relationship between district size and/or the presence of a runoff stage and the number of candidates, mostly using cross-country data. In an important contribution, Lijphart (1994)

[3]The first paper addressing candidates entry decision is Palfrey (1984). Other studies relating number of candidates and electoral rules are Cox (1987, 1990).

presents systematic evidence supporting the idea that the level of proportionality embedded in the various electoral rules significantly affects the degree of multi-candidate competition.

Other studies criticize Lijphart's "institutional view" arguing that the number of parties/candidates should be related to societal cleavages and not to artificial institutional design characteristics[4]. We find hard to believe in the pure social cleavages argument, advocated by some sociologists, because within the same country elections governed by different political rules (lower house under proportional and upper house under plurality, for instance) have very different number of candidates, as demonstrated by Cox (1997). Apparently, consensus is building around a more nuanced view combining both the institutional and the sociological currents. This hybrid view suggests the "permissiveness" embedded in proportional and runoff elections should be important to explain the number of candidates only insofar as there is a reasonable degree of heterogeneity in society. Similarly, heterogeneity should not be important in explaining the number of candidates if the voting structure leaves no room for it to manifest itself.

Ordeshook and Shvetsova (1994), for example, using cross-country data provide evidence that it is the interaction of institutional design (district size, in their paper) and social cleavages that matters, not any of each separately. In the same vein, Amorim Neto and Cox (1997) and Golder (2006) find a positive association between the number of presidential candidates and runoff dummy multiplied by an index of ethnic fragmentation using cross-country data. Importantly, in his paper neither the runoff variable nor the ethnic fragmentation one are by themselves statistically significant.

Regarding specifically the effect of runoffs, Wright and Riker (1989) use data from Democratic primaries held in southern states between 1950 and 1982 to investigate whether those held under simple plurality entailed less candidates than the ones employing the two-ballot system. They find that the average number of candidates in plurality primaries was less than 3, whereas the figure for runoff primaries was above 5. Controlling for other factors, such as the presence of the incumbent, the conditional difference in the number of candidates falls to 2, but the coefficient on the runoff variable remains highly statistically significant. Wright and Riker is a highly cited paper lending credence to Duverger's Hypothesis, but despite its clear finding it has an important weakness: it implicitly assumes the decision of adopting plurality

[4] See the discussion in Cox (1997).

or runoff to be exogenous. Unfortunately, it is possible that Southern States self-selected into this two categories of ballot system. If unobservable characteristics affect both the decision to opt for runoff primaries and politicians motivations to enter the race, then the estimated coefficient is not reflecting the pure effect of the voting system on the number of candidates.

Jones (1999) also tests the influence of runoffs on the number of candidates using cross-country data from presidential elections. Using different econometric methods and samples he finds that runoff elections have on average approximately one more candidate than simple majority ones. As Wright and Riker (1989) he too finds an important and negative incumbency effect[5]. The problem is again endogeneity bias, since the author has no exogenous source of variation in the ballot structure. Furthermore, the fact he uses a cross-country dataset probably aggravates the selection bias problem (since it is expected that institutional characteristics vary more strongly among countries than within sub-national units).

The rest of this paper is organized as follows. In section 2, we introduce our dataset and the identification strategy we think properly addresses the endogeneity problems mentioned above. In section 3, we present our basic results, and section 4 concludes.

2 Data and identification strategy

In Brazil, mayoral elections take place every four years. After redemocratization in 1985, six free mayoral elections took place in 1985, 1988, 1992, 1996, 2000 and 2004. We have data for the last five of them. In the 1988 election, the prevailing legislation mandated simple plurality for all municipalities across the country, independent of electorate size. But, crucially for our identification strategy, the Constitutional reform - approved at the end of that same year - imposed a strict rule: elections in municipalities with more than 200,000 registered voters were required to have a second ballot. Below this threshold, there was no change in the simple plurality rule. Hence, in all subsequent mayoral elections there have been instances of both simple majority and runoff contests. Table 1 below summarizes the information on ballot structure for all five elections in our sample. The evolution in the number of elections through time is the combined result of increased data availability and a rise in the number of new

[5]More recent work by Gyourko and Ferreira (2006) also attest to the importance of incumbency. They show using a discontinuity regression method that incumbents are much more likely to get reelected.

municipalities during the nineties.

Table 1: Ballot structure in municipal elections

	1988	1992	1996	2000	2004
Plurality	2536	3637	5356	5502	5490
Runoff	0	30	47	57	68
Total	2536	3667	5403	5559	5558

The panel data structure and the law shift at the end of 1988 allows us to explore both cross-section and time-series variations in order to identify the effect of runoffs on the number of competing candidates. Identification thus comes from two sources: differences in electoral rules across municipalities in a same election, and differences arising from municipalities changing status between elections. Further, controlling for fixed effects in a difs-in-difs specification as we do considerably diminishes the chances we run into omitted variables bias problems.

The electoral data - number of candidates and eligible voters - comes from the Superior Electoral Court (TSE) and Regional Electoral Courts (TREs) datasets, and the Gini coefficient at municipal level comes from the 1991 and 2000 Censuses. Table 2 below presents some summary statistics. Unfortunately, for the 1988 and 1992 elections the availability of data is more scarce than for the more recent elections. Moreover, the municipalities for which they are available do not perfectly match. This is important because it means the number of observations in the difs-in-difs regressions will be smaller than in any particular election. For instance, the municipalities appearing in both the 1988 and 1992 elections add up to 2283, less than the figure for 1988 alone (2536, see table 1).

Table 2: Summary statistics

	1988	**1992**	**1996**	**2000**	**2004**	**Total**
Candidates	3.068	2.908	2.839	2.706	2.827	2.840
	(1.351)	(1.209)	(1.221)	(1.059)	(1.113)	(1.176)
Electorate/10,000	19.224	17.105	18.352	19.517	21.556	19.317
	(136.577)	(110.852)	(119.652)	(124.387)	(134.808)	(125.281)
Incumbent	–	–	–	0.657	0.427	0.265
				(0.475)	(0.495)	(0.441)
		1991			**2000**	
Gini		0.525			0.560	
		(0.055)			(0.058)	

Standard errors in parentheses

We asssess the role of the runoff variable by itself, as suggested by "pure institutional view", and also its interaction with a measure of social cleavage as suggested in more recent studies. We use the local Gini inequality index as a proxy for social cleavage. Inequality in income is arguably a reasonable indication of different public policy views and political demands in a country with no clear ethnic divisions but extreme disparities in income such as Brazil[6]. It is also important to control for electorate size - even if this is not common in the literature - because the rule establishing the second ballot is a (discontinuous) function of this variable. Hence, not adding electorate size may lead to an omitted variable bias if, for any reason, the number of candidates is a function of it.

In all pooled regressions we control for State and time dummies. The more general estimated model thus has the following specifications in the pooled and difs-in-difs regressions, respectively:

$$y_{it} = c + \alpha.D_{it} + \gamma.H_{it} + \beta.D_{it}.H_{it} + \lambda.E_{it} + S_i + T_t + \epsilon_{it} \tag{1}$$

$$y_{it} = c + F_i + \alpha.D_{it} + \gamma.H_{it} + \beta.D_{it}.H_{it} + \lambda.E_{it} + \epsilon_{it} \tag{2}$$

[6]Brazil is one of the most inequal countries in the world.

Where y_{it} is the number of candidates in municipality i in election t; D_{it} assumes 1 if there is a runoff stage and 0 otherwise; H_{it} is the local Gini coefficient; F_i is the municipality fixed effect; E_{it} is electorate size, S_i and T_t are State and time dummies, and ϵ_{it} is an error term[7].

What does the raw data tell us about the number of candidates in elections with and without a second-ballot? Table 3 below displays unconditional averages of this variable. As can be seen, simple averages seem to support Duverger's Hypothesis: the number of candidates competing in elections where there is a runoff stage is considerably greater than the number of contendors in simple plurality elections. This difference reaches nearly 4.5 in the 1996 mayoral election and its average is 3.5 candidates for the whole sample.

Table 3: Average number of candidates

	1988	**1992**	**1996**	**2000**	**2004**	**Total**
Simple Plurality	3.068	2.884	2.802	2.670	2.782	2.808
	(1.351)	(1.175)	(1.141)	(0.974)	(1.014)	(1.111)
Runoff	–	5.733	7.106	6.105	6.426	6.391
		(1.837)	(2.189)	(2.491)	(2.275)	(2.290)
Total	3.068	2.908	2.839	2.705	2.827	2.840
	(1.351)	(1.221)	(1.209)	(1.059)	(1.113)	(1.176)

Standard errors in parentheses

As we will show in the next section, the conditional runoff effect is smaller than these unconditional means suggest, but is nonetheless significant both economically and statistically. Furthermore, it operates in a more nuanced way via its interaction with the Gini index.

We proceed as follows: first, we run pooled OLS regressions; secondly we run fixed effects estimations and third, as a robustness check, we run a placebo regression in which we assume the municipalities with runoffs in 1992, 1996, 2000 and 2004 already played by this rule in 1988, *before* the law was enacted. We do this to allay fears that omitted factors correlated with adoption are driving our findings. Therefore the outcome of this last regression will be consistent with the others' if they are opposite to them. Put it differently, we expect that applying the medicine when there is no illness will not "cure" the patient.

[7] We include an incumbent dummy for the 2000 and 2004 elections. A Constitutional amendment allowing reelection was approved in 1997.

3 Results

We first run pooled OLS regressions lumping all elections together. This strategy does not account for omitted time invariant unobservable characteristics at the municipal level, which may be potentially correlated with both runoff variable and number of candidates. The results appear in Table 4 below. The runoff dummy is positively correlated with the dependent variable in specifications (1) and (2). Electorate size has a positive sign and its point estimate means an increase of 100,000 voters leads to more 0.02 candidates, all else equal. Its practical significance is hence minor. Interestingly, the sign of the runoff dummy variable turns negative after we include the interactive term $D_{it}.H_{it}$ and is not different from zero in the most complete specification including electorate size.This is in line with several empirical papers cited previously arguing institutional permissiveness is important when there is a reasonable degree of heterogeneity among the electorate. As will become clear later, our panel estimations will strenghten this effect.

The partial effect $E(y_{it} \mid X, D=1) - E(y_{it} \mid X, D=0) = \alpha + \beta.H_{it}$ shows the importance of heterogeneity in assessing the effect of the runoff dummy.[8] Substituting the estimated coefficients from specifications (3), (4) and (5) for α and β in the above formula, one easily sees that $E(y_{it} \mid D=1) - E(y_{it} \mid D=0)$ has lower bounds of 0.89, 0.89 and 1.04 (using the lowest Gini in the runoff group, 0.43) and upper bounds of 4.96, 4.96 and 2.90 (using the greatest Gini in the runoff sample, 0.67), respectively. These magnitudes are significant if one recalls the magnitude of the runoff effects are 1 and 2 in Jones (1999) and Wright and Riker (1982) papers.

Finally, the incumbent variable has the “wrong” sign in the pooled regression: the presence of a running incumbent increases the number of candidates. This variable is nevertheless only marginally significant.

[8] X is a vector containg all the control variables included in each regression in Table 4.

Table 4: Pooled OLS[9]

Dependent Variable: Number of Candidates					
	(1)	(2)	(3)	(4)	(5)
Runoff	3.426	3.388	-6.406	-6.413	-2.329
	(0.077)***	(0.077)***	(0.806)***	(0.806)***	(0.811)***
Gini		1.235	1.112	1.110	0.976
		(0.138)***	(0.138)***	(0.138)***	(0.135)***
Runoff × Gini			16.945	16.960	7.764
			(1.389)***	(1.389)***	(1.407)***
Incumbent				0.038	0.034
				(0.021)*	(0.021)
Electorate					0.002
					(0.000)***
Observations	22715	22608	22608	22608	22580
R-squared	0.15	0.15	0.16	0.16	0.19

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

We also rerun the above regression restricting our sample to include solely the municipalities that appear in all elections. We do so as a robustness check and also to have a base of comparison for the difs-in-difs regression that will follow (and include only municipalities appearing for which we have data for more than one election). As one can see, there is little change from the results shown in table 4.

[9]For the 1988 and 1992 regressions the Gini coefficient employed is the one from the 1991 Census, whereas for the 1996, 2000 and 2004 regressions the Gini comes from the 2000 Census.

Table 5: Pooled OLS in restricted sample

Dependent Variable: Number of Candidates					
	(1)	(2)	(3)	(4)	(5)
Runoff	3.320	3.272	-4.601	-4.622	-1.663
	(0.107)***	(0.107)***	(1.142)***	(1.142)***	(1.126)
Gini		1.409	1.296	1.289	1.153
		(0.213)***	(0.213)***	(0.213)***	(0.209)***
Runoff × Gini			13.712	13.751	6.812
			(1.981)***	(1.981)***	(1.963)***
Incumbent				0.061	0.058
				(0.034)*	(0.034)*
Electorate					0.002
					(0.000)***
Observations	11415	11415	11415	11415	11397
R-squared	0.13	0.13	0.13	0.13	0.17

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Next we present the results from difs-in-difs regressions using pairs of elections in which the first is always 1988 (for which the rule was simple majority independent of size). The number of observations varies in accordance with data availability (only municipalities present in both elections of each election pair are included). The gain relative to the pooled regressions is the inclusion of fixed effects and the possibility of exploring variation in the time dimension (before/after the law shift). As far as we know, no empirical work testing the influence of runoffs explores time variation controlling for fixed effects. The decision to include various election pairs comes from the possibility that there is a time lag between the law change and candidates entry decision. The last column also shows the result when we include all elections in the panel[10].

As can be seen in the Table 6, the same kind of result remains: the interactive variable is

[10] For the 1988/1992 pair, there is no variation in the Gini variable and thus it does not enter the regression separetely (a perfect correlation with the fixed effect would result). For all other regressions we use the 1991 Gini for the 1988 election and the 2000 Gini for the rest.

always strongly statistically significant and has a positive sign, and the runoff dummy alone has a negative coefficient. The incumbency effect now has the "correct" sign and is precisely estimated. As found in other works, incumbent participation seems to discourage entry.

Looking at the estimated coefficients, one can see that above a certain level of heterogeneity, the runoff effect becomes positive. Judging by the point estimate of specifications (1), (2), (3) and (4) in Table 6, this happens for H_{it} above 0.64, 0.56, 0.61 and 0.59[11]. In Table 7, we run the same regression, but we allow for variation in the Gini index over time. As one can see, the results are similar to those in Table 6. Moreover, this strategy also allows to include this variable alongside the fixed effects. As one can see, there is no clear pattern regarding the isolated effect of the heterogeneity variable on the number of candidates.

In sum, it is only natural that after isolating a great deal of possible common factors affecting both runoff and number of candidates variables, the impact of the former on the latter weakens. As we condition on more variables, heterogeneity becomes more and more important to the argument that runoffs yield more candidates. However, the main intuition is unaltered: runoffs lead to more candidates conditional on there being a minimum level of heterogeneity in the electorate.

[11] There were 68 municipalities using the second-ballot in 2000. From these, 25 had Gini indexes above 0.60.

Table 6: Fixed Effects (Gini - 1991)

Dependent Variable: Number of Candidates				
	(1)	(2)	(3)	(4)
Runoff	-7.369	-7.451	-6.815	-6.810
	(2.640)***	(1.945)***	(1.826)***	(1.743)***
Runoff × Gini	11.405	13.174	11.056	11.492
	(4.735)**	(3.518)***	(3.338)***	(3.196)***
Incumbent			-0.293	-0.080
			(0.032)***	(0.040)**
Years Included	1988 & 1992	1988 & 1996	1988 & 2000	1988 & 2004
Observations	4566	5070	5072	5072
# of Municipalities	2283	2535	2536	2536
R-squared	0.01	0.01	0.04	0.01

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 7: Fixed Effects (Allowing variation in Gini)

Dependent Variable: Number of Candidates					
	(1)	(2)	(3)	(4)	(5)
Runoff	-7.666	-12.547	-11.879	-13.212	-11.249
	(2.634)***	(2.460)***	(2.372)***	(2.238)***	(1.293)***
Gini		-0.865	-0.714	-1.289	0.228
		(0.390)**	(0.442)	(0.427)***	(0.221)
Runoff × Gini	13.042	22.162	19.551	22.773	19.110
	(4.744)***	(4.295)***	(4.174)***	(3.940)***	(2.305)***
Electorate	-0.008	-0.003	-0.001	-0.002	-0.001
	(0.002)***	(0.001)***	(0.001)	(0.001)***	(0.000)*
Incumbent			-0.270	-0.019	-0.056
			(0.036)***	(0.042)	(0.019)***
Years Included	1988 & 1992	1988 & 1996	1988 & 2000	1988 & 2004	All Years
Observations	4530	5016	5018	5018	22580
# of Cities	2265	2508	2509	2509	5505
R-squared	0.01	0.01	0.05	0.02	0.02

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

Lastly, we run a placebo regression assuming mayoral elections in 1988 were already governed by the new rule. Since they were not, we expect the evidence presented above to vanish from the regression. This is precisely what happens as one can note from Table 8 below. The sign of the coefficients are reversed: more heterogeneity in runoff municipalities diminishes the number of candidates, a fact inconsistent with theory and established evidence.

The fact that the coefficients are of opposite sign in the placebo regressions means that the pooled regressions are underestimating the impact of the interactive variable on the number of candidates.

Table 8: "Placebo" regression

Dependent Variable: Number of Candidates				
	(1)	(2)	(3)	(4)
	1992	1996	2000	2004
Runoff	6.942	6.631	6.244	6.497
	(2.409)***	(1.842)***	(1.672)***	(1.559)***
Gini	0.617	0.510	0.520	0.561
	(0.514)	(0.489)	(0.486)	(0.484)
Runoff × Gini	-7.854	-6.860	-6.222	-6.746
	(4.335)*	(3.361)**	(3.086)**	(2.883)**
Electorate	0.002	0.002	0.002	0.002
	(0.000)***	(0.000)***	(0.000)***	(0.000)***
Observations	2265	2508	2509	2509
R-squared	0.18	0.24	0.25	0.25

Standard errors in parentheses

* significant at 10%; ** significant at 5%; *** significant at 1%

4 Conclusion

Theory suggests the number of candidates should vary with the electoral structure. In particular, runoff elections should entail more candidates than simple plurality when there is a sufficient amount of heterogeneity among voters. Many empirical papers have lent credence to this claim first put forth informally by Duverger.

However, most of them employ cross-country data and assume the electoral system to be exogenously determined. Therefore, they are highly subject to endogeneity biases. Exploring the exogenous change in electoral legislation imposed by the new Brazilian Constitution on the country's municipalities, and resorting to fixed effect estimations, we are able to avoid these common endogeneity criticisms. Our findings corroborate the nuanced view that runoff systems yield a higher number of candidates only if there is enough heterogeneity amidst the electorate.

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