Document de travail du LEM / Discussion paper LEM 2019-14

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Electoral rules and turnout: Evidence from a quasi-natural experiment*

Quentin DAVID† Hubert JAYET‡ Federico REVELLI§

May 13, 2019

Abstract

This paper exploits a quasi-experimental variation (population threshold change) in the French system of municipal elections from 2008 to 2014 to estimate the impact of switching from a majoritarian plurinominal open-list system to a proportional closed-list system. It uses a regression discontinuity design, a reduced-form first-difference approach, and a structural approach based on a generalization of the difference-in-discontinuities approach (Grembi, Nannicini and Troiano, 2016). We find that the reform had a negative impact on both ballot box turnout and valid vote turnout. The key determinant was the effect of the reform on electoral competition. When controlling for the presence of a single list in the local contests, the change from majoritarian plurinominal open-list to proportional closed-list voting was positive and significant for both ballot box turnout and valid vote turnout.

*We would like to thank the participants of the EPCS conference, EP@L workshop and LEM seminar for their helpful comments and suggestions. We also would like to thank Andrew Eggers for sharing his replication files with us. The usual disclaimer applies.

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1 Introduction

Investigating what determines voter turnout in democratic elections at both central and local government levels has been a major field of inquiry among political scientists and political economists alike for decades (Geys, 2006). While elections are not the only way people can make their voice heard and influence policy-making in Western democracies, the fraction of eligible voters who actually decide to cast their votes in non-compulsory electoral systems has traditionally been taken as the fundamental indicator of the health of a democratic system (Lijphart, 1997). Empirically, whether low turnout rates adversely affect the quality and accountability of politicians and various indicators of public sector performance remains an open question. Higher voter turnout has been found to help progressive candidates, favor minority and disadvantaged groups, and lead to more redistribution and welfare spending (social security, health, education), thus helping to redress the democratic deficit of poor participation contests (Fowler, 2013, Fujiwara, 2015). Conversely, Mueller and Stratmann (2003), Fumagalli and Narciso (2012) and Hodler et al. (2015) challenge the postulate that low turnout means poor democracy, and find that higher turnout can be linked to the implementation of policies that actually retard growth and reduce welfare. The apparently conflicting claims about the impact of turnout on the quality of the democratic process ultimately depend on the reasons why turnout is high or low: it is therefore of crucial importance to identify its underlying determinants (Revelli, 2016).

Among the factors that the literature reports as drivers of voter turnout, electoral rules are traditionally viewed as fundamental in cross-country comparisons (Jackman, 1987). However, within-country changes, reforms, or discontinuities at predetermined thresholds determining how voters can express their preferences for parties and candidates, or how their votes are translated into seats in representative assemblies, have recently attracted the attention of scholars. Provided these circumstances approximate to the conditions of a natural experiment, randomly forming treatment and control groups of voters that are heterogeneously affected by a change in electoral rules, they should yield consistent estimates of the causal effects of electoral rules on turnout rates.

To shed light on the impact of electoral rules on voter turnout rates, this work took a large dataset describing elections in the municipalities of France, and took advantage of the unique quasi-experimental conditions of a population threshold change between two consecutive elections. In 2008, the threshold between

the two electoral systems was set at 3,500 inhabitants. This threshold was lowered to 1,000 inhabitants for the 2014 municipal elections. We investigated the impact of the unpredicted, exogenous change in the population threshold for the application of alternative electoral systems for local assemblies (a 'party-centric' closed-list proportional representation system in larger localities versus a 'candidate-centric' plurality/majoritarian voting system in smaller localities) on two measures of voter behavior: ballot box turnout (BBT), the traditional indicator of participation in elections used by most scholars, and valid vote turnout (VVT).

Theoretically, the impact of the reform on the rate of turnout in the affected localities is the result of conflicting forces. On the one hand, shifting to a proportional system should foster turnout by raising expectations that smaller parties will get a chance to sit on the council relative to first-past-the-post systems. But on the other hand, switching from a candidate-centric system where voters can express a preference vote for individual candidates to the council to a party-centric one with closed lists may tend to depress turnout. In addition, the change in the electoral rule might also have an impact on supply, with a different number of candidates and lists deciding to run in local contests depending on the features of the electoral system itself.

We estimate the impact of the change in the electoral rules following three distinct approaches. We start with a Regression Discontinuity Design (RDD) as in Eggers (2015) for each threshold and each election separately. For 2008, our results are very similar to those of Eggers (2015): crossing the threshold increases BBT and has no significant effect on VVT. In 2014, crossing the 1,000 population threshold significantly lowers both BBT and VVT. The heterogeneous impact of the thresholds on BBT and VVT is further investigated in our second approach. Using a first difference model, we assess the net effect of the reform on turnout while eliminating unobserved time-invariant heterogeneity. We find that the reform slightly lowered ballot box turnout, while the impact on valid vote turnout was also negative, but much larger. Further, we take the two sides of the election into consideration: the electoral demand and supply. We show that when controlling for electoral supply, i.e. for the presence of electoral competition, the net effect of the reform is positive on both measures of turnout. We conclude with a structural model to evaluate the optimal threshold needed to maximize voters' utility.

The rest of this paper is structured as follows. Section 2 reviews the literature on the impact of electoral rules and ballot structure on voter turnout rates. Sections 3 and 4 describe the French institutional setting

and the dataset, respectively. Section 5 illustrates and discusses the econometric approaches we use. Section 6 presents our results and the further investigation of the underlying mechanisms linking electoral rules and turnout. Section 7 summarizes our findings and concludes.

2 Electoral rules, ballot structure, and turnout: A review

In representative democracies, how votes cast are translated into seats and how far voters can determine which candidates enter the elected assembly is likely to have a significant impact on voters' perception of the importance of their voting. Accordingly, the features of the electoral rules have traditionally been seen as crucial determinants of cross-country differences in voter turnout rates. At the same time, it is increasingly recognized that within-country changes, reforms, or discontinuities at predetermined thresholds determining how voters can express their preferences for parties and candidates, or how their votes are translated into seats in representative assemblies, form ideal circumstances for identifying the impact of electoral rules on voters' behavior.

The two most important characteristics of electoral systems that can influence an individual's decision to vote in a rational choice framework are the degree of proportionality of the system and the structure of the ballot itself (Smith, 2018). The degree of proportionality is determined in turn by the formula employed to translate votes into seats, by the size of the electoral district to which it is applied, and by the number of voting rounds (single versus dual ballot). The structure of the ballot can either be an open list, where voters freely choose their favored candidates among candidates endorsed and presented by parties (leading to competition among candidates who share the same party label, and so making personal reputation valuable), or a closed party list, where party leaders have full control over fixed ranking ballots. In these latter party-centered systems, voters can choose only among parties, and have no or only limited opportunity to overturn the order in which the candidates are elected, so that the value of personal attachment to candidates is minimized and there is no incentive for personal vote-seeking behavior among candidates.

It is traditionally argued that proportional representation and larger district size favor turnout by giving smaller parties and minor candidates a greater chance of getting seats in parliament or on councils relative to majoritarian, first-past-the-post systems (Blais and Carty, 1990; Katz, 1997; Ladner and Milner, 1999;

Blais and Aarts, 2006). However, the lower accountability of multi-party coalition governments formed under a proportional representation rule, together with the fact that plurality systems favor spending on goods that can be targeted locally, while proportional systems stimulate spending on goods with broader benefits (Milesi-Ferretti et al., 2002; Persson and Tabellini, 2003; Aidt et al., 2006), might have the opposite effect of discouraging voters' participation, by persuading them that their votes count less. This could partly explain why the empirical evidence on the effect of proportionality on turnout is inconclusive (Cancela and Geys, 2016). Moreover, the mixed evidence from those studies might come from the fact that using small-sample-sized cross-country panel datasets where inference on electoral system effects derives mostly from cross-sectional variation due to the sparsity of radical electoral reforms, could be unable to control for other unobserved differences between national socio-political environments and potential endogeneity of electoral rules, and so fail to properly identify the causal effect of electoral systems on voter turnout.

To address these important empirical issues of endogeneity and omitted variables, Funk and Gathmann (2013) used a long panel dataset for the Swiss cantons dating back to the late 19th century, and took advantage of the fact that over the 110 subsequent years, 23 of the 25 cantons in Switzerland switched from legislatures elected under a plurality system to a proportional system. The fact that all cantons share a common history and cultural and institutional features lessens, though does not completely overcome, the problems inherent in cross-country studies. They found that the switch to a proportional representation system shifted spending away from geographically targeted transfers toward wider-ranging public goods, with little or no changes in total government size. As for the strictly political impact, they found that proportional representation led to party fragmentation, favored left-wing parties, and stimulated a substantial increase in voter turnout. Beath et al. (2016) compared first-past-the-post elections (multiple single-member districts) and at-large elections (single multi-member district) in a field experiment on 250 villages in Afghanistan, and found that the latter system led to the election of more competent representatives in terms of educational attainment. However, they did not investigate the impact of the electoral rules on voter turnout.

Among the studies focusing on quasi-random variation of electoral rules around exogenously determined demographic thresholds, Barone and De Blasio (2013) focused on the Italian mayoral election system. They investigated the impact of dual ballot (a system with a second-round, run-off election between the top

two candidates in the first round) versus single-ballot electoral systems on turnout, by taking advantage of the fact that towns above the 15,000 population threshold use the first system, while those below that threshold use the second one. They found that the dual ballot voting system fostered voter turnout (in the first of the two rounds relative to single-round elections), and explain it by the system leading to broader political participation in terms of parties and candidates (a traditional argument related to dual-ballot rules), selection of higher quality politicians (more skilled and experienced) to gather a larger consensus in the second round, and sounder management of local public finances in general, with increased spending on non-targetable public goods at the expense of pork-barrel policies. To identify the impact of dual ballot and proportional representation electoral systems in a quasi-experimental setting, Fauvelle-Aymar and Lewis-Beck (2008) compared cantonal (two-round majoritarian uninominal, aggregated at the departmental level) and regional (single-round proportional) elections that took place in France in 1992, 1998 and 2004, and found that majoritarian systems with dual balloting rounds were characterized by less extremist party voting and less party competition than purely proportional ones, with little difference in voter turnout. Dubois and Leprince (2017) analyzed second-round elections in small French municipalities and found that closeness of the contest and electoral stakes in terms of number of council seats to be assigned in the second round (a figure depending on the seats already assigned in the first round) led to higher voter turnout. Finally, by explicitly focusing on the role of party mobilization, Cox (2015) suggests that the rate of turnout should be higher in proportional representation than in first-past-the-post systems because most districts in first-past-the-post systems are so uncompetitive or have such geographically dispersed social networks that parties have little incentive to expend resources on mobilization, also considering that the marginal benefit of a vote in a district varies unpredictably over time. Empirically, Cox et al. (2016) lend support to the elite mobilization hypothesis whereby a switch to proportional representation increases mean turnout and decreases its cross-district variance.

As regards the impact of the specific characteristics of the ballot on turnout – not only how seats are allocated to parties, but how seats are allocated to specific candidates within parties and how far voters can influence such allocation (Carey and Shugart, 1995) – most of the existing literature has relied on cross-country variation in the extent to which people are allowed to vote for candidates, parties, or both. Early work by

Mattila (2003) and Karvonen (2004) tested the traditional hypothesis that allowing voters preferential voting should stimulate turnout by offering them more freedom of choice and power to determine which individual candidates should be elected. However, they found no convincing evidence in support of that hypothesis. Closed-list systems could produce higher and better-coordinated mobilization efforts by party structures and impose lower cognitive and informational demands on voters (particularly those most disadvantaged and least motivated) than open-list candidate-centered ones, and might therefore foster higher voter participation than open list systems. Robbins (2010) tested this hypothesis using a composite personal vote index (based on Carey and Shugart, 1995) that accounts for whether votes are pooled across candidates, whether party leaders control access to the ballot, and whether votes are cast for parties or individual candidates, and found that more party-centric electoral competition tended to be characterized by significantly higher voter turnout rates. Similar evidence of a negative effect of candidate-centric systems on turnout has been obtained on more recent cross-country panel data controlling for potentially important concomitant factors like district size and number of seats allocated, electoral formula disproportionality, and effective number of parties (Söderlund, 2017).

Among within-country studies, two recent papers by Eggers (2015) and Sanz (2017) are closely related to ours in terms of institutional framework, objectives, and methodology. Eggers (2015) studied the French local government institutional environment and made use of the fact that the electoral law in France imposes a proportional representation electoral system for municipalities whose population exceeds 3,500, while localities below that population threshold have a plurality electoral system. This allowed a regression discontinuity design to study turnout rates in the municipalities in the two groups around the threshold, with those municipalities being similar in many dimensions other than the electoral system. While he found that the modest increase in proportionality occurring when crossing the threshold (due to the "fortified" characteristics of the proportional representation system, attributing a winner's bonus seats to the party with the larger share of votes) raised turnout significantly, his research design may have been weakened by the existence of "compound treatments," i.e., changes in rules, institutions, or mandated policies taking place at the identical population threshold, which was unchanged between the two local elections of 2001 and 2008 considered. Sanz (2017) instead used a regression discontinuity design to compare turnout rates in Spanish municipal elections

under closed-list proportional representation (localities above a nationally set threshold of 250 inhabitants) and under an open list plurality-at-large system (localities below the threshold). He found that the open-list system – characterized by a slightly lower degree of proportionality than the closed-list one, but allowing voters to cast a vote for an individual candidate – produced higher turnout by between one and two percentage points, and attributed most of the effect to the larger number of parties entering political competition under the open-list system. An important advantage of the institutional set-up studied by Sanz (2017) relative to other national settings exploiting discontinuities at demographic thresholds (Eggers et al., 2017) is that no other policy rules changed there at the same population threshold, making it possible to attribute the turnout difference in the proximity of the threshold solely to the different ballot structures.

Finally, the extent to which the characteristics of the electoral system and the ballot structure influence invalid voting – voters incurring the cost of participating, but deciding to cast blank or spoiled ballots – has attracted far less attention than the analysis of the decision to participate per se (Cohen, 2018a; 2018b). A number of explanations for why people register to vote, travel to the polling station, and possibly wait in line just to cast an invalid vote – a blank ballot, an incorrectly marked one, or one with an unauthorized candidate written on it – have been offered in the literature based on structural, circumstantial or individual factors (Kouba and Lisek, 2019). Besides the unintentional spoiling of a vote due to illiteracy, innumeracy, or severe misinformation on the basic voting rules (factors that can to some extent be proxied by the social and demographic structure of the population and by the complexity of the voting system itself), two substantial motivations have been put forward to explain the intentional act of invalidating a vote (Power and Garand, 2007). The first category of explanation has to do with invalidation of a vote being an expression of deep voter discontent. This could reflect an anti-system sentiment, and might be accompanied by alienation, social marginalization, and even violent forms of protest, or could be the response of frustrated and disenchanted voters to poor economic performance, wanting to signal a rejection of all available options. Invalid voting that can be explained in this way is unlikely to be strongly affected by the specific features of the electoral system such as its degree of proportionality or by the structure of the ballot itself. The second explanation has to do with institutional design, and points to a number of legal structures that would make casting a valid vote more or less desirable for a voter. These include compulsory voting provisions forcing citizens to the

polls who would normally abstain and so are more likely to cast blank or spoiled ballots, concurrent elections where varyingly salient contests are held simultaneously, and specific features of the voting or political system (bicameralism, large district size, disproportionality between votes and seats, or excessive number of political parties). These features would affect the perception of a voter of the actual likelihood of his or her vote making a difference to the electoral outcome. Combined with the degree to which a voter feels obliged to vote (social and peer pressure), has the option to vote without having really decided to do so (concurrent elections) or actually has an obligation to participate in an election (mandatory voting), these aspects of the electoral system might well have an impact on the proportion of voters who decide, once at the polls, to cast an invalid ballot (McAllister and Makkai, 1993; Power and Roberts, 1995). Given the non-negligible share of invalid ballots observed in all elections at both national and local levels, including the set-up we consider here, we investigated the impact of change in ballot structure both on the standard figure of overall voter turnout and on the proportion of valid votes.

3 The French institutional framework

The focus of this research is the investigation of the institutional factors influencing whether and how people cast their votes in local elections. We use a large dataset for elections in French municipalities recording ballot box turnout rates, valid vote turnout rates, and detailed municipal data, and take advantage of the quasi-experimental conditions of a population threshold change between two consecutive elections (2008 and 2014). Municipal elections in France are of two different types: either a proportional closed-list system in larger municipalities, or a majoritarian plurinominal open-list system in smaller municipalities. In both systems, there is a second round if no list (or too few candidates) gets more than 50% of the votes. In the closed-list system, the winning list receives a majority bonus of 50% of the seats.[1]

In 2008, the population threshold was set at 3,500 inhabitants. Importantly, this threshold was lowered to 1,000 inhabitants for the 2014 municipal election. The decision was taken by the central government in April 2013, and the population count relies on the legal population registered in 2011 by the INSEE.[2] As

[1] If there is a second round, aggregation among lists is allowed after the first round. A complete presentation of the two electoral systems is available in the Appendix **??**.

[2] As stated in their website, the "French National Institute of Statistics and Economic Studies is a Directorate-General of

the population count used to distinguish large and small municipalities preceded the reform, and assuming independence of the INSEE, population manipulation is unlikely, and this discontinuity can be seen as exogenous and unanticipated by municipalities. In particular, it is unreasonable to believe that municipalities could have manipulated their populations in response to this threshold change.

Table 1: Main differences between 2008 and 2014 elections and important thresholds

Population thresholds		0→	100→	500→	1000→	1500→	2500→	3500→	5000→	10000→
Poll type	2008	Plurality voting						Proportional representation		
	2014	Plurality voting			Proportional representation					
Max wage for mayor (€/month)		646.25		1178.46	1634.63				2090.81	2515.92
Number of elected councilors	2008	9	11	15		19	23	27	29	33
	2014	7								
Reimbursement of campaign expenditures	2008	NO						YES		
	2014	NO			YES					
Choice of representatives for intermunicipalities	2008	Representatives are selected by the elected municipal council								
	2014	Direct election among running candidates for municipal council								

Other thresholds have not been changed over a long period of time, and we cannot rule out the possibility that some mayors have been working to cross some thresholds to claim higher pay or more council members. Table **??** summarizes the main thresholds for the 2008 and 2014 elections together with the main features of the two electoral systems. We note that the effective thresholds in 2008 had not been changed since 1946. As stated in the table, there is another reform likely to affect turnout: the direct election of the representatives on the intermunicipal council. These representatives were previously chosen by the municipal council.

4 Summary statistics

We set out to study the impact of the change in the electoral system on two main variables: ballot box turnout (BBT hereafter), defined as the proportion of eligible voters who actually cast their votes at an election, and which is the traditional measure used by most scholars, and valid vote turnout (VVT hereafter), which is the proportion of valid votes cast per total potential votes. When analyzing the change in these variables at a

the Ministry for the Economy and Finance. INSEE's mission is to collect, analyze and disseminate information on the French economy and society across the whole of France. INSEE operates with total professional independence."

population threshold, as in a regression discontinuity design (RDD), a first question is whether population manipulation is possible. As explained above, population manipulation seems unlikely in our framework, in particular looking at the threshold change between the 2008 and 2014 municipal elections. Figure **??** shows the number of municipalities on either side of the 1,000 population threshold in 2008 and 2014. The same is done for the 3,500 population threshold in Figure **??**. We see that although there is some sorting (which is not excludable), it was similar at both thresholds in both elections. In other words, the reform did not change the sorting patterns. [3]

[3]The 2011 legal population determines precisely whether municipalities have an open list majoritarian or a closed list proportional election. For the 2008 election, the legal population was that of the last census: 1999 unless there was a formal demand from the municipality to correct their population count. In practice, such demands were accepted for municipalities with significant demographic variations resulting (generally) from urban developments. In our sample, for 2008, 54 municipalities had a legal population slightly below 3500 inhabitants and experienced a closed list proportional election, while 84 municipalities had a legal population slightly above 3500 inhabitants and experienced an open list majoritarian election. For these municipalities, we use the 2006 measure of legal population (corresponding to the census following the 1999 one) as a proxy for the population used to determine the electoral system. We also performed many robustness checks (removing these municipalities from the sample, keeping the 1999 population, etc.). Our results are not driven by this correction.

Figure 1: Sorting around the 1000 population thresholds in 2008 and 2014

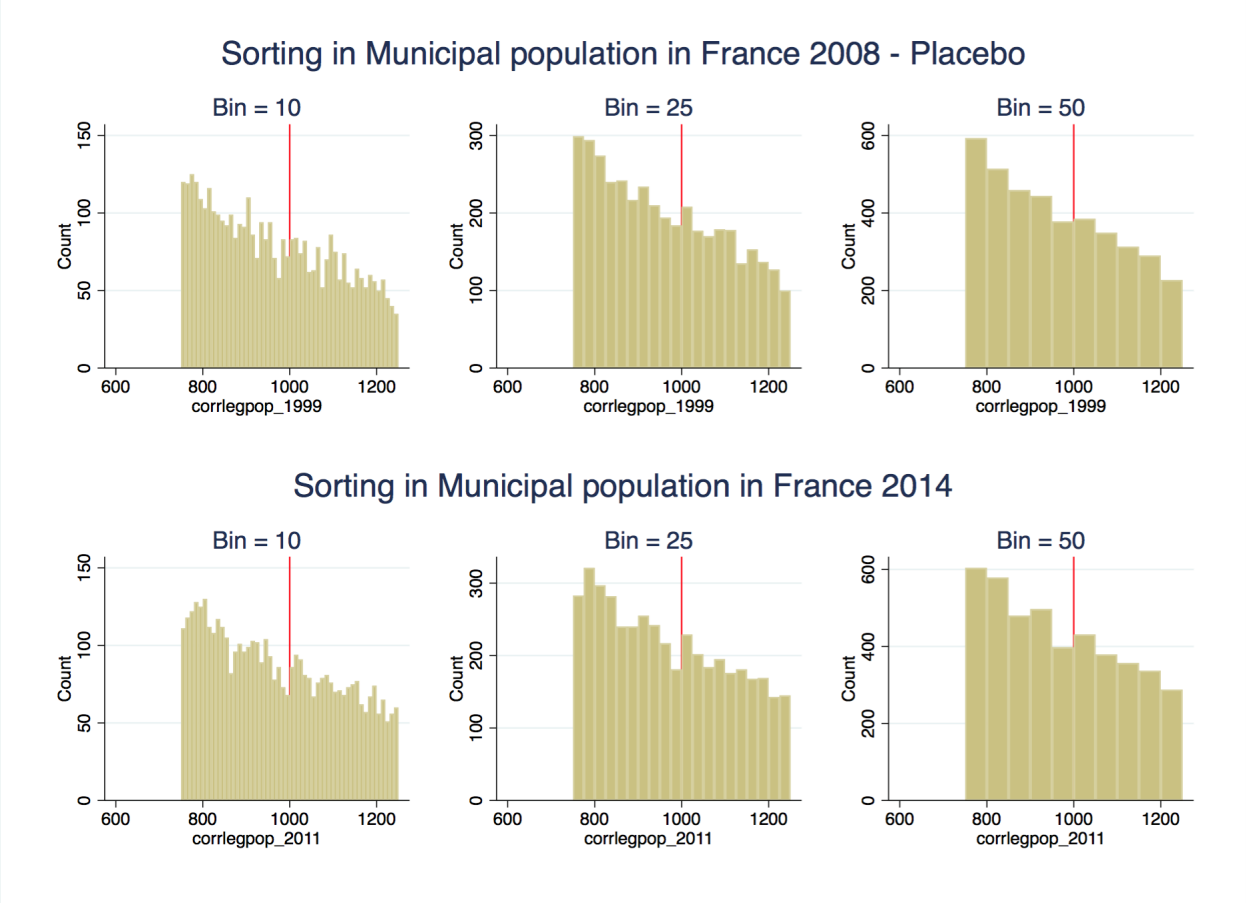
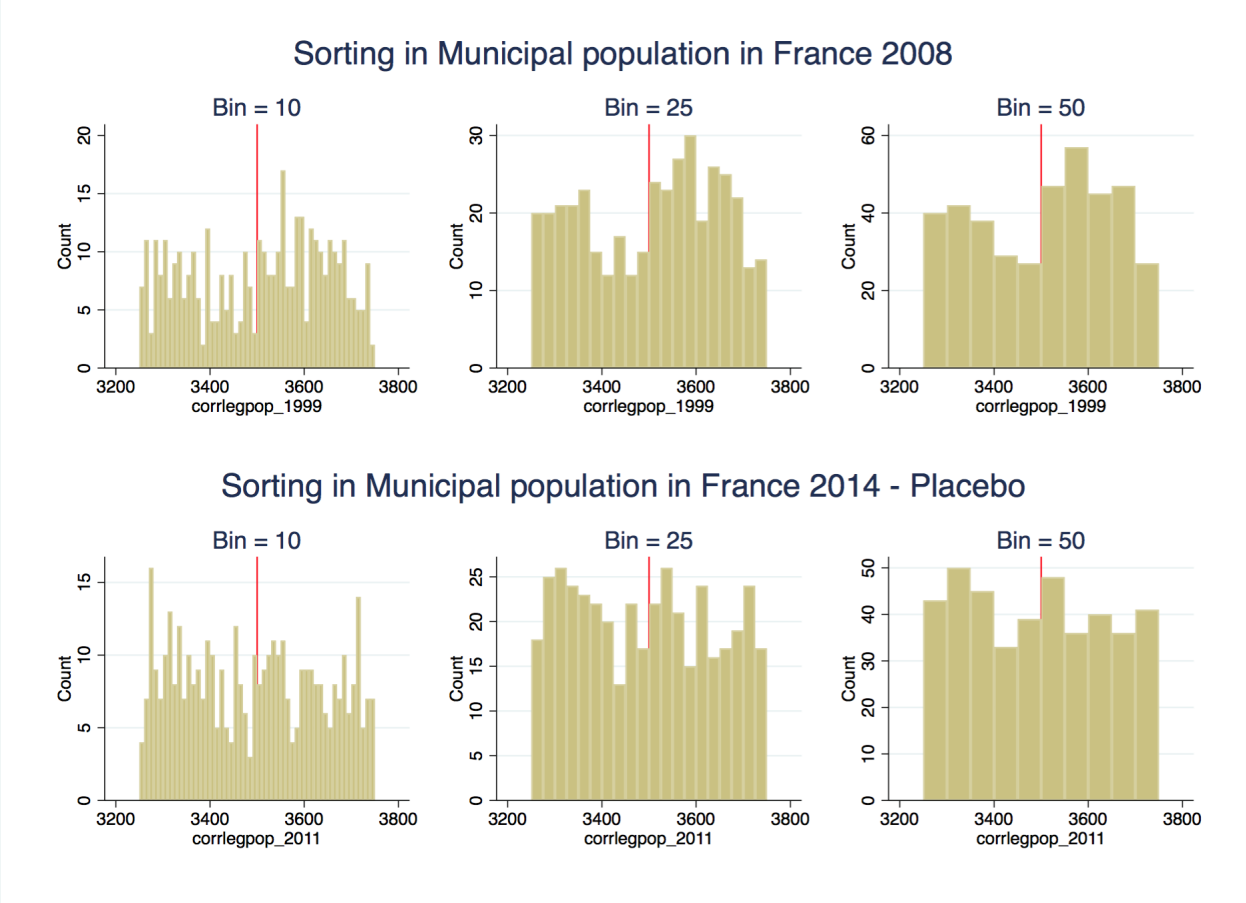
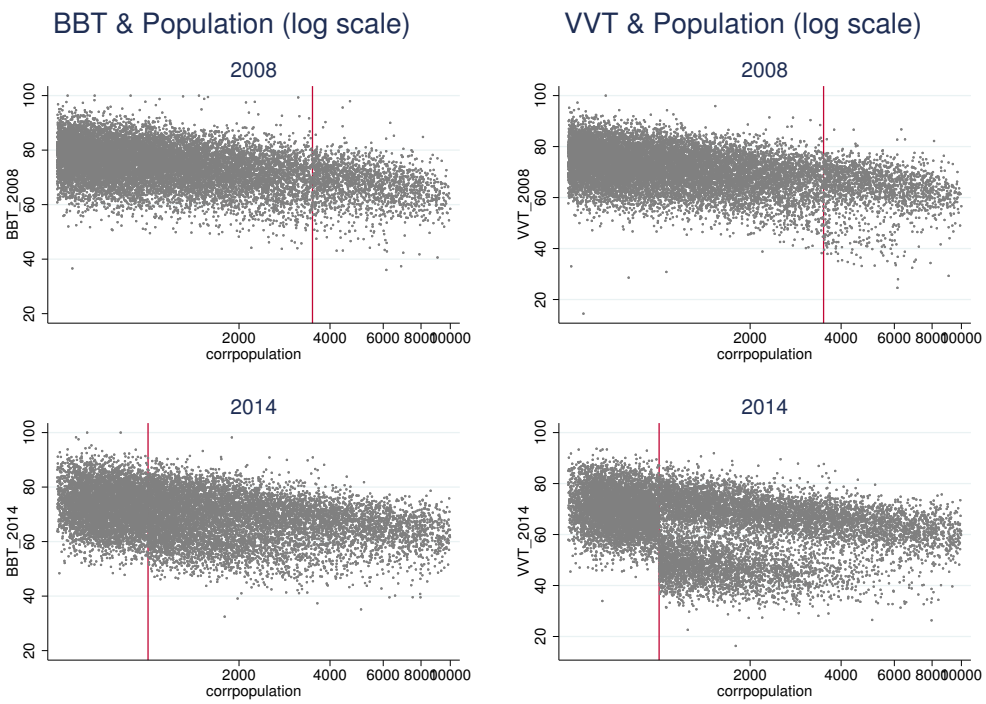


Figure 2: Sorting around the 3500 population thresholds in 2008 and 2014



When analyzing the determinants of turnout, our main independent variable is the log of population. The analysis suggests that the rate of turnout decreases roughly linearly in log population. This is also documented by Geys (2006) and Eggers (2015). Figure **??** confirms the linear relationship between log of population and either BBT or VVT, at both elections. Visual inspection of the raw data gives a first intuition of the impact of discontinuities at the thresholds. In 2014, there was a severe breakdown for VVT at the threshold. A similar discontinuity, though much smaller, seems to have occurred in 2008. These breakdowns do not appear for BBT.

Figure 3: Population, turnout and thresholds



Some basic summary statistics are presented in Table **??** for our main sample composed of municipalities whose population was between 500 and 9,999 inhabitants at both elections. Both measures of turnout were higher in 2008 than in 2014. Ballot box turnout decreased from 73.9% to 69.7%, and valid vote turnout from 70.5% to 64.2%. We have the number of competing lists for the closed proportional list elections. It concerns many more (and smaller) municipalities in 2014 (following the threshold change). On average, there were 1.9 competing lists in 2014 and 2.46 in 2014. At both elections, the median was 2. Table **??** shows the transitions between our main group of municipalities between the two elections. We can see that 6,747 municipalities would have had another type of election without the reform. These municipalities form our "treated" group. The control group is composed of the municipalities that had the same system at both elections: 5,494 municipalities with the open list majoritarian system and 1,965 municipalities with a closed list proportional system.

Table 2: Summary statistics

	N	Mean	Std. dev.
Ballot box turnout 2008	14,200	73.92%	7.74
Ballot box turnout 2014	14,197	69.69%	8.55
Valid vote turnout 2008	14,200	70.49%	8.35
Valid vote turnout 2014	14,197	64.26%	11.55
Number of candidate lists (closed lists) 2008	1,754	2.46	0.89
Number of candidate lists (closed lists) 2014	8,709	1.9	0.84

Table 3: Number of municipalities in various population bins in 2008 and 2014

		Legal population for the 2014 municipal election			
		500-999	1,000-3,499	3,500-9,999	TOTAL
Legal population	500-999	5,424	1,143	0	6,567
for the 2008	1,000-3,499	70	5,572	231	5,873
municipal	3,500-9,999	0	32	1,734	1,766
election	TOTAL	5,494	6,747	1,965	14,206

5 Econometric Models

This section gives the theoretical grounding of our econometric approaches. First, we derive a simple model of voting to justify why we have to work on the logit transformation of the turnout (instead of the direct measure of the turnout) and the type of estimations that we have to manage. Second, we describe the three empirical approaches we use for estimation: a regression discontinuity design (RDD), a first difference approach (FD) and a difference-in-discontinuity (diff-in-disc) design, which relies on a structural estimation

based on the theoretical model.

5.1 A theoretical model of turnout

As we are interested in the impact of population thresholds determining the type of poll, we look at the relation between voting behavior and the size of the population. More precisely, for each type or election, we write the net utility of voting as a function of population and a set of control variables. The type of election is itself a function of population: an open list plurality/majoritarian voting system is used for municipalities below a threshold $\overline{P}$, while a closed list proportional system is used for municipalities above that threshold. Denoting by $j = \{p, l\}$ the electoral system, with $j = p$ for plurality voting and $j = l$ for the closed list system, the net utility of voting for voter k in municipality i with the voting rule j is

$$V_{i,k}^{j} = \overline{V}^{j}\left(p_i, X_i\right) + \eta_{i,k} \tag{1}$$

with

$$\overline{V}^{j}\left(p_i, X_i\right) = \alpha_0^j + \alpha_1^j \phi\left(p_i\right) + X_i \zeta^j,$$

where p_i is the population of municipality i, X_i is a vector of control variables for municipality i and $\eta_{i,k}$ is an iid random term. The function $\phi\left(\right)$ is used for dealing with nonlinearities. In our estimation, we use the logarithmic function and so from now on we will have $\phi\left(p_i\right) = \ln\left(p_i\right)$.

Knowing that a plurality system is used for municipalities below a threshold $\overline{P}$ while a proportional system is used for municipalities above that threshold, equation (**??**) can be rewritten as:

$$\begin{aligned}
V_{i,k} &= \overline{V}^{p}\left(p_i, X_i\right) \times \left(1 - \mathbb{I}_{p_i \geq \overline{P}}\right) + \overline{V}^{l}\left(p_i, X_i\right) \times \mathbb{I}_{p_i \geq \overline{P}} + \eta_{i,k} \\
&= \overline{V}^{p}\left(p_i, X_i\right) + \left(\overline{V}^{l}\left(p_i, X_i\right) - \overline{V}^{p}\left(p_i, X_i\right)\right) \times \mathbb{I}_{p_i \geq \overline{P}} + \eta_{i,k} \\
&= \alpha_0^p + \left[\alpha_0^l - \alpha_0^p + \left(\alpha_1^l - \alpha_1^p\right) \ln\left(\overline{P}\right)\right] \mathbb{I}_{p_i \geq \overline{P}} + \alpha_1^p \phi\left(p_i\right) \\
&+ \left(\alpha_1^l - \alpha_1^p\right) \mathbb{I}_{p_i \geq \overline{P}} \left[\ln\left(p_i\right) - \ln\left(\overline{P}\right)\right] + X_i \zeta^p + \mathbb{I}_{p_i \geq \overline{P}} X_i \left(\zeta^l - \zeta^p\right) + \eta_{i,k}
\end{aligned}$$

where $\mathbb{I}_{p_i \geq \overline{P}}$ is a dummy variable equal to unity if and only if $p_i \geq \overline{P}$. Then, after simple calculations:

$$\begin{aligned}
V_{i,k} &= \overline{V}\left(p_i, X_i\right) + \eta_{i,k} \\
\overline{V}\left(p_i, X_i\right) &= \alpha_0 + \alpha_1 \ln\left(p_i\right) + \beta \mathbb{I}_{p_i > \overline{P}} + \gamma \mathbb{I}_{p_i > \overline{P}} \ln \frac{p_i}{\overline{P}} + X_i \zeta_0 + \mathbb{I}_{p_i \geq \overline{P}} X_i \zeta_1
\end{aligned} \tag{2}$$

where:

$$\begin{aligned}
\alpha_0 &= \alpha_0^p \\
\alpha_1 &= \alpha_0^l - \alpha_0^p + \left(\alpha_1^l - \alpha_1^p\right) \ln\left(\overline{P}\right) \\
\beta &= \alpha_1^p \\
\gamma &= \alpha_1^l - \alpha_1^p \\
\zeta_0 &= \zeta^p \\
\zeta_1 &= \zeta^l - \zeta^p
\end{aligned} \tag{3}$$

The two main coefficients of interest are β and γ. If there are no control variables (X_i empty) or they have the same impact for both types or elections ($\gamma^l = \gamma^p$), $\beta = \overline{V}^l\left(\overline{P}, X_i\right) - \overline{V}^p\left(\overline{P}, X_i\right)$ is the break in utility level generated by the change in electoral system at the threshold $\overline{P}$, while $\gamma = \alpha_1^l - \alpha_1^p$ is the change in the marginal impact of population.

Assuming that $\eta_{i,k}$ follows a Gumbel type III distribution, the individual probability of voting takes the standard form of the binary logit model:

$$Prob_i = \frac{1}{1 + \exp\left(-\overline{V}\left(p_i, X_i\right)\right)}$$

which, using the logit transformation, may be written as

$$\begin{aligned}
\ln \frac{Prob_i}{1 - Prob_i} &= \overline{V}\left(p_i, X_i\right) \\
&= \alpha_0 + \alpha_1 \ln\left(p_i\right) + \beta \mathbb{I}_{p_i > \overline{P}} + \gamma \mathbb{I}_{p_i > \overline{P}} \ln \frac{p_i}{\overline{P}} + X_i \zeta_0 + \mathbb{I}_{p_i \geq \overline{P}} X_i \zeta_1
\end{aligned}$$

The turnout rate, $Turn_i$, converges toward $Prob_i$ by the law of large numbers and we have:

$$\begin{aligned}
\ln \frac{Turn_i}{1 - Turn_i} &= \overline{V}\left(p_i, X_i\right) + \varepsilon_i \\
&= \alpha_0 + \alpha_1 \phi\left(p_i\right) + \beta \mathbb{I}_{p_i > \overline{P}} + \gamma \mathbb{I}_{p_i > \overline{P}} \ln \frac{p_i}{\overline{P}} + X_i \zeta_0 + \mathbb{I}_{p_i \geq \overline{P}} X_i \zeta_1 + \varepsilon_i
\end{aligned} \tag{4}$$

The change in the type of election may have two effects. First, it may impact the turnout rate independently of population. In that case, the function $\overline{V}\left(p_i, S_i\right)$ has a break at $p_i = \overline{P}$: $\beta \neq 0$. We make no prior assumption about the sign of this break. Eggers (2015) shows that the closed-list system leads to more proportionality than the plurality system, so that the utility of voting is higher under the former than the

latter. We may thus expect β to be positive. There may be a countervailing effect, however: the closed-list system constrains the voter's choice more than the multi-member plurality voting system, where voters can express a preference for an individual candidate. A more constrained choice leads to a lower utility level, so that if the impact of a more constrained choice dominates the impact of more proportionality, β would be expected to be negative. Second, the marginal impact of population on turnout may differ between the plurality system and the closed list system. For the plurality system, below the threshold $\overline{P}$ the marginal impact is measured by the coefficient $\alpha_1 = \alpha_1^p$. For the closed list system, above the threshold $\overline{P}$ the marginal impact is measured by: $\alpha_1 + \gamma = \alpha_1^l$. Then, if $\gamma \neq 0$, the marginal impact of population may differ between the two types of election. Under the plurality system, where people vote for individual candidates, good personal knowledge of each candidate is important. Such personal knowledge becomes more and more difficult to get as population increases, making the choice less easy and voting less useful. On the contrary, under the closed list system, personal knowledge of the candidates is not really useful, given also that most lists are affiliated to national parties. Since population should matter less under the closed list system than under the plurality system, we can expect the relationship between turnout and population to be weaker for the closed list system than for the plurality system: $\gamma > 0$.

Comparing two elections

In our empirical analysis, we consider two consecutive municipal elections held in 2008 and 2014. We index our observations by $t = 0, 1$, with $t = 0$ for the municipal election in 2008 and $t = 1$ for the municipal election in 2014. The relevant difference between these two elections is that the threshold separating plurality from proportional voting changed, from $\overline{P}_0 = 3,500$ in 2008 to $\overline{P}_1 = 1,000$ in 2014, without any other change. Moreover, this change was completely unexpected and so may be considered purely exogenous.

We use three different econometric models to compare the two elections and evaluate the effect of the electoral rule on turnout. These approaches are described below.

5.2 Econometric model I: The regression discontinuity design (RDD)

The idea of this approach, used by Eggers (2015), is to investigate whether turnout is different just above or just below the threshold. Since we have two different thresholds, we separately estimate equation (**??**) for the 2008 and 2014 elections (and their respective thresholds):

$$ln\frac{Turn_i}{1-Turn_i} = \alpha_0 + \alpha_1 ln(p_i) + \tau \mathbb{I}_{p_i > \overline{P}} + \gamma \mathbb{I}_{p_i > \overline{P}} ln(p_i) + \epsilon_i \tag{5}$$

where $\overline{P}$ takes the value of the threshold for each election: 3,500 in 2008 and 1,000 in 2014. Equation (**??**) is equivalent to Equation (**??**), with $\tau = \beta - \gamma \ln \overline{P}$.

5.3 Econometric model II: a first difference model (FD)

The second approach measures the net effect of changing the electoral system. We compare the municipalities where the electoral system has changed between the two elections to those where the electoral rule remained the same. To explain the determinants of turnout we estimate the following equation:

$$ln\frac{Turn_{i,t}}{1-Turn_{i,t}} = \alpha_0 + \alpha_1 electiontype_{i,t} + \zeta_0 X_i + \zeta_1 X_{i,t} + \epsilon_{i,t} \tag{6}$$

where *electiontype* takes the value 1 if it is a proportional election and 0 otherwise. We control for the time-varying municipal characteristics ($X_{i,t}$) – log of population, socio-economic structure, education, percentage of people working in the public sector – and for time-invariant municipal characteristics X_i. Equation (**??**) is a variant of Equation (**??**), where the interaction between the dummy and population is ignored, and where we use time-varying controls.

The estimation of equation (**??**) is very likely to be affected by time-invariant municipal unobservables. A simple way to remove that effect is to estimate the equation in first differences. This leaves us with the following equation to be estimated:

$$\Delta_t ln\frac{Turn_{i,t}}{1-Turn_{i,t}} = \alpha_1 \Delta_t electiontype_{i,t} + \zeta_1 \Delta_t X_{i,t} + \mu_i \tag{7}$$

where $t = \{0, 1\}$ and Δ_t is the time difference operator. In practice, we regress the difference of the logit transformation of turnout between the two elections on the difference of the independent variables.

5.4 Econometric model III: The difference-in-discontinuity (Diff-in-disc)

We use a generalization of the difference-in-discontinuity model developed by Grembi, Nannicini and Troiano (2016), considering a threshold change instead of a single threshold that was abandoned. We start from equation (**??**), writing it for period t:

$$\ln \frac{Turn_{i,t}}{1-Turn_{i,t}} = \alpha_{0,t} + \alpha_{1,t} \ln (p_{i,t}) + \beta_t \mathbb{I}_{p_{i,t}>\overline{P}_t} + \gamma_t \mathbb{I}_{p_{i,t}>\overline{P}_t} \ln \frac{p_{i,t}}{\overline{P}_t} + X_{i,t}\zeta_{0,t} + \mathbb{I}_{p_{i,t}\geq\overline{P}_t}\zeta_{1,t} + \varepsilon_{i,t} \tag{8}$$

where $\overline{P}_0 = 3,500$ and $\overline{P}_1 = 1,000$. All our coefficients are indexed by t, as we make no prior assumption that the net utility of voting was the same at both elections. Combining the two periods in the same formula, and neglecting control variables, we obtain our base equation to be estimated:

$$\begin{aligned} \log \frac{Turn_{i,t}}{1-Turn_{i,t}} = {} & \alpha_{0,0}(1-t) + \alpha_{0,1}.t + \alpha_{1,0}(1-t)\ln(p_{i,t}) + \alpha_{1,1}.t.\ln(p_{i,t}) \\ & + \beta_{0,1}.t.\mathbb{I}_{p_{i,t}>1000} + \gamma_{0,1}.t.\mathbb{I}_{p_{i,t}>1000} \ln\left(\frac{p_{i,t}}{1000}\right) \\ & + \beta_{1,0}(1-t)\,\mathbb{I}_{p_{i,t}>3500} + \gamma_{1,0}(1-t)\,\mathbb{I}_{p_{i,t}>3500} \ln\left(\frac{p_{i,t}}{3500}\right) + \varepsilon_{i,t} \end{aligned} \tag{9}$$

6 Results

In this section, we use the three approaches presented above to show the impact of setting a threshold separating the two electoral systems in France on ballot box turnout (BBT), the traditional measure used by most scholars, and valid vote turnout (VVT). As shown in the theoretical model, the right approach to assess the effect of the population on turnout is to work on its logit transformation, i.e., $\log \frac{turn}{1-turn}$. Nevertheless, for purposes of comparison with other papers, the corresponding estimations for these two measures of actual turnout (and not their logit transformation) are presented in the Online Appendix.

6.1 The regression discontinuity design approach

In this section, we replicate the Eggers (2015) RDD approach estimating equation (**??**). In his paper, Eggers estimated the effect of crossing the 3,500 population threshold for 2001 and 2008 (separately and pooled,

provided the threshold was the same for decades). Here, we estimate the discontinuity for the 2008 and 2014 elections, considering the effect of crossing the effective threshold at each election separately.

The results are summarized in Tables **??**-**??** for BBT and VVT.[4] The results are unexpected. Like Eggers (2015), more proportionality is associated with higher BBT at the 3,500 population threshold in 2008 (converting the result from Table **??**, columns 3 and 6, it corresponds to an increase in turnout of 1.3 or 1.1 percentage points, respectively). However, looking at 2014, crossing the new 1,000 population threshold has the opposite effect. It is associated with a decrease in BBT of about 1 percentage points (Table **??**, columns 3 and 6).

Looking at VVT, crossing the threshold in 2008 had no significant effect, while crossing the 2014 threshold was associated with a large, significant decrease in VVT (according to Table **??**, columns 3 or 6, it corresponds to a fall in VVT of 7 percentage points at 1,000 inhabitants). This asymmetric effect of crossing two different thresholds at two elections is puzzling, and is addressed in the following sections.

Table 4: RDD: effect of crossing the 3,500 threshold in 2008 for the logitBBT

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	25%	50%	75%	25%	50%	75%
$\mathbb{I}[Pop_i \geq 3,500]$	0.033	0.033	0.062***	0.013	0.025	0.051**
	(0.397)	(0.219)	(0.006)	(0.715)	(0.315)	(0.015)
controls	NO	NO	NO	YES	YES	YES
Pop window	25	50	75	25	50	75

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

[4]The full tables are available in the Online Appendix. Since Eggers (2015) was working on actual BBT and not the logit transformation, the results of Table A.**??** should be the same as those presented in his paper. Results are qualitatively similar to those in Table 1 of Eggers (2015), but the coefficients and their significances are marginally different. Comparing our database to the replication files provided by Andrew Eggers, it turns out that the sample is slightly different, as he does not include Corsica, and there are some additional missing observations. The differences between our results come from the differences in the composition of our respective samples. We decided to keep our sample as being more exhaustive.

Table 5: RDD: effect of crossing the 3,500 threshold in 2008 for the logitVVT

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	25%	50%	75%	25%	50%	75%
$\mathbb{I}[Pop_i \geq 3,500]$	-0.019	-0.016	0.021	-0.041	-0.026	0.009
	(0.643)	(0.557)	(0.326)	(0.281)	(0.305)	(0.661)
controls	NO	NO	NO	YES	YES	YES
Pop window	25	50	75	25	50	75

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 6: RDD: effect of crossing the 1,000 threshold in 2014 for the logitBBT

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	25%	50%	75%	25%	50%	75%
$\mathbb{I}[Pop_i \geq 1,000]$	-0.049*	-0.044**	-0.050***	-0.055**	-0.049***	-0.053***
	(0.054)	(0.016)	(0.001)	(0.026)	(0.006)	(0.001)
controls	NO	NO	NO	YES	YES	YES
Pop window	25	50	75	25	50	75

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 7: RDD: effect of crossing the 1,000 threshold in 2014 for the logitVVT

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	25%	50%	75%	25%	50%	75%
$\mathbb{I}[Pop_i \geq 1,000]$	-0.314***	-0.311***	-0.309***	-0.317***	-0.312***	-0.308***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
controls	NO	NO	NO	YES	YES	YES
Pop window	25	50	75	25	50	75

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6.2 First difference: Evaluating the net effect of the reform

In this section, we start by estimating equation (**??**) for various sub-samples and using various control variables. The idea is to measure the net effect of the reform on the logit transformation of BBT and VVT for treated municipalities compared to untreated though similar ones.[5] Our treated group (municipalities affected by a change in their electoral system between 2008 and 2014) is composed of $6,946$ municipalities. We use two different sub-samples to compare these treated municipalities to similar but not treated municipalities. The "large" sub-sample is composed of municipalities with a population between 500 and 9,999 inhabitants in both elections. There are $14,206$ municipalities (including the treated ones) with $1,965$ municipalities with a population above $3,500$ inhabitants. For the small sub-sample ($750 - 4999$ inhabitants at both elections), there are $9,506$ municipalities with only 740 municipalities located at the right of our control group. The advantage of the small sub-sample is that, as can be seen from Table **??**, beside the 1,000 and 3500 thresholds, there is no other threshold within the population window considered.

Considering the equation in first difference, we look at whether changing the electoral rules affects turnout. The results are clear. Whatever the sub-sample and the set of control variables, the net effect of the electoral reform on the treated municipalities is a decrease in BBT and VVT. The size of the effect is difficult to infer from Tables **??** and **??**. If we look at the estimation performed on turnout (tables Tables A.**??** and A.**??**), we see that the treatment makes BBT and VVT decrease by 1% and 5%, respectively.

[5] We note that according to Table **??**, among the $6,946$ ($= 1,143 + 5,572 + 231$) municipalities where the electoral system has changed from 2008 to 2014, there are 231 municipalities that are formally "not treated" in the sense that the change in their electoral system would have taken place without the reform, as their population crossed the 3,500 population threshold for the 2014 election. According to the estimated equation, these municipalities belong to the treated group. We run a robustness check to see whether looking at the municipalities directly affected by the reform (where the population was between 1,000 and 3,500 inhabitants in 20014) would have changed the results, and find it would not. These tables are available on request.

Table 8: First difference - The net effect of the reform on ΔlogitBBT

	(1)	(2)	(3)	(4)
VARIABLES	500-9999	500-9999	750-4999	750-4999
name_to_list	-0.025***	-0.025***	-0.050***	-0.050***
	(0.002)	(0.002)	(0.000)	(0.000)
D ln population	-0.104***	-0.113***	-0.079**	-0.086**
	(0.001)	(0.000)	(0.048)	(0.038)
D %farmers		-0.742**		-0.870
		(0.046)		(0.126)
D %self employed		0.030		-0.114
		(0.739)		(0.339)
D %managers and enginers		-0.096		-0.136
		(0.271)		(0.253)
D %intermediate workers		-0.145**		-0.266***
		(0.037)		(0.006)
D %with wollars		-0.099		-0.168*
		(0.151)		(0.073)
D %female		0.146		0.059
		(0.307)		(0.738)
D %secondary education		0.041		0.007
		(0.458)		(0.944)
Constant	-0.192***	-0.191***	-0.171***	-0.166***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	13,971	13,971	8,722	8,722
R-squared	0.003	0.004	0.004	0.006

Robust pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

To summarize, at the 2008 threshold of $3,500$ inhabitants, the RDD approach suggests that municipalities with a closed-list proportional system have higher BBT rates (+1.1 to +1.3 percentage points). At the 2014 election with a threshold of $1,000$ inhabitants, municipalities with a closed-list proportional system have a lower BBT rate (-1.2 to -1.3 percentage points). The net effect of the reform in treated municipalities (compared to untreated ones) is to lower their BBT by about 1%. Looking at VVT, there is no significant discontinuity at 3,500 inhabitants in 2008, while in 2014 there is a large discontinuity: municipalities with a

closed-list proportional system have a much lower VVT rate at the 1,000 population threshold (-7 percentage points). The net effect of the reform is a decrease in VVT rate (-5%). The difference between the two indicators (BBT and VVT) comes from spoiled ballots. Stated differently, treated municipalities have a lower turnout and voters cast a higher proportion of spoiled ballots.

Table 9: First difference - The net effect of the reform on ΔlogitVVT

	(1)	(2)	(3)	(4)
VARIABLES	500-9999	500-9999	750-4999	750-4999
name_to_list	-0.200***	-0.200***	-0.226***	-0.226***
	(0.000)	(0.000)	(0.000)	(0.000)
D ln population	-0.080*	-0.087**	-0.040	-0.043
	(0.051)	(0.038)	(0.494)	(0.475)
D %farmers		-0.582		-0.757
		(0.208)		(0.472)
D %self employed		-0.036		-0.214
		(0.750)		(0.253)
D %managers and enginers		-0.119		-0.222
		(0.229)		(0.145)
D %intermediate workers		-0.231***		-0.417***
		(0.008)		(0.002)
D %with wollars		-0.149*		-0.243*
		(0.072)		(0.073)
D %female		0.084		-0.027
		(0.632)		(0.913)
D %secondary education		0.043		0.014
		(0.580)		(0.922)
Constant	-0.175***	-0.173***	-0.155***	-0.149***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	13,976	13,976	8,724	8,724
R-squared	0.043	0.044	0.032	0.034

Robust pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Electoral reform, electoral competition and turnout

In the above analysis, we explored the effect of the electoral system on turnout by implicitly assuming that the reform only affected voters' behavior, i.e. the demand side of the election. For various reasons, the reform is also likely to affect electoral competition, i.e. the supply side of the election (Sanz, 2017). For open list elections held in smaller municipalities, electoral supply should not be a key determinant of turnout because lists are open and a voter is free to cast a vote for anyone, even if they are not a candidate. In the closed list elections, where voter can choose only between the competing lists, electoral supply (the number of competing lists) is likely to carry much more weight in the individual decision to turn out. In addition, it is easier to run for election in the open list system since the candidate lists do not have to be complete. By contrast, in the closed list system the number of candidates on each list must be equal to the number of seats to be filled. As a consequence, running for the election is likely to be more complicated. To address that question, we start by investigating the effect of the reform on electoral competition.

We have the number of competing lists only for the closed-list elections. In Table **??**, we look at the determinants of the probability of having a single list running for the election in 2014 for municipalities with the closed list proportional election. It turns out that the probability of having a single list decreases with the population of the municipality and with the turnout at the previous election. The municipalities whose electoral system has changed between 2008 and 2014 have a significantly higher probability of having no electoral competition. The use of additional control variables at the municipal level does not change these effects. Based on the first column, the probability of having a single list (and no electoral competition) is 56% for a municipality of 1,000 inhabitants, falling to 20% at 3,500 inhabitants. These figures are 45.3% and 14.3% if we consider column 4, with all controls, instead of column 1.

Table 10: Electoral competition in 2014 - dep var: P(single list)

	(1)	(2)	(3)	(4)
VARIABLES	1000-9999	1000-9999	1000-9999	1000-9999
ln_corrpopulation	-1.293***	-1.545***	-1.351***	-1.278***
	(0.000)	(0.000)	(0.000)	(0.000)
BBT_{2008}		-0.045***	-0.045***	-0.047***
		(0.000)	(0.000)	(0.000)
name_to_list			0.443***	0.455***
			(0.001)	(0.000)
Constant	9.189***	14.350***	12.471***	14.293***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	8,592	8,592	8,592	8,592
controls	NO	NO	NO	YES
Pseudo R-squared	0.0803	0.0955	0.0970	0.102

Robust pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

These results are in line with the evidence provided by Sanz (2017) on the impact of open-list versus closed-list voting systems on the number of party-lists running in Spanish municipal elections, and suggest that the reform has a crucial impact on the supply side of the election. Switching to a proportional voting system based on closed lists significantly raises the probability of having no electoral competition in the affected municipalities. Table **??** gives the results of the estimation of the effect of the electoral reform on logitBBT (column 1-3) and logitVVT (columns 4-6), controlling for the degree of electoral competition, with columns 1 and 4 reproduced for comparison purposes and corresponding to column (2) in Tables (**??**) and (**??**).

The results show that the key determinant of turnout is whether there is electoral competition or not (i.e., whether there is a single list or more than one list). Importantly, when controlling for the presence of a single list in the local contest, the change in the electoral system from the plurality open-list to the proportional closed-list system is actually positive and significant for both BBT and VVT. In terms of size of the effects, as seen in Table A.**??** the presence of a single list has a significant negative impact on BBT and

VVT of around 10 and 20 percentage points respectively, while the total rate of turnout increases by 3.2% and the proportion of valid votes raises by 2.7% (instead of falling by -1% and -5%, respectively, when not controlling for electoral competition) on switching to the proportional closed-list system. Finally, in columns 3 and 6, we explore the interaction between the change in the electoral system and the electoral competition. The reference is composed of municipalities whose electoral rule has not changed ($name\_to\_list = 0$) and where there is some electoral competition ($single\_list = 0$). We can see that whether municipalities change their electoral system or not, without electoral competition ($single\_list = 1$), BBT and VVT decrease significantly. For municipalities affected by the reform but with more than one candidate list, both BBT and VVT increase.[6]

[6]In terms of magnitude, compared to municipalities whose electoral system has not changed and with more than one candidate list, column 3 of Table **??** suggests that BBT (VVT) decreases by 8% to 8.2% (12.5% to 17.4%) in municipalities with a single list candidate (the second, higher value is for municipalities whose electoral system has changed). Municipalities where the electoral system has changed and where there are several competing lists increase their turnout by 4.3% (3.7%). Similar values can be found in Table (A.**??**).

Table 11: Mechanisms for logitBBT and logitVVT

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	logitBBT	logitBBT	logitBBT	logitVVT	logitVVT	logitVVT
name_to_list	-0.025***	0.161***		-0.200***	0.124***	
	(0.002)	(0.000)		(0.000)	(0.000)	
single_list		-0.496***			-0.866***	
		(0.000)			(0.000)	
name_to_list=0 & single_list=0			ref.			ref.
name_to_list=0 & single_list=1			-0.332***			-0.523***
			(0.000)			(0.000)
name_to_list=1 & single_list=0			0.172***			0.148***
			(0.000)			(0.000)
name_to_list=1 & single_list=1			-0.342***			-0.756***
			(0.000)			(0.000)
Constant	-0.191***	-0.180***	-0.185***	-0.173***	-0.154***	-0.165***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	13,971	13,971	13,971	13,976	13,976	13,976
R-squared	0.004	0.228	0.231	0.044	0.446	0.453
controls	YES	YES	YES	YES	YES	YES

Robust pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

6.3 The diff-in-disc approach

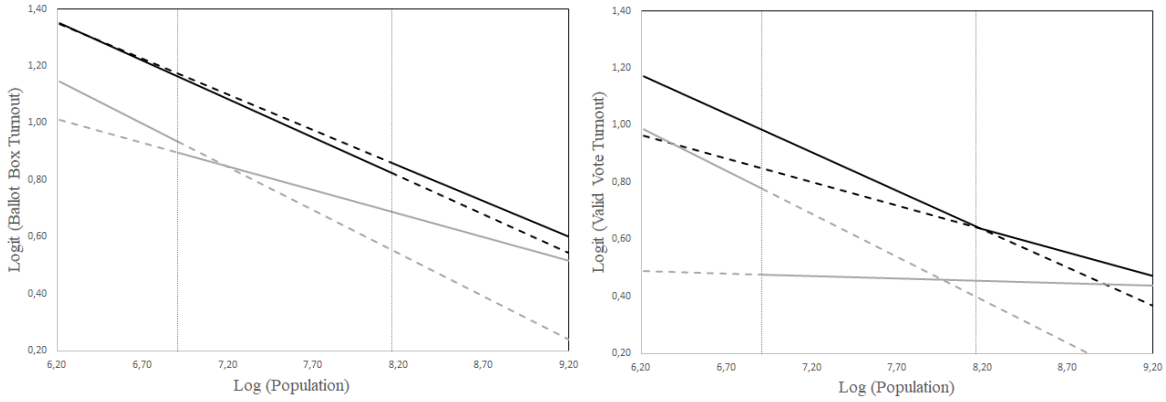
Results for the base model

For diff-in-disc estimation, our base results come from estimating equation (**??**) by Ordinary Least Squares, without control variables, and using the subsample of all municipalities with a population of between 500 and 9,999 inhabitants. We consider the same dependent variables as in the previous section: ballot box turnout and valid vote turnout.

The detailed estimation results are given in the Online Appendix, Table **??**, column (1) for ballot box turnout, and column (3) for valid vote turnout. For easier interpretation of the results, we look at the shape of the estimated relationship between turnout and population for each election and each measure of turnout.

The shape of these relationships is displayed in Figure **??**, left-hand panel for ballot box turnout and right-hand panel for valid vote turnout. These figures are the graphical representation of the estimated equation (**??**). In both cases, the black lines represent the relationship between the log of population and the logit of turnout for 2008 (equation (**??**) with $t = 0$), and the gray lines represent the same relationship for 2014 (equation (**??**) with $t = 1$). The line is continuous when the voting system is used for this population level. It is dotted when the voting system is not used for this population. The two thin vertical lines correspond to the thresholds of 1,000 and 3,500 inhabitants, respectively. We also carried out tests of the effects of each threshold. The P-values associated with these tests are given in Table **??**.

Figure 4: The estimated relation between turnout and population (Base model)



(a) Ballot box turnout (b) Valid vote turnout

Black continuous line: 2008 election

Grey continuous line: 2014 election

Dashed lines: extensions of the estimated functions

Table 12: Tests of the effect of thresholds in the base model (P-values)

				P-Value	
Test	Election	Threshold	H0	Ballot Box Turnout	Valid Vote Turnout
Break	2008	3500	$\beta_{1,0} = 0$	0,036	0,785
	2014	1000	$\beta_{0,1} = 0$	0,001	0,000
Change in slope	2008	3500	$\gamma_{1,0} = 0$	0,472	0,000
	2014	1000	$\gamma_{0,1} = 0$	0,000	0,000

First, looking at BBT (left-hand panel), we find that in 2008, crossing the 3,500 threshold turnout has a

positive impact. However, as we can see from the tests in Table **??**, this break is only marginally significant (The P-value is 3.6%) and its impact is quite small: crossing the 3,500 threshold raises turnout by 0.8%. Looking at 2014, we see that at the 1,000 threshold, the break then becomes negative and significant. Again, the effect is small: -0.8%. All these results are in line with RDD estimation (section **??**).

The analysis of valid vote turnout (right-hand panel) tells us a different story. In 2008, there is no break at the 3,500 threshold. In 2014, crossing the 1,000 threshold has a large impact: VVT decreases by 7%. These results confirm the analysis of the previous section: in the treated municipalities, ballot box turnout has changed only modestly changed while there was a large decrease in valid vote turnout, coming from a large increase in spoiled votes.

Focusing on the slopes of these estimated functions, turnout is more sensitive to changes in population with the plurality open-list vote system than with the proportional closed-list system. This difference is particularly striking in 2014. BBT is a decreasing function of population for both systems, but the curve is much steeper for the plurality system than for the proportional one, whereas VVT is almost insensitive to population for the proportional closed-list system, while it is a strongly decreasing function of population for the plurality vote system.[7] This result is no surprise in the light of our discussion in Section **??** – under the plurality voting system, people vote for individual candidates, so that a good personal knowledge of each candidate is important. This personal knowledge becomes more and more difficult to get as population increases, making choice less easy and voting less useful. By contrast, under the list system, personal knowledge of the candidates is not really useful, especially as most lists are affiliated to a national party, making the size of the electorate a less important determinant of the rate of turnout.

Turnout and poll type: The role of electoral competition

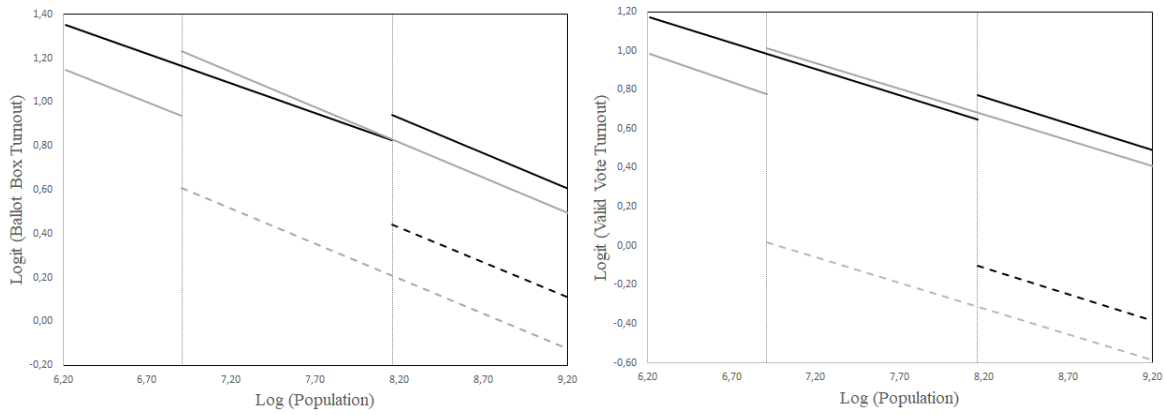
As noted above, for a good understanding of the consequences of the change in poll type, we have to take account of its impact on the electoral supply (Sanz, 2017). In Section **??**, we saw that under the closed list system, the number of competing lists was an increasing function of the size of the municipality (see Table **??**). The probability of having an uncontested election decreases from 57% for a municipality with 1,000

[7]The difference is also noticeable in 2008 for valid vote turnout, while the only exception is for ballot box turnout in 2008, where there is no visible change in slope.

inhabitants to 21% for a municipality with 3,500 inhabitants. It seems that having a single list does not only discourage participation, but is also likely to encourage spoiled ballots. This will be discussed further on.

To assess the role of the number of lists, we add a dummy variable to the base model. This variable is unity for municipalities under the closed list system with a single list competing for votes. The results are available in Table **??**, column (2) and (4) for BBT and VVT. The estimated relations between the log of population and the logit of turnout are displayed in Figure (**??**). The continuous lines represent the estimated relation for municipalities that are either under the plurality system or the closed list system with more than one list (black line for 2008, gray line for 2014).

Figure 5: The estimated relation between turnout and population taking account of the number of lists



(a) Turnout (b) Valid vote turnout

Black lines: 2008 election

Grey lines: 2014 election

Continuous lines: Logit(Turnout) under the plurality system or the list system with more than one list

Dashed lines: Logit(Turnout) under the list system with one list only

For both measures of turnout, the results are qualitatively similar. We see that for municipalities with some electoral competition (more than one list), there is a positive break (like Eggers, 2015) at the threshold, but slopes are similar for both electoral systems at both elections.

For municipalities with a single list, at both elections, turnout is much lower with the proportional closed-list system (dashed lines) compared to the majoritarian open list system (black line for the 2008 election, gray line for the 2014 election). We note that the impact of having a single list is much stronger for valid

vote turnout than for ballot box turnout. Calculating the estimated turnout levels for municipalities with either 1,000 or 3,500 inhabitants, having a single list (compared to municipalities with more than one list) decreases BBT by around 13% (from 77.4% to 64.8%) at 1,000 inhabitants and 14% (from 69.6% to 55.2%) at 3,500 inhabitants. For VVT, the gap between municipalities with a single list and those with some electoral competition reaches 23% (from 73.4% to 50.5%) at 1,000 inhabitants and 24% (from 66.5% to 42.3%) at 3,500 inhabitants. This suggests that in small municipalities, having a single list leads voters to cast a higher proportion of spoiled ballots. To explain this difference, we can start from the fact that when the pool of electors is small, not voting is not anonymous, while spoiling a ballot is anonymous. Anybody can look at the voting list and identify electors who did not participate in the poll, but it is impossible to identify voters who have cast a spoiled ballot. Social control (and pressure) is likely to be higher in small municipalities than in bigger ones. As a consequence, electors who do not want to vote for one of the competing lists (even more so if there is a single list) may prefer to cast a spoiled vote rather than not show up at the polling station. We then interpret the difference between the two measures of turnout as the consequence of the choice of electors who still go to the polls, but facing a more restricted choice under the closed list system, do not want to support any list and so cast a spoiled ballot.

Choosing the best voting system?

Between 2008 and 2014, the municipalities between 1,000 and 3,500 inhabitants were switching from a plurality open-list system to a proportional closed-list system. Was this change good for democracy? If we assume that a higher utility of voting is associated with a higher level of turnout (consistent with the theoretical model developed in Section **??**), the best electoral system is the one with the highest turnout. An additional question concerns the measure of turnout. Which of BBT and VVT best reflects the utility of voting? In small municipalities, voters who are dissatisfied with the electoral supply they are offered prefer to spoil their vote rather than not vote. We interpret this result by their preference to challenge the candidate anonymously. This issue of remaining anonymous is even more important when there is only one list, as this list will be elected with certainty; electors who usually go to the polls but do not vote may be considered as taking a stand against the future municipal government. These considerations imply that electors who cast

a spoiled vote are also electors who have a low utility of voting, suggesting that valid vote turnout is the relevant measure in terms of utility of voting.

Looking at Figure **??**, we see that at both elections, the curve for the plurality voting system and the curve for the proportional closed list system cross at similar population levels: around 3,500 in 2008, and 3,000 in 2014. In 2008, the 3,500 threshold had an interesting property: voters in municipalities below 3,500 were better off under the plurality system while municipalities above 3,500 were better off under the closed list system, so that each municipality was assigned to its preferred electoral system. This optimal assignment disappeared in 2014. Municipalities between 1,000 and 3,000 inhabitants would still have been better off under the plurality system, but they were obliged to switch to the proportional system. The fact that small municipalities (under 3,000 inhabitants) were worse off under the closed list system came almost entirely from the impact of the closed list system on electoral supply. As we can see from Figure **??**, whenever there was more than one list competing for votes (see the continuous lines at the right hand side of each threshold), the proportional closed list system was preferred to the majoritarian open list system: at all population levels, the curve for the closed list system is above the curve for the plurality system, whatever the period and the turnout measure.[8] The results in Figure **??**, suggesting that the plurinominal open list system is preferred to the proportional closed list system in small municipalities is driven by electoral supply, which is too small in small municipalities, leading to a high probability of having a single candidate list and no choice for the voters. When controlling for the electoral supply, the more proportional closed list system is preferred by voters.

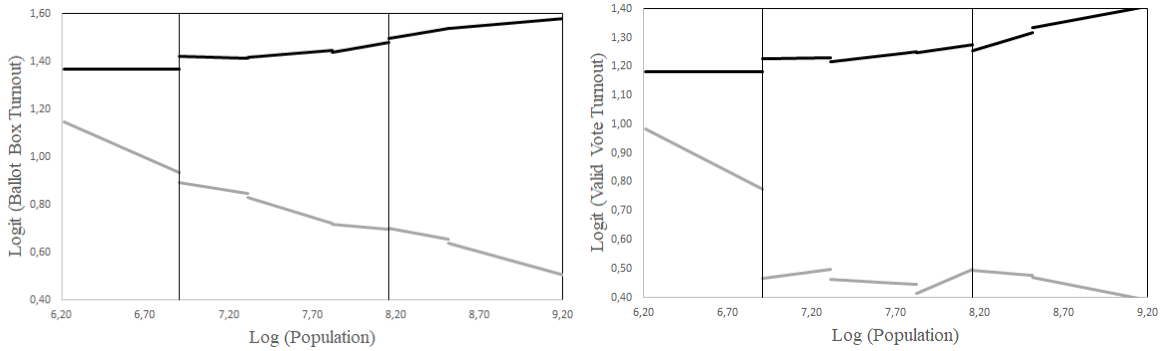
A robustness check: Looking at all the thresholds

The 3,500 threshold in 2008 and the 1,000 threshold in 2014 are both important. Crossing them means a change in the electoral system. However, as noted earlier, they are not the only thresholds. Others may have an impact on turnout insofar as they are linked to a change in the characteristics of the municipal council or of the election. We re-estimate our model using all the thresholds listed in Table **??** for the two elections. The estimated functions are displayed in Figure **??**. The formal tests for the impact of each threshold on a break and a change in slope are displayed in theOnline Appendix, Table **??**. It turns out that the main

[8]This results is not explicitly displayed in Figure **??** but derives from the extension of the plotted functions.

discontinuity is for VVT at the new threshold for the 2014 election. According to the tests, there is another threshold that has a significant and unexpected impact on turnout: the 1,000 population threshold in 2008, but the effect goes in the opposite direction, supporting our results: in 2008, crossing the 1,000 population threshold increased both measures of turnout. In 2014, crossing the same threshold reduces turnout.

Figure 6: Considering the difference-in-discontinuity with all thresholds from table **??**



(a) Ballot box turnout

(b) Valid vote turnout

Logit(Turnout) with all thresholds (Black for 2008, gray for 2014)

7 Conclusion

This paper made use of a recent electoral reform involving a large number of French local governments (municipalities) to address the important question of how electoral rules affect voters' participation in decentralized elections.

We studied two measures of turnout: ballot box turnout and valid vote turnout. We argue that the latter is a better measure of the health of a democracy than the former, in particular in small constituencies where voters might prefer to cast an anonymous spoiled ballot rather than not vote at all, which is readily observable.

We found that the reform decreased the ballot box turnout modestly but significantly, whereas its negative effect on valid vote turnout was larger.

On investigating the underlying mechanisms, we found the effect was driven by the impact of the reform on electoral supply. Smaller municipalities are more likely to have a single competing list (and no electoral competition) in the closed list proportional system. Lowering the threshold between the two election systems

markedly increased the number of municipalities with a single competing list. These municipalities had a lower ballot box turnout and an even lower valid vote turnout (i.e. a higher rate of spoiled ballots). In municipalities where there was some electoral competition (more than one list), the impact of the reform on both measures of turnout was positive.

We show that to properly assess the effects of a reform, we must measure its effect on both sides of the election: electoral supply and demand. In the French context, the reform was successful for municipalities with some electoral competition, but the negative impact of the reform on electoral competition was excessive. Indeed, one of its consequences was no electoral competition at all in many small municipalities. The positive effect of implementing more proportionality was more than offset by the negative impact on electoral competition. If our measure of the utility of voting is properly captured by the logit transformation of the valid vote turnout (which is discussed in the paper and suggested by our theoretical model of voting), the optimal threshold between these two electoral systems should be around 3,000 to 3,500 inhabitants.

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8 Appendix

8.1 Detailed presentation of the two electoral systems

8.1.1 Smaller municipalities: majoritarian plurinominal open list system

In smaller municipalities (less than 3,500 inhabitants in 2008 and less than 1,000 in 2014), the election takes the form of a plurinominal open list majoritarian system. Each voter can vote for as many candidates as the number of seats to elect. The voter can choose candidates from different lists, mix candidates among lists, add candidates (that were not officially candidates) and remove candidates. There are two rounds. At the first round, all candidates with more than 50% of the votes are elected. At the second round, the candidates are ranked according to their vote share and remaining seats are allocated to the candidates with the higher vote share.

Running lists can be incomplete (less candidates than seats).

8.1.2 Larger municipalities: proportional closed list system with majority bonus

In larger municipalities, voter can only vote for one list. The winning list receives a (large) majority bonus of 50% of the seats. The remaining seats are allocated proportionately to the vote share of each list according to their score. There is a second round if no list get 50% of the votes. Lists with more than 10% of the votes can maintain for the second round. Lists can also merge between the two rounds.

The number of candidates on running lists must be equal to the number of seats to be filled.

9 Online appendix

9.1 Tables

9.1.1 Full tables

Table 13: RDD: effect of crossing the 3,500 threshold in 2008 for the logitBBT (corresponding to table **??**)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	25%	50%	75%	25%	50%	75%
$\mathbb{I}[Pop_i \geq 3,500]$	0.033	0.033	0.062***	0.013	0.025	0.051**
	(0.397)	(0.219)	(0.006)	(0.715)	(0.315)	(0.015)
ln(pop)	-0.169	-0.241***	-0.276***	-0.006	-0.174***	-0.218***
	(0.278)	(0.000)	(0.000)	(0.968)	(0.000)	(0.000)
$\mathbb{I}[Pop \geq 3,500] \times ln(pop_i)$	-0.158	0.061	-0.025	-0.211	0.140	-0.017
	(0.567)	(0.571)	(0.706)	(0.400)	(0.153)	(0.785)
% farmers				5.031***	4.139***	2.634***
				(0.000)	(0.000)	(0.000)
% craftsmen				2.783***	2.141***	1.538***
				(0.000)	(0.000)	(0.000)
% white collars				-1.282***	-1.072***	-1.087***
				(0.000)	(0.000)	(0.000)
% intermediate workers				0.035	-0.186	-0.299***
				(0.887)	(0.224)	(0.001)
% employees				0.422*	0.522***	0.557***
				(0.073)	(0.000)	(0.000)
% female				0.528	0.534*	1.083***
				(0.245)	(0.070)	(0.000)
% secondary education				0.510**	0.483***	0.519***
				(0.023)	(0.000)	(0.000)
Constant	0.827***	0.818***	0.807***	0.150	0.190	-0.029
	(0.000)	(0.000)	(0.000)	(0.564)	(0.248)	(0.777)
Observations	1,392	3,415	8,136	1,391	3,414	8,134
R-squared	0.004	0.026	0.107	0.192	0.192	0.230
Pop window	25	50	75	25	50	75

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 14: RDD: effect of crossing the 3,500 threshold in 2008 for the logitVVT (corresponding to table **??**)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	25%	50%	75%	25%	50%	75%
$\mathbb{I}[Pop_i \geq 3,500]$	-0.019	-0.016	0.021	-0.041	-0.026	0.009
	(0.643)	(0.557)	(0.326)	(0.281)	(0.305)	(0.661)
ln(pop)	-0.219	-0.241***	-0.275***	-0.060	-0.174***	-0.218***
	(0.183)	(0.000)	(0.000)	(0.695)	(0.000)	(0.000)
$\mathbb{I}[Pop \geq 3,500] \times ln(pop_i)$	0.201	0.208*	0.063	0.157	0.283***	0.072
	(0.488)	(0.051)	(0.330)	(0.561)	(0.004)	(0.232)
% farmers				4.934***	4.003***	2.582***
				(0.000)	(0.000)	(0.000)
% craftsmen				2.861***	2.157***	1.517***
				(0.000)	(0.000)	(0.000)
% white collars				-1.028***	-0.956***	-0.927***
				(0.001)	(0.000)	(0.000)
% intermediate workers				0.081	-0.036	-0.218**
				(0.763)	(0.815)	(0.016)
% employees				0.542**	0.574***	0.572***
				(0.032)	(0.000)	(0.000)
% female				0.280	0.194	0.749***
				(0.566)	(0.516)	(0.000)
% secondary education				0.516**	0.481***	0.517***
				(0.032)	(0.000)	(0.000)
Constant	0.640***	0.640***	0.628***	0.009	0.124	-0.075
	(0.000)	(0.000)	(0.000)	(0.974)	(0.457)	(0.445)
Observations	1,392	3,415	8,138	1,391	3,414	8,136
R-squared	0.006	0.032	0.120	0.158	0.175	0.229
Pop window	25	50	75	25	50	75

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 15: RDD: effect of crossing the 1,000 threshold in 2014 for the logitBBT (corresponding to table **??**)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	25%	50%	75%	25%	50%	75%
$\mathbb{I}[Pop_i \geq 1,000]$	-0.049*	-0.044**	-0.050***	-0.055**	-0.049***	-0.053***
	(0.054)	(0.016)	(0.001)	(0.026)	(0.006)	(0.001)
ln(pop)	-0.306***	-0.304***	-0.259***	-0.252***	-0.260***	-0.231***
	(0.002)	(0.000)	(0.000)	(0.010)	(0.000)	(0.000)
$\mathbb{I}[Pop \geq 1,000] \times ln(pop_i)$	0.177	0.188***	0.100**	0.165	0.173**	0.096**
	(0.326)	(0.008)	(0.030)	(0.353)	(0.014)	(0.035)
% farmers				1.484***	1.145***	0.722***
				(0.000)	(0.000)	(0.000)
% craftsmen				0.756***	0.708***	0.467***
				(0.000)	(0.000)	(0.000)
% white collars				-0.483***	-0.597***	-0.667***
				(0.000)	(0.000)	(0.000)
% intermediate workers				-0.227**	-0.267***	-0.236***
				(0.048)	(0.000)	(0.000)
% employees				0.376***	0.284***	0.158***
				(0.001)	(0.000)	(0.001)
% female				0.744***	0.801***	0.419***
				(0.002)	(0.000)	(0.000)
% secondary education				0.261**	0.352***	0.365***
				(0.010)	(0.000)	(0.000)
Constant	0.941***	0.935***	0.948***	0.360***	0.353***	0.619***
	(0.000)	(0.000)	(0.000)	(0.005)	(0.000)	(0.000)
Observations	4,348	9,983	18,791	4,263	9,791	18,359
R-squared	0.019	0.049	0.094	0.073	0.095	0.125
Pop window	25	50	75	25	50	75

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 16: RDD: effect of crossing the 1,000 threshold in 2014 for the logitVVT (corresponding to table **??**)

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	25%	50%	75%	25%	50%	75%
$\mathbb{I}[Pop_i \geq 1,000]$	-0.314***	-0.311***	-0.309***	-0.317***	-0.312***	-0.308***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
ln(pop)	-0.315***	-0.302***	-0.263***	-0.278**	-0.271***	-0.241***
	(0.007)	(0.000)	(0.000)	(0.018)	(0.000)	(0.000)
$\mathbb{I}[Pop \geq 1,000] \times ln(pop_i)$	0.394*	0.378***	0.248***	0.402*	0.364***	0.240***
	(0.065)	(0.000)	(0.000)	(0.060)	(0.000)	(0.000)
% farmers				1.127***	0.919***	0.645***
				(0.000)	(0.000)	(0.000)
% craftsmen				0.765***	0.647***	0.421***
				(0.000)	(0.000)	(0.000)
% white collars				-0.229	-0.342***	-0.480***
				(0.150)	(0.000)	(0.000)
% intermediate workers				-0.105	-0.160*	-0.172***
				(0.451)	(0.056)	(0.001)
% employees				0.389***	0.301***	0.172***
				(0.006)	(0.000)	(0.001)
% female				0.447	0.668***	0.331***
				(0.118)	(0.000)	(0.003)
% secondary education				0.294**	0.328***	0.362***
				(0.016)	(0.000)	(0.000)
Constant	0.779***	0.776***	0.788***	0.285*	0.223**	0.470***
	(0.000)	(0.000)	(0.000)	(0.067)	(0.016)	(0.000)
Observations	4,349	9,985	18,794	4,264	9,793	18,362
R-squared	0.115	0.144	0.182	0.130	0.161	0.198
Pop window	25	50	75	25	50	75

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 17: Mechanisms for logitBBT (corresponding to col. 1-3 of table **??**)

	(1)	(2)	(3)	(4)
VARIABLES	logitBBT	logitBBT	logitBBT	logitBBT
name_to_list	-0.025***	0.161***		0.156***
	(0.002)	(0.000)		(0.000)
1 list		-0.496***		-0.485***
		(0.000)		(0.000)
3 lists				0.048***
				(0.000)
4+ lists				0.088***
				(0.000)
0b.name_to_list#0b.lists_1			0.000	
			(.)	
0b.name_to_list#1.lists_1			-0.332***	
			(0.000)	
1.name_to_list#0b.lists_1			0.172***	
			(0.000)	
1.name_to_list#1.lists_1			-0.342***	
			(0.000)	
D ln population	-0.113***	-0.093***	-0.087***	-0.085***
	(0.000)	(0.003)	(0.006)	(0.007)
D %farmers	-0.742**	-1.005***	-0.958***	-0.952***
	(0.046)	(0.005)	(0.006)	(0.006)
D %self employed	0.030	0.070	0.068	0.076
	(0.739)	(0.413)	(0.421)	(0.376)
D %managers and enginers	-0.096	-0.034	-0.038	-0.034
	(0.271)	(0.683)	(0.646)	(0.687)
D %intermediate workers	-0.145**	-0.100*	-0.100*	-0.097*
	(0.037)	(0.084)	(0.084)	(0.095)
D %with wollars	-0.099	-0.061	-0.060	-0.056
	(0.151)	(0.334)	(0.342)	(0.371)
D %female	0.146	0.191	0.189	0.183
	(0.307)	(0.157)	(0.161)	(0.174)
D %secondary education	0.041	0.035	0.039	0.038
	(0.458)	(0.462)	(0.408)	(0.419)
Constant	-0.191***	-0.180***	-0.185***	-0.188***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	13,971	13,971	13,971	13,971
R-squared	0.004	0.228	0.231	0.231

Robust pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 18: Mechanisms for logitVVT (corresponding to col. 4-6 of table **??**)

	(1)	(2)	(3)	(4)
VARIABLES	logitVVT	logitVVT	logitVVT	logitVVT
name_to_list	-0.200***	0.124***		0.116***
	(0.000)	(0.000)		(0.000)
1 list		-0.866***		-0.847***
		(0.000)		(0.000)
3 lists				0.082***
				(0.000)
4+ lists				0.126***
				(0.000)
0b.name_to_list#0b.lists_1			0.000	
			(.)	
0b.name_to_list#1.lists_1			-0.523***	
			(0.000)	
1.name_to_list#0b.lists_1			0.148***	
			(0.000)	
1.name_to_list#1.lists_1			-0.756***	
			(0.000)	
D ln population	-0.087**	-0.052	-0.039	-0.040
	(0.038)	(0.186)	(0.323)	(0.311)
D %farmers	-0.582	-1.041***	-0.944**	-0.958**
	(0.208)	(0.007)	(0.013)	(0.011)
D %self employed	-0.036	0.033	0.031	0.044
	(0.750)	(0.732)	(0.752)	(0.658)
D %managers and enginers	-0.119	-0.011	-0.020	-0.010
	(0.229)	(0.899)	(0.815)	(0.903)
D %intermediate workers	-0.231***	-0.152**	-0.152**	-0.147**
	(0.008)	(0.021)	(0.022)	(0.027)
D %with wollars	-0.149*	-0.083	-0.080	-0.076
	(0.072)	(0.212)	(0.222)	(0.255)
D %female	0.084	0.162	0.158	0.149
	(0.632)	(0.278)	(0.288)	(0.311)
D %secondary education	0.043	0.033	0.042	0.038
	(0.580)	(0.571)	(0.469)	(0.511)
Constant	-0.173***	-0.154***	-0.165***	-0.167***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	13,976	13,976	13,976	13,976
R-squared	0.044	0.446	0.453	0.450

Robust pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

9.1.2 Results for the Difference in discontinuity

Table 19: Results of the difference in discontinuity estimations for BBT and VVT

	(1)	(2)	(3)	(4)
VARIABLES	Logit(Ballot Box Turnout)		Logit(Valid Vote Turnout)	
Intercept 2008 (α_{00}	3.032***	3.035***	2.851***	2.850***
	(0)	(0)	(0)	(0)
Intercept 2014 (α_{01})	3.033***	3.033***	2.860***	2.860***
	(0)	(0)	(0)	(0)
Initial slope 2008 (α_{10})	-0.270***	-0.271***	-0.270***	-0.270***
	(0)	(0)	(0)	(0)
Initial slope 2014 (α_{11})	-0.304***	-0.304***	-0.302***	-0.302***
	(0)	(0)	(0)	(0)
Break at 1000 inhab. 2014 (β_{01})	-0.0401***	0.296***	-0.299***	0.238***
	(0.00134)	(0)	(0)	(0)
Slope change at 1000 inhab. 2014 (γ_{01})	0.138***	-0.0164	0.285***	0.0386
	(1.32e-07)	(0.527)	(0)	(0.127)
Break at 3500 inhab. 2008 (β_{10})	0.0345**	0.115***	-0.00481	0.125***
	(0.0360)	(0)	(0.785)	(0)
Slope change at 3500 inhab. 2008 (γ_{10})	0.0196	-0.0476*	0.105***	0.00227
	(0.472)	(0.0743)	(0.000170)	(0.918)
Only one list in 2008		-0.499***		-0.876***
		(0)		(0)
Only one list in 2014		-0.622***		-0.995***
		(0)		(0)
Observations	30,883	30,744	30,888	30,749
R-squared	0.864	0.884	0.783	0.854

Robust pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 20: Results of the difference in discontinuity for BBT and VVT considering all threshold from table **??**

	(1)	(2)
VARIABLES	Logit(Ballot Box Turnout)	Logit(Valid Vote Turnout)
Intercept 2008	3.419***	3.168***
	(0)	(0)
Intercept 2014	3.033***	2.860***
	(0)	(0)
Initial slope 2008	-0.330***	-0.319***
	(0)	(0)
Initial slope 2014	-0.304***	-0.302***
	(0)	(0)
Break at 1000 inhab. 2008	0.0540***	0.0428**
	(0.00192)	(0.0104)
Break at 1000 inhab. 2014	-0.0438**	-0.311***
	(0.0163)	(0)
Slope change at 1000 inhab. 2008	-0.0167	0.0116
	(0.801)	(0.856)
Slope change at 1000 inhab. 2014	0.188***	0.378***
	(0.00924)	(7.75e-05)
Break at 1500 inhab. 2008	0.00383	-0.0155
	(0.857)	(0.420)
Break at 1500 inhab. 2014	-0.0134	-0.0342
	(0.555)	(0.269)
Slope change at 1500 inhab. 2008	0.0749	0.0617
	(0.355)	(0.414)
Slope change at 1500 inhab. 2014	-0.104	-0.106
	(0.225)	(0.365)
Break at 2500 inhab. 2008	-0.00898	-0.00412
	(0.739)	(0.868)
Break at 2500 inhab. 2014	-0.000532	-0.0306
	(0.984)	(0.404)
Slope change at 2500 inhab. 2008	0.0668	0.00345
	(0.624)	(0.977)
Slope change at 2500 inhab. 2014	0.156	0.273
	(0.219)	(0.103)
Break at 3500 inhab. 2008	0.0157	-0.0181
	(0.648)	(0.601)
Break at 3500 inhab. 2014	0.00498	-0.00159
	(0.875)	(0.968)
Slope change at 3500 inhab. 2008	-0.00953	0.0902
	(0.957)	(0.602)
Slope change at 3500 inhab. 2014	-0.0716	-0.299
	(0.655)	(0.138)
Break at 5000 inhab. 2008	0.000801	0.0190
	(0.981)	(0.589)
Break at 5000 inhab. 2014	-0.0179	-0.00659
	(0.524)	(0.844)
Slope change at 5000 inhab. 2008	-0.0559	-0.0599

9.1.3 Tables for the actual turnout (BBT and VVT) instead of $\log \frac{turn}{1-turn}$

Following the theoretical explanation of the paper, the tables of the paper have been obtained using the logit transformation of the turnout (i.e. $\log \frac{turn}{1-turn}$). In this section, we reproduce the same estimation using the actual turnout (either BBT or VVT) instead of the logit transformation. For simplicity, tables are numbered A.?? to A.?? where A stands for "appendix" and the number correspond to the corresponding the table in the paper.

Table A.??. RDD: effect of crossing the 3,500 threshold in 2008 for the BBT

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	25%	50%	75%	25%	50%	75%
$\mathbb{I}[Pop_i \geq 3,500]$	0.033	0.033	0.062***	0.013	0.025	0.051**
	(0.397)	(0.219)	(0.006)	(0.715)	(0.315)	(0.015)
controls	NO	NO	NO	YES	YES	YES
Pop window	25	50	75	25	50	75

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A.??. RDD: effect of crossing the 3,500 threshold in 2008 for the VVT

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	25%	25%	25%	25%	25%	25%
I3500	-0.386	-0.335	0.351	-0.862	-0.549	0.110
	(0.675)	(0.573)	(0.434)	(0.314)	(0.322)	(0.796)
controls	NO	NO	NO	YES	YES	YES

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A.??. RDD: effect of crossing the 1,000 threshold in 2014 for the BBT

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	25%	25%	25%	25%	25%	25%
I1000	-1.196**	-1.136***	-1.290***	-1.327***	-1.233***	-1.334***
	(0.015)	(0.001)	(0.000)	(0.006)	(0.000)	(0.000)
controls	NO	NO	NO	YES	YES	YES

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A.??. RDD: effect of crossing the 1,000 threshold in 2014 for the VVT

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	25%	25%	25%	25%	25%	25%
I1000	-7.564***	-7.515***	-7.493***	-7.623***	-7.522***	-7.443***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
controls	NO	NO	NO	YES	YES	YES

pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A.**??**. First difference - The net effect of the reform on ΔBBT

	(1)	(2)	(3)	(4)
VARIABLES	500-9999	500-9999	750-4999	750-4999
name_to_list	-0.861***	-0.863***	-1.231***	-1.236***
	(0.000)	(0.000)	(0.000)	(0.000)
D ln population	-1.828***	-1.901***	-1.537**	-1.548**
	(0.001)	(0.001)	(0.044)	(0.049)
D %farmers		-5.457		-7.796
		(0.335)		(0.376)
D %self employed		-0.281		-2.591
		(0.857)		(0.249)
D %managers and enginers		-2.137		-3.572
		(0.181)		(0.103)
D %intermediate workers		-3.203**		-5.643***
		(0.012)		(0.003)
D %with wollars		-1.857		-3.083*
		(0.130)		(0.090)
D %female		2.498		-0.028
		(0.330)		(0.993)
D %secondary education		0.712		0.147
		(0.485)		(0.941)
Constant	-3.580***	-3.558***	-3.264***	-3.180***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	13,977	13,977	8,724	8,724
R-squared	0.005	0.006	0.006	0.008

Robust pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A.??. First difference - The net effect of the reform on ΔVVT

	(1)	(2)	(3)	(4)
VARIABLES	500-9999	500-9999	750-4999	750-4999
name_to_list	-5.061***	-5.065***	-5.493***	-5.500***
	(0.000)	(0.000)	(0.000)	(0.000)
D ln population	-1.547*	-1.633*	-0.843	-0.822
	(0.079)	(0.072)	(0.534)	(0.556)
D %farmers		-6.539		-8.487
		(0.483)		(0.707)
D %self employed		-1.439		-4.927
		(0.549)		(0.238)
D %managers and enginers		-2.867		-5.146
		(0.176)		(0.125)
D %intermediate workers		-5.124***		-9.279***
		(0.007)		(0.003)
D %with wollars		-3.179*		-5.557*
		(0.068)		(0.060)
D %female		1.813		-1.186
		(0.618)		(0.828)
D %secondary education		0.874		0.069
		(0.600)		(0.982)
Constant	-3.535***	-3.490***	-3.215***	-3.076***
	(0.000)	(0.000)	(0.000)	(0.000)
Observations	13,977	13,977	8,724	8,724
R-squared	0.055	0.056	0.037	0.038

Robust pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table A.**??**. Mechanisms for BBT and VVT

	(1)	(2)	(3)	(4)	(5)	(6)
VARIABLES	BBT	BBT	BBT	VVT	VVT	VVT
name_to_list	-0.863***	3.204***		-5.065***	2.609***	
	(0.000)	(0.000)		(0.000)	(0.000)	
1 list		-10.867***			-20.501***	
		(0.000)			(0.000)	
name_to_list=0 & single_lists=0			ref.			ref.
name_to_list=0 & single_lists=1			-8.398***			-13.237***
			(0.000)			(0.000)
name_to_list=1 & single_lists=0			3.377***			3.116***
			(0.000)			(0.000)
name_to_list=1 & single_lists=1			-7.765***			-18.194***
			(0.000)			(0.000)
Constant	-3.558***	-3.323***	-3.400***	-3.490***	-3.046***	-3.273***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Observations	13,977	13,977	13,977	13,977	13,977	13,977
R-squared	0.006	0.311	0.312	0.056	0.517	0.524
controls	YES	YES	YES	YES	YES	YES

Robust pval in parentheses

*** p<0.01, ** p<0.05, * p<0.1

9.1.4 Testing all the thresholds

Table 21: Join tests of the effect of all the thresholds on break and change of slope (P-values)

	Ballot Box Turnout		Valid Vote Turnout	
Threshold	2008 election	2014 election	2008 election	2014 election
1000	0.004	0.015	0.014	0.000
1500	0.645	0.438	0.467	0.405
2500	0.879	0.402	0.986	0.261
3500	0.897	0.893	0.786	0.333
5000	0.887	0.804	0.631	0.927