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A few signatures matter: Barriers to entry in Italian local politics

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ABSTRACT

Competition for public office is an essential feature of democracy but having many candidates competing for the same position might lead to voter confusion and be counterproductive. In current democracies, ballot access regulations limit citizens' right to become candidates, seeking to balance this trade-off by discouraging frivolous contenders. This paper examines the causal effect of signature requirements – a widespread ballot access regulation – and finds that their impact goes beyond this goal. I use data on Italian local elections and apply a regression discontinuity design (RDD) to estimate the effects of these requirements on electoral competition, candidates' selection, voter participation and administrative efficiency. I find that signature requirements reduce the number of candidates running for office, decrease electoral competition, lead to a more experienced pool of candidates, and reduce voter turnout. The positive effects of this policy are observed in municipalities with fragmented political systems, where signature requirements lead to fewer wasted votes and fewer spoiler candidates. The downside is observed in municipalities with concentrated political systems: signature requirements increase the frequency of uncontested races and reduce voter participation. Findings reveal how this barrier to entry impacts key dimensions of democracy and indicate that designing efficient electoral institutions requires a clear understanding of local political contexts.

> "In an ideal political democracy competition is free in the sense that no appreciable costs or artificial barriers prevent an individual from running for office, and from putting a platform before the electorate."
>
> – Gary S. Becker, *Competition and Democracy*

> "Between this ideal case [free competition for a free vote] which does not exist and the cases in which all competition with the established leader is prevented by force, there is a continuous range of variation within which the democratic method of government shades off into the autocratic one by imperceptible steps."
>
> – Joseph A. Schumpeter, *Capitalism, Socialism and Democracy*

1. Introduction

Competition for public office is an essential feature of democracy. The presence of alternative viable candidates allows voters to express their preferences and keeps incumbents accountable. Indeed, political competition has been associated with positive

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economic and policy outcomes, such as high economic growth (Besley et al., 2010) and active legislative representation (Konisky and Ueda, 2011). However, having many candidates competing for the same position may be counterproductive: it increases the complexity of voters' choices, potentially leading to voter confusion and the misrepresentation of the majority (Shue and Luttmer, 2009; Lau et al., 2014). In current democracies, ballot access regulations limit citizens' right to become candidates, seeking to balance this trade-off by discouraging frivolous candidates who do not have popular support and simply add noise to the electoral process.[2]

These artificial barriers to entry separate existing democracies from the democratic ideal of "free competition for a free vote" (Schumpeter, 2013) and might harm voters by substantially limiting the supply of candidates. Their potential value, however, is supported by recent studies that document possible benefits of having few candidates, especially under the plurality rule. First, such barriers may reduce the risk of voter confusion (Shue and Luttmer, 2009) and the prevalence of ballot order and adjacency effects by which candidates (particularly marginal ones) receive votes due to a favorable position on the ballot (Ho and Imai, 2008; King and Leigh, 2009). Second, fewer candidates may reduce vote splitting, which occurs when people with similar preferences fail to coordinate, vote for different candidates, and dilute their chances of winning (Hall and Snyder, 2015; Pons and Tricaud, 2018). Pons and Tricaud (2018) show, in the context of French parliamentary and local elections, that the presence of a third candidate reduces the vote share for the top candidate closest ideologically to her, frequently affecting the outcome of the election. The participation of a third candidate "often results in an outcome that harms a majority of her supporters (...) and a majority of voters" (Pons and Tricaud, 2018, p. 1623).

A frequent institutional response to avoid an excess of candidates is requiring prospective candidates to collect a certain number of signatures to run for public office. This rule is now commonly accepted and has become the most widespread method of regulating candidacy submissions in current democracies.[3] Indeed, the "Code of Good Practice in Electoral Matters" (European Commission for Democracy through Law, 2002) provides recommendations on how these signature requirements should be implemented, indicating that they are theoretically compatible with the principle of universal suffrage.[4] The document supports the commonly-held view that "only the most marginal parties seem to have any difficulty gathering the requisite number of signatures" (European Commission for Democracy through Law, 2002, p. 16).

However, despite its ubiquity and acceptance, there is scarce well-identified evidence on how these requirements impact electoral competition and whether and how they affect other related political outcomes. The ideal experiment to answer these questions requires to compare elections between constituencies that differ only in the presence or lack of signature requirements. In this paper, I exploit a "natural experiment" that closely resembles this ideal study. I use a regression discontinuity design (RDD) to estimate the causal effects of signature requirements on Italian municipal elections, exploiting the fact that candidates in cities with less than 1000 inhabitants are exempt from this requirement (which applies to all other municipalities). I use information on more than 5000 mayoral elections in small municipalities during the period 1993–2000, when the exemption in signature requirements did not coincide with any other policy change.

The paper contributes to the literature on the impacts of both political institutions and administrative burdens by providing novel and rigorous evidence on the causal effects of signature requirements on a broad set of electoral and policy outcomes. Based on this evidence, it also provides a theoretical framework to guide the normative assessment of the effects of signature requirements and inform about features of the political context that could moderate these effects.

The quasi-experimental variation in signature requirements and the existence of abundant data on Italian municipalities makes it possible to test how this widespread ballot access regulation – and their associated costs – affect the entry decisions of potential candidates and how changes in the candidate pool driven by this barrier shape voter behavior. To this end, I examine the impact of signature requirements on the number of candidates, electoral competition, voter participation, administrative efficiency, and candidates' personal characteristics. Finally, informed by a theoretical framework that highlights the relevance of political fragmentation in shaping the effects of barriers to entry in politics, I assess how these effects look like in municipalities with high and low levels of political fragmentation.

I find that signature requirements reduce the number of candidates by 0.21, a 10 percent drop relative to the mean observed just below the threshold. However, this reduction is not driven solely by marginal candidates and does not seem to substantially simplify voters' choices. The frequency of elections with more than two candidates, the number of wasted votes (defined as votes to candidates other than the top two), and the presence of potential spoiler candidates (that is, third candidates obtaining more votes than the difference between the winner and the runner-up) fall only slightly with signature requirements, and changes are not statistically different from zero (at standard significance levels). Instead, signature requirements lead to a reduction in political

[2] Abrams (1996) examines the US Supreme Court's reviews of state ballot access laws, presenting arguments for and against them. In *Storer v. Brown* (1974), for example, the US Supreme Court recognized the "substantial state interest" in providing the electorate with an understandable ballot and therefore supported "reasonable requirements for ballot position". In Italy, signature requirements are intended to prove the candidates' representativeness of the electorate (*Istruzioni per la presentazione e l'ammissione delle candidature*, Italian Ministry of Internal Affairs).

[3] Afghanistan, Albania, Algeria, Andorra, Austria, Azerbaijan, Belarus, Belgium, Bosnia and Herzegovina, Bulgaria, Burundi, Canada, Croatia, Denmark, Ethiopia, Germany, Grenada, Guyana, Hungary, Iceland, Italy, Libya, Liechtenstein, Lithuania, Luxembourg, Mongolia, Montenegro, Netherlands, Norway, Palau, Poland, Republic of Korea, Romania, Russian Federation, Rwanda, Senegal, Slovenia, Suriname, Switzerland, Turkey, Turkmenistan, Tuvalu, and the United Kingdom are among the countries identified by the Inter-Parliamentary Union (IPU) as requiring candidates to provide signatures or nominations from electors to participate in parliamentary elections. In some countries, these requirements apply only to independent candidates or to just one of the chambers. The information was obtained from the website: https://www.ipu.org/ (accessed on October 10th, 2019).

[4] In this context, the principle of universal suffrage includes both the universal right to vote (active suffrage) and the universal right to stand for election (passive suffrage).

competition.[5] The frequency of unopposed races jumps from 10 to 17 percent, the average winner's margin increases 11 percentage points (from 29 percent to 40 percent), and the number of both "effective" candidates (Laakso and Taagepera, 1979) and "non-marginal" candidates falls.[6] This reduction in political competition and, particularly, the decrease in the number of non-marginal candidates exceed signature requirements' aim of avoiding frivolous candidates and points to the first risk of these requirements: acting as a barrier to entry for serious potential candidates and thereby reducing electoral competitiveness.

I then assess whether the observed reduction in electoral competition is driven by particular types of candidates. I use information on personal characteristics of mayoral candidates to determine whether signature requirements alter the profiles of contenders and elected mayors. I find that the signature requirements reduce the proportion of young candidates and candidates without local government experience. I also construct a measure of candidates' attractiveness (based on personal characteristics associated with winning elections) and find no significant change in this variable at the cutoff, a result that reinforces the idea that signature requirements do not discourage only frivolous or unattractive candidates.

In addition to investigating these effects on candidate entry, I assess signature requirements' impact on voter participation, an effect that could be driven by the reduction in electoral competition (Palfrey and Rosenthal, 1983; Myatt, 2015; Feddersen and Sandroni, 2006; Coate and Conlin, 2004) or the absence of their candidates of choice (Pons and Tricaud, 2018). I find evidence consistent with these models of voting behavior: signature requirements lead to a drop in voter turnout (by 3.6 percentage points), and an increase in the number of blank and null votes. These findings point to the second risk of signature requirements and barriers to political entry: reduced voter engagement. Electoral participation is considered an essential feature of a healthy democracy, and, therefore, policies with the potential to affect it should be carefully evaluated.

Lastly, I assess whether signature requirements impact municipalities' budget allocation (shares of investments and current expenditures in total spending) and administrative efficiency. I find that signature requirements lead to a large and significant increase in the speed of investment payments – an indicator of administrative efficiency – but have no effects on the municipalities' budget allocation.[7] Overall, the extent of the impact on policy choices and implementation (as captured in budget data) appears small relative to the observed changes in political representation and participation.

I build on the observed results on electoral competition to propose a framework that guides the normative assessment of the effects of signature requirements and provides insights on features of local contexts that could moderate them. The framework presents a simple trade-off: increasing running costs can reduce vote splitting at the expense of an increased risk of uncontested elections. In the model, there is one candidate who always runs for office and two potential contenders (each representing one of two groups with similar preferences).[8] If only one contender runs, there are no wasted votes, and the majoritarian candidate wins. However, if the two contenders run, the electorate's votes split, and the majority might be misrepresented. Likewise, if no contender runs, the only candidate wins even when she does not represent the majority. Running costs influence contenders' entry decisions: an increase in these costs reduces the likelihood of three-candidate races ("positive" margin) but increases the chances of uncontested elections ("negative" margin). The impact of a change in the running costs on each of these two margins depends on the contenders' winning chances and, therefore, on the relative sizes of the groups and the ability of voters to coordinate.

I try to capture these features of the local political context using a measure of political concentration and assess whether the impact of signature requirements varies with it. I use the distribution of council seats in the year 1992 (before the exemption in signature requirements was introduced) to build a measure of fragmentation of the political system for each municipality in the sample, and I estimate the regression discontinuity (RD) effect in cities of low and high fragmentation separately. The presence of more groups and no absolute majorities in councils can be associated both with the absence of clear favorites and with more dispersed preferences and lower coordination across groups. Indeed, in cities with fragmented political systems, the introduction of signature requirements has a significant impact on the "positive" margin — the number of races with more than two candidates, the number of wasted votes, and the presence of potential spoiler candidates significantly drop at the cutoff without a significant change in the number of uncontested races. In cities with concentrated political systems, the number of unopposed races more than doubles at the cutoff, and there are no significant changes on the "positive" margin. The described framework provides a clear normative assessment of these results: signature requirements reduce the potential misrepresentation of the majority in cities with fragmented political systems but increase misrepresentation in politically concentrated ones.

The differential impact of signature requirements on political competition across municipalities also helps demonstrate the drivers of voter participation. In cities with concentrated councils where signature requirements lead to a jump in the frequency of unopposed races, voter turnout drops and the number of blank and null votes increases. Contrastingly, voter participation does not significantly change in cities with dispersed political power. This finding links the two main risks of barriers to entry in politics, associating an increase in uncontested elections with a decrease in voter participation.

[5] Throughout the paper, the concept of political (or electoral) competition refers to the presence of multiple viable candidates competing for voters' support and resulting in balanced elections.

[6] The number of "effective" candidates is given by the inverse of the sum of the squared vote shares of all candidates (that is, the inverse of the Herfindahl–Hirschman vote concentration index). The number of "non-marginal" candidates is defined as the number of candidates who obtain more than 25% of voter support or at least 85% of the winner's number of votes. These two measures of political competition are mostly unaffected by the addition or exclusion of candidates who receive small shares of votes.

[7] The speed of payments is equal to the ratio between cash basis and accrual basis expenditures. Its value ranges from 0 to 1, with a higher number indicating that the municipality complies with its payment obligations faster (that is, the same year expenditures are accrued).

[8] The setting resembles that of a "divided majority" analyzed in various articles in the literature that examine multicandidate elections (see, for example, Bouton and Ogden, 2017).

The results in this paper have two main implications. First, they highlight the importance and the potential costs of institutional barriers to entry: signature requirements change the observed extent of both electoral contestation and participation, two dimensions considered central to democratic functioning. Second, they stress the relevance of the interaction between institutional and political factors in shaping politicians' and voters' behavior, pointing to the need of understanding local political contexts to design efficient institutions.

This paper contributes to several strands of literature. First, it adds to the study of the impact of administrative burdens on the access to public services and the exercise of citizens' fundamental rights (Herd and Moynihan, 2019). This literature has shown how frictions in applications' rules and processes have significant effects on people's lives, affecting, for example, the choice and access to college education (Bettinger et al., 2012), the take-up of tax benefits (Bhargava and Manoli, 2015), and the choice of health plans (Kling et al., 2012). This paper extends these insights to the context of political candidacies, providing strong evidence in support of two of the main tenets of this literature: administrative burdens are consequential and have distributive effects, as they affect some groups more than others (Herd and Moynihan, 2019).

Second, this paper relates to the set of articles examining barriers to entry in politics. The existing literature has focused mainly on legislative elections in the United States where most restrictions apply only to independent candidates, and it has relied on selection-on-observables assumptions (Ansolabehere and Gerber, 1996; Stratmann, 2005) or on difference in differences (Drometer and Rincke, 2009; Kapoor and Magesan, 2018). The evidence in these papers associates stricter requirements with fewer candidates, especially independent or from minor parties. This paper contributes to this literature by providing causal evidence of this relationship using a novel identification strategy.[9] By doing so, it provides evidence on the empirical validity of one of the most fundamental results of citizen-candidate models (Osborne and Slivinski, 1996; Besley and Coate, 1997): that running costs reduce the equilibrium number of (non-marginal) candidates. The evidence presented also emphasizes the importance of political contexts in moderating the effects of these requirements.[10]

Thirdly, it contributes to the analysis of the institutional and political factors affecting voter participation. Most of the earlier work on this topic used cross-country comparisons to examine the role of compulsory voting, electoral systems (proportional vs. majority) and voter registration requirements in determining voter participation (Blais, 2006; Cancela and Geys, 2016). In recent years, new studies have begun to complement these analyses by exploiting quasi-experimental variation in the institutional framework across sub-national units and have found, for example, significant effects of compulsory voting (Hoffman et al., 2017), proportional representation (Eggers, 2015) or concurrent elections (Cantoni et al., 2021) on voter participation. This study adds to this latter literature and presents evidence on the impact of barriers to entry for candidates on voter participation. It also provides evidence on the possible mechanisms underlying this relationship (i.e. electoral competition and number of candidates) and the political factors that moderate it (political fragmentation). Since signature requirements are unlikely to have a direct impact on voter participation, the results of this study provide suggestive evidence of a causal link between the supply of political candidates and voter participation, a relationship that has been difficult to verify in the literature due to the pervasiveness of potential reverse causality and omitted variable biases.

Finally, in terms of methodology, this paper ties into a developing strand of literature that uses RD designs based on population thresholds to assess the impacts of various policies on political and economic outcomes. Regarding Italian municipalities, recent articles have examined the effects of politicians' remuneration (Gagliarducci and Nannicini, 2013), electoral rules (Bordignon et al., 2016), fiscal rules (Grembi et al., 2016), term limits (De Benedetto and De Paola, 2019) and gender quotas (Spaziani, 2022).[11]

The remainder of the paper is structured as follows: Section 2 describes Italian municipalities' institutional setting. Section 3 presents the data sources and the empirical strategy. Section 4 describes the main hypotheses and empirical results. Section 5 presents a theoretical framework describing the possible effects of signature requirements on the misrepresentation of the majority, and Section 6 assesses its empirical validity. Section 7 presents conclusions.

2. Signature requirements in Italian municipalities

Municipalities are the smallest administrative units in Italy and are in charge of the provision of several public services (including waste management, urban planning and permits, and social services). Each municipal government is composed by a mayor, an executive committee and a local council. These local institutions are regulated by national laws, which have been modified in different occasions during the last decades. In 1993, the National Parliament overhauled the municipalities' institutional framework,

[9] Arnold and Freier (2015) use a similar empirical strategy to assess the effect of signature requirements on citizen initiatives. Using municipal-level data for Germany, they find that reducing signature requirements increases the likelihood of observing an initiative petition.

[10] Other related papers have examined the role of campaign spending as a barrier to entry in politics (Milligan and Rekkas, 2008). In ongoing research, Avis et al. (2018) exploit a discontinuity in the rule establishing campaign spending limits for Brazilian mayoral candidates. They find that higher spending limits act as a barrier to entry, leading to fewer, more experienced and wealthier candidates. Their results regarding political competition and selection are similar to the findings in this paper; this helps in drawing a clear connection between two different forms of barriers to entry. In the setting examined here, in contrast to the Brazilian case, turnout is not mandatory; this allows me to examine how changes in the candidate pool impact voter participation. Avis et al. (2018) do not observe changes in this dimension.

[11] Eggers et al. (2018) provide a brief review of this literature and warn about the manipulation of population figures in Italy and other European countries, which could invalidate the RD assumptions and causal interpretations of the results. In the case examined in this paper, population data is predetermined relative to the policy change, ruling out the possibility of strategic sorting around the threshold. Nonetheless, I provide various validity checks that reveal no evidence of manipulation.

and established the direct election of the mayor in replacement of the existent parliamentary system.[12] The new law strengthened the role of the mayor, who became the "crucial player of municipal politics in Italy" (Bordignon et al., 2016, p. 2355), responsible for the administration and representation of the municipality, and with the right to appoint the members of the executive committee. The local council, also elected by the voters and previously the main local institution, remained only as a supervisory body, controlling governmental activities and voting on the local budget.[13]

In municipalities with less than 15,000 inhabitants, each mayoral candidate must be accompanied by a single list of candidates for the local council. Elections consist of a single round and voters cannot split their decision: they vote jointly for mayor and council members. The candidate with most votes wins the mayor position, and her companion list gets 2/3 of the seats in the council.[14,15] To participate in the election, each candidate must file an administrative programme to be posted on the municipality's notice board and a petition undersigned by a number of registered voters (who cannot be among the list of candidates for the local council).[16,17] Each citizen can only subscribe to one of the lists, and signatures must be certified either by a public notary or by the local authorities. The set of instructions for the presentation of political candidacies published by the Italian Ministry of Internal Affairs indicates that the collection of signatures is intended to ensure the representativeness of those who participate in the electoral race.[18] The amount of signatures needed depends on the population of the municipality, as computed by the last available national census, and jumps at nine different thresholds.

In municipalities with less than 1000 inhabitants, candidates do not need to present signatures.[19] From that population threshold onwards, all candidates must collect some amount of subscriptions to participate in local elections: in particular, in municipalities with up to 2000 inhabitants, candidates must collect and certify 30 signatures.[20]

The jumps in the number of required signatures facilitate the use of a RDD to assess the causal effect of stricter ballot access restrictions on local political outcomes. However, in most cases, changes in signature requirements coincide with changes in other features of local institutions, compromising the plausibility of the identification assumptions.[21] In the 5000 and 100,000 thresholds, mayors and council members remuneration increases. In the 10,000, 500,000 and one million thresholds, the size of the council increases. I focus the empirical analysis on the 1000 inhabitants threshold for two main reasons. First, signature requirements are introduced at this threshold, thus permitting to compare two qualitatively different scenarios: *with* and *without* signature requirements (as opposed, for example, to the 2000-inhabitants threshold where the change happens only in the intensive margin). The introduction of signature requirements implies that candidates go through a pre-electoral screening and have to deal with a greater amount of bureaucratic procedures and administrative burden (absent in municipalities below the threshold).[22] Second, a practical consideration: sample size is large around the threshold and allows for a precise statistical analysis.[23]

For the empirical analysis, I consider just the period 1993–2000, since a law passed in October 2000 (*Legislative Decree 267/2000*) set a 10-percent increase in the mayors' wage at the 1000-inhabitants threshold, introducing a potential confounding factor and compromising the soundness of the assumption needed to identify a causal effect. The law also reduced the number of

[12] Until 1993, citizens voted in an open list system for council members. The elected council would then choose the mayor. Law 81/1993 introduced the direct election of the mayor and established the institutional setting for Italian municipalities until the year 2000 (when it was replaced by *Legislative Decree 267/2000*). The law specified, among other things, the electoral rules, the requirements for potential candidates, and the responsibilities of elected officials and government bodies.

[13] The council can terminate the mayoral term by approving a vote of no confidence. That decision, which is really infrequent in Italian municipalities, implies also the dissolution of the council itself.

[14] Only if the two most voted candidates receive the exact same amount of votes, there is a second round.

[15] The remaining 1/3 seats are distributed proportionally among the other lists. To this end, the number of votes of each list is divided successively by 1, 2, 3, 4,..., until the number of seats to be allocated is reached, and then, from the quotients thus obtained, the highest quotients are chosen, in a number equal to that of the seats to be allocated, arranging them in a descending ranking. Each list obtains as many seats as the quotients belonging to it included in the ranking list (*Legge 25 marzo 1993, n. 81*).

[16] The administrative programme is a document intended to be the "mere statement of the candidate's main policy goals" *(Istruzioni per la presentazione e l'ammissione delle candidature* Italian Ministry of Internal Affairs. 2015. p. 235). The Italian law does not impose any formal requirements on this document.

[17] In Italy, all Italian citizens are entitled to vote and there is no need to formally register to vote. The only requirements are: (i) to be an Italian citizen, (ii) to be over the age of 18; (iii) to not have any pending cases that render you "incapabable of voting" (as, for example, having committed a crime); and (iv) to be registered as resident in the municipality. When voting, citizens must present an electoral card (*tessera elettorale*) that municipalities deliver at no charge at the citizen's address when they register as a resident of the municipality or turn 18 years of age.

[18] *Istruzioni per la presentazione e l'ammissione delle candidature*. Italian Ministry of Internal Affairs. 2015. p. 13

[19] As indicated earlier in this section, municipal electoral rules and institutions are regulated by national laws. Municipalities have no authority of voluntarily introducing changes to them and, therefore, municipalities below the 1000-inhabitants threshold cannot require mayoral candidates to collect signatures. As in all other municipalities, candidates need to present the administrative programme.

[20] The rule implies that, in municipalities with exactly 1000 inhabitants, candidates must collect signatures from 3 percent of the local population. A 3-percent signature requirement is high relative to the uses in other Western democracies. In the US, for example, those states with signature requirements generally ask for less than 1 percent of registered voters (Ansolabehere and Gerber, 1996). The *Code of Good Practice in Electoral Matters* (European Commission for Democracy through Law, 2003) argues for signature requirements being lower than 1% of the constituency concerned.

[21] Gagliarducci and Nannicini (2013) and Eggers et al. (2018) provide a description of the policy changes in Italian municipal institutions occurring at the different population thresholds. Their nonetheless detailed description overlooks the changes in signature requirements.

[22] The term *administrative burden* is used as defined by Herd and Moynihan (2019): the costs that people encounter when they search for information about public services (learning costs), comply with rules and requirements (compliance costs), and experience the stresses, loss of autonomy, or stigma that come from such encounters (psychological costs) (Herd and Moynihan, 2019, p. 2).

[23] Solow (2017) exploits the discontinuity in the number of required signatures at the 20,000 threshold (from 200 to 250 signatures) and finds that this increase in signature requirements reduces the probability of seeing a "sure loser" in a multi-candidate election and increases the likelihood of observing a "competitive" third place candidate.

signatures required to be a candidate in municipalities with 1000 to 2000 inhabitants from 30 to 25. The period and the threshold examined in this paper are particularly fit for the analysis for one additional reason: population figures used to determine the level of signature requirements come from the 1991 population census, and therefore were already determined when the jump in signature requirements at the 1000-inhabitants threshold was introduced. Before 1993, signature requirements for council lists in municipalities with less than 5000 inhabitants were determined according to the following scale: 10 for municipalities with up to 2000 inhabitants, and 30 for the others.[24] No policies were set to change at the 1000-inhabitants threshold. This is crucial to overcome potential concerns on strategic manipulation of population figures that could invalidate the conclusions of the empirical analysis (I discuss this point further in Section 4.2).

3. Data and empirical strategy

To assess the impact of signatures requirements on local political outcomes, I collected information on Italian municipalities with population between 250 and 1750 inhabitants for the period 1993–2000.[25] The sample consists of a total of 2693 municipalities (5408 electoral races) and includes information on electoral results, candidates' personal characteristics, municipal budgets, and socio-demographic indicators.[26]

3.1. Data sources

Municipal Elections. I obtained the information on municipal elections from the Historical Elections Archives published by the Italian Ministry of the Interior. The information includes the names of all mayoral candidates, the number of registered voters, the number of votes to each candidate, the number of blank and null votes, and the total seats in the local council obtained by each list in municipal elections since 1993.[27] I use these data to compute different measures of electoral competition and voter participation.

Candidates' Characteristics. The Register of Local Administrators published by the Italian Ministry of the Interior provides age, gender, party list, place of birth, and self-reported measures of educational attainment and occupation for all members of municipal governments (mayors, members of the executive committee, and councilmen) since 1985. I match this information using candidates' names in the electoral data to retrieve personal characteristics of 10,600 candidates (96.5 percent of the total) and to construct a measure of experience in municipal government for each candidate.

I complement candidates' personal information with data on the distribution of surnames by municipality computed from the universe of personal tax returns in 2005, originally used by Gagliarducci and Manacorda (2020).

Pre-1993 Councils Composition. I also use the information of the Register of Local Administrators to compute the composition of the local councils in the period 1985–1992.[28] I use the name of the party list of each council member to count the number of different groups in the council and to build a Herfindahl–Hirschman index of seat concentration (which gives the probability that two council members chosen at random belong to the same party). This index is a widely-used measure of concentration in legislatures. It is calculated as the sum of the square of the fractions obtained by each of the lists (i.e. $\Sigma_{i=1}^{N} s_i^2$, with s_i being the fraction of seats obtained by list i). The index takes its highest value (equal to 1) when one list has every seat in the legislature.

Socio-Demographic Indicators. I also use information from the Italian 1991 National Census published by the Italian National Institute of Statistics (Istat).[29] Importantly, from this census, I obtain the official number of inhabitants in each municipality. This figure is used to establish the number of signatures required to stand as candidate in local elections. I also obtain information on population density, age structure, and labor market conditions in the different municipalities.

Budget Information. I obtained data on annual municipal budgets for the period 1993–1999 from the Italian Ministry of the Interior. The information consists of total revenues and spending, and their main subdivisions (revenues: taxes, transfers, fees, and others; spending: current, capital and others) reported both in cash and accrual basis. I use this information to compute measures of the budget composition by municipality and local administrative efficiency.

3.2. Empirical strategy

To estimate the impact of signature requirements on any political outcomes of interest it is necessary to solve the endogeneity problem that arises if these requirements are correlated with other (potentially unobservable) variables that also determine it (as it is likely to happen, for example, if signature requirements are a constant fraction of constituencies' population). I use a sharp RDD to deal with this potential endogeneity issue, exploiting that signature requirements are introduced at the 1000-inhabitants

[24] *Decree 570/1960*, and its subsequent modifications.

[25] I focus on municipalities between 250 and 1750 inhabitants to have a symmetrical population bandwidth around the 1000-inhabitant threshold and stay sufficiently away from the 2000-inhabitants threshold (and avoid any issue that could arise from sorting or manipulation around that threshold).

[26] Municipalities in the sample have a total of 2.59 million inhabitants (approximately 4,5 percent of the Italian population at the time).

[27] The information was downloaded from the website: http://elezionistorico.interno.it/ (accessed on April 2nd, 2016). The data set does not include information on municipalities in Sicilia, Valle d'Aosta, Friuli-Venezia Giulia and Trentino-Alto Adige. The electoral information for these regions is not systematically reported in the consulted source.

[28] Electoral information for the municipalities in the sample is available only from 1993, after the change in the electoral system described in Section 2.

[29] Census results are publicly available at Istat's website: http://ottomilacensus.istat.it/ (accessed on April 7, 2016)

threshold. This institutional setting generates arguably exogenous variation in signature requirements, allowing me to estimate their causal effect on local political outcomes.

Following Hahn et al. (2001), I use the Rubin causal framework to state the identification assumption that allows me to estimate the (local) effect of signature requirements. Let $Y_i(r)$ be the potential outcome Y in municipality i given an institutional setting (r), which can be either "no signature requirements" (n) or "signature requirements" (s). The potential outcome is the value a variable would take under either institutional arrangement and might depend on population (P). I make the following assumption:

RDD assumption. $E[Y_i(s)|P=p]$ and $E[Y_i(n)|P=p]$ are continuous in P at P_0.

The assumption states that the potential outcomes of the variables of interest do not show a discontinuity at the relevant threshold. Under this continuity assumption, a jump in these variables at that threshold can be interpreted as an effect of the introduction of signature requirements. Hence, the local average treatment effect at the threshold $\tau_{SRD} \equiv E[Y_i(s) - Y_i(n)|P=P_0]$ can be identified by:

$$\tau_{SRD} = \mu_+ - \mu_- \quad \text{with} \quad \mu_+ \equiv \lim_{p \to P_0^+} E[Y_i(s)|P=p] \quad \text{and} \quad \mu_- \equiv \lim_{p \to P_0^-} E[Y_i(n)|P=p]$$

For estimation and inference, I follow Calonico et al. (2014b,a) and use a local-linear estimator of τ_{SRD}, obtained by computing the difference in intercepts of two first-order local polynomial estimators, one from each side of the threshold. The estimator ($\hat{\tau}_{SRD}$) is formally given by:

$$\begin{aligned}
\hat{\tau}_{SRD}(h^+, h^-) &= b_0^+ - b_0^- \\
(b_0^+, b_1^+) &= \arg\min_{b_0, b_1} \sum_{i=1}^{n} \mathbf{1}(P > P_0)(X_i - b_0 - P_i b_1)^2 K\left(\frac{P_i - P_0}{h}\right) \\
(b_0^-, b_1^-) &= \arg\min_{b_0, b_1} \sum_{i=1}^{n} \mathbf{1}(P \leq P_0)(X_i - b_0 - P_i b_1)^2 K\left(\frac{P_i - P_0}{h}\right)
\end{aligned}$$

where $K(\cdot)$ is a kernel function, h is a positive bandwidth and $\mathbf{1}(\cdot)$ denotes the indicator function. The kernel function (that assigns greater weights to observations close to P_0) and the bandwidth localize the fit of the regression near to the threshold. I estimate the regression using mean squared error optimal bandwidth (h), a triangular kernel, and compute bias-corrected point estimates and robust confidence intervals (Calonico et al., 2014a), which are shown to provide better empirical coverage than the alternatives available in the literature. I assess the robustness of the results to the use of a covariate-adjusted local-linear estimator of τ_{SRD} (Calonico et al., 2019) and alternative bandwidths.[30]

4. Empirical analysis: The effect of signature requirements on local politics

In this section, I present the RD estimates of the effect of signature requirements on different political and policy outcomes. Table 1 reports basic descriptive statistics for the outcome variables and Table A.10 in the appendix provides their definition and sources.

4.1. What are the potential impacts of signature requirements?

Signature requirements impose a burden to potential candidates who want to participate in an election and can influence different aspects of the electoral and political landscape. I examine four sets of outcomes: number of candidates and electoral competition, candidates' characteristics, voter participation, and budget allocation and administrative efficiency.

Number of candidates and electoral competition. Signature requirements are an administrative burden that has the goal of ensuring the representativeness of candidates and avoiding frivolous ones. The disincentives brought on by the increased cost of participating in an election, the potential mistakes in the signature collection process that may lead to disqualification, and the impossibility of certain individuals to collect the required number of signatures can lead to a reduction in the number of candidates. I assess this first hypothesis by estimating the treatment effect of signature requirements on the (raw) number of candidates running for mayor.

While signature requirements – when binding – are set to limit the number of candidates, the direction of their impact on electoral competition (that is, on the presence of multiple viable candidates competing for voters' support and resulting in balanced elections) is uncertain. To assess this effect I use several variables. First, I construct two measures of the number of viable and serious candidates competing for office. I compute the number of "non-marginal" candidates by counting candidates who obtain the votes of more than 25 percent of the registered voters (that is around 230 votes in municipalities close to the threshold or more than

[30] The covariate-adjusted estimator can lead to important efficiency gains relative to the standard unadjusted estimator. The consistency of this estimator requires, in addition to Assumption 1, that there is no RD treatment effect on the covariates (Calonico et al., 2019). The estimator is formally given by $\hat{\tau}_{SRD}(h) = b_0^+ - b_0^-$, with b_0^+ and b_0^- resulting from the following local linear least-squares estimation:

$$\arg\min_{b_0^+, b_1^+, b_0^-, b_1^-, \gamma} \sum_{i=1}^{n} (Y_i - \mathbf{1}_{(P<P_0)}(b_0^- - P_i b_1^-) - \mathbf{1}_{(P>P_0)}(b_0^+ - P_i b_1^+) - \gamma Z)^2 K_h\left(P_i - P_0\right)$$

where Z is a set of covariates, h is a positive bandwidth, $K_h(\cdot)$ is a kernel function, and $\mathbf{1}_{(\cdot)}$ denotes the indicator function.

Table 1
Summary statistics.

Variable	N	Mean	SD	Min	Max
Number of candidates and electoral competition					
Candidates (amount)	5408	2.05	0.65	1.00	7.00
Effective candidates (index)	5408	1.83	0.50	1.00	4.63
Non-marginal candidates (amount)	5408	1.58	0.50	1.00	3.00
Unopposed race	5408	0.16	0.37	0.00	1.00
Winner's share	5408	0.66	0.18	0.28	1.00
Winner's margin	5408	0.36	0.33	0.00	1.00
Race with > 2 candidates	5408	0.19	0.39	0.00	1.00
Wasted votes (share)	5408	0.02	0.06	0.00	0.43
Race with potential spoiler	5408	0.09	0.29	0.00	1.00
Political participation					
Turnout (share)	5408	0.81	0.11	0.22	1.00
Blank/Null (share)	5408	0.06	0.06	0.00	0.45
Candidate votes (share)	5408	0.75	0.12	0.21	0.96
Candidates' characteristics					
Female (share)	10694	0.09	0.28	0.00	1.00
Age (years)	10694	46.63	10.73	19.00	85.00
Young (< 46 years old, share)	10694	0.48	0.50	0.00	1.00
Education (years)	10595	12.99	3.46	5.00	20.00
Surname frequency (share of local pop.)	11067	0.02	0.04	0.00	0.46
Experience in local govt. (years)	11080	5.13	4.64	0.00	15.00
No experience in local govt. (share)	11080	0.34	0.47	0.00	1.00
Propensity to win (index)	10564	0.46	0.24	0.06	0.98
Budget composition and administrative efficiency					
Investment (share)	14210	0.34	0.18	0.00	0.97
current expenditure (share)	14210	0.53	0.16	0.02	0.88
Investment payments (speed)	14210	0.19	0.20	0.00	1.00
Current exp. payments (speed)	14208	0.81	0.07	0.29	1.00

Table A.10 in the appendix reports the definition and sources of the different variables.

7 times the amount of signatures needed to run) or get at least 85 percent of the winner's amount of votes. The idea behind this variable is to leave aside frivolous candidates, and measure how many contenders with substantial popular support participate in the election. I then calculate the "effective" number of candidates (Laakso and Taagepera, 1979). This measure is given by the inverse of the sum of the squared vote shares of all candidates (that is, the inverse of the Herfindahl–Hirschman vote concentration index). If one candidate gets all of the votes, the effective number candidates is equal to one. If all candidates split votes in equal parts, the effective number of candidates is equal to the number of people running for office. These two measures should be unaffected (or almost) by the addition or exclusion of a candidate who receives a small share of votes. I also consider the frequency of unopposed races (i.e., races with only one candidate) as the extreme case of limited competition.

Second, I consider two variables linked to the election's competitive balance: the winner's vote share and the winner's margin. The winner's vote share is given by the percentage of votes obtained by the winning candidate, and the winner's margin is given by the difference between the votes obtained by the winner and the runner-up divided by the sum of their votes.

Finally, I estimate signature requirements' impact on a set of variables associated to the complexity of voters' choice and the potential of majority misrepresentation. Under plurality rule, the potential benefits of reducing the number of candidates are relevant in elections with more than two candidates. It is in these cases when limited strategic behavior from voters might lead to a misrepresentation of the majority. In a recent paper, Pons and Tricaud (2018) show, using data from French parliamentary and local elections, that the presence of a third candidate reduces the vote share for the top candidate closest ideologically to her, frequently affecting the outcome of the election. In the context analyzed here, most candidates belong to local parties without common denominations and it is not possible to sort them in terms of ideology. To assess if signature requirements are reducing the potential cases of misrepresented majorities, I estimate their effect on three aspects of elections: (a) the frequency of races with more than two candidates; (b) wasted votes (calculated as votes going to candidates other than the two top as a percentage of registered voters); and (c) the frequency of elections where the number of wasted votes is larger than the difference between the winner and the runner-up. This last variable indicates the possible presence of a spoiler candidate.

Candidates' characteristics. The burden imposed by signature requirements is supposed to mostly discourage non-representative or frivolous candidates. However, there might be personal characteristics of potential candidates that can make the task of collecting signatures relatively easier or harder to them. On the one hand, for example, potential candidates with no previous experience in administrative processes might find it harder to understand the formal requirements for the collection of signatures. In the same vein, potential candidates with less spare time due to personal or professional obligations (such as, young children at their care or full-time jobs) might find it more costly to engage in signature collection. On the other hand, candidates with a larger close network or deeper social ties in the community might find it easier to comply with these requirements. The potential for differential impacts

underscores one of the main issues with administrative burdens: by affecting some groups disproportionately, these burdens can increase inequality in access to services and rights for citizens (Herd and Moynihan, 2019). This is particularly relevant in the case of barriers to entry into politics. The disproportionate impact on some sectors means that they will be limited in their ability to access office (and change the barriers and burdens that affect them).

I assess if signature requirements have an impact on individuals' selection into politics based on five variables: gender, age, the "surname frequency" (% of tax-reporting adults in the municipality sharing the same surname of the candidate, as a proxy for social ties), years of political experience in local governments, and education (measured by years of schooling). Finally, to observe if, beyond changes in some specific characteristics, signature requirements impact on candidates' general appeal or quality, I follow Avis et al. (2018) and construct a measure of candidates' "propensity to win". I use electoral races in the period 1993–2000 in municipalities with 2000 to 3000 inhabitants (that is, not included in the sample of this study) to estimate how different personal characteristics (gender, age, schooling, experience in government, incumbency, and surname frequency) relate to the probability of winning an election. The model shows that schooling, experience in government and incumbency are strong predictors of electoral victory (Table A.5). I then use the estimated coefficients to predict the "propensity to win" of each candidate in the sample of this study.

Voter participation. In addition to investigating the effects on political competition and candidate selection, I assess whether signature requirements impact voter participation. A reduction in electoral competition (Palfrey and Rosenthal, 1983; Myatt, 2015; Feddersen and Sandroni, 2006; Coate and Conlin, 2004) or the absence of a candidates of choice (Pons and Tricaud, 2018) might discourage voters from participating in the election.

To measure voters' electoral participation, I consider three different variables: turnout, blank and null votes, and candidate votes (that is, non-blank valid votes).[31] In all cases, I construct the variable as a percentage of registered voters.

Budget allocation and administrative efficiency. The potential impacts of signature requirements in the degree of political competition, candidates' characteristics, and voter participation can affect the preferences and incentives of elected politicians and lead to changes in public policy choices and implementation. Chamon et al. (2019) exploit an arbitrary discontinuity in the electoral rule that led to exogenous variation in political competition across Brazilian municipalities and show that greater political competition induced more investment and less current expenditure in Brazil.

I assess the impact of signature requirements on the municipal budget composition by looking at the share of investments and current expenditures in municipalities' total expenditure. I also estimate the of impact signature requirements on two administrative efficiency measures: the speed of payments for investment and current expenses. The speed of payments is equal to the ratio between cash basis and accrual basis expenditures. Its value ranges from 0 to 1, with a higher number indicating that the municipality complies with its payment obligations faster (that is, in the same year the expenditures are accrued). This metric is a good indicator of the mayors' administrative efficiency because payments are under the direct control of the mayor (Gagliarducci and Nannicini, 2013).

4.2. Validity of RDD assumptions

Before discussing the signature requirements' impacts on the different sets of outcomes, I present a set of validity checks that support the plausibility of the RDD assumptions and the causal interpretation of the estimates. The two main threats to the RDD identification assumption are the presence of strategic sorting of units around the cutoff and the existence of multiple treatments occurring at the cutoff. Eggers et al. (2018) discuss the potential problems of RDDs using population thresholds in the Italian context, and indicate there is suggestive evidence of manipulation around some of these thresholds. However, their evidence refers mainly to thresholds where municipal authorities' salaries change, something that does not occur in the setting analyzed in this paper. In the period 1993–2000, the only policy change at the 1000 population threshold was the introduction of signature requirements.[32] Furthermore, as stated in Section 2, population figures used in this period to determine the level of signature requirements were those of the 1991 National Census. In 1991, there were no changes in municipalities' institutional framework at the 1000-inhabitants threshold.[33] The jump in signature requirements at the 1000-inhabitants threshold was introduced later, in 1993. The fact that population figures were already set when the bill was proposed in 1992 eliminates the possibility of strategic sorting around the threshold.[34] The draft of the bill sent to the legislature did not mention explicit population thresholds for signature requirements, which were introduced in later readings.

Nonetheless, to further address these concerns, I check for the existence of a jump in the density of the running variable (population) at the 1000-inhabitants threshold, a sign of potential manipulation. Fig. A.1 in the appendix displays the frequency of municipalities using two different bin widths (20 and 40 inhabitants), and shows no bunching around the threshold. I also formally test for the presence of a jump using the manipulation test proposed by Cattaneo et al. (2020). Table A.1 (appendix) reports the

[31] The number of "candidate votes" (Pons and Tricaud, 2018) is obtained by subtracting the number of blank votes from the number of total valid (i.e., non-null) votes. The number of candidate votes can decrease due to a fall in turnout or an increase in the number of blank or null votes.

[32] Eggers et al. (2018) provide a detailed list of different policies changing at specific population thresholds, but they overlook changes in signature requirements. The only jump they report at the 1000-inhabitants threshold is the increase in wages introduced in October 2000 (*Decreto Legislativo 267/2000*). I confirmed this by doing an independent institutional background check.

[33] *Decree 570/1960* and its subsequent modifications.

[34] *Bill C.72, April 23rd 1992, XI Italian Legislature.*

results of the test, using both a linear and a quadratic local polynomial density estimator: the null hypothesis of no jump cannot be rejected (p-values of 0.62 and 0.79, respectively).

To credibly interpret the RD estimates as causal effects, it is also crucial that no other determinants of the outcomes of interest vary discontinuously at the 1000 population threshold (that is, that there are no multiple treatments). Importantly, as indicated above, no other policy changed at that threshold in the period of analysis. I also check for discontinuities in a set of pre-determined socio-demographic variables obtained from the 1991 National Census. Results, reported in Table A.2 in the appendix, show no signs of systematic discontinuities at the 1000-inhabitants threshold (with the only exception of the percentage of low-skilled workers), providing further support to the validity of the empirical design. Table A.3 reports the (placebo) RD effects on the set of dummy variables used as covariates for the covariate-adjusted estimator (described in Section 3.2). I include a dummy variable indicating the region of the municipality and an indicator variable taking value one for the first election in the municipality after the introduction of the signature requirements. There are no significant jumps in these variables at the cutoff.[35]

Finally, Table A.4 shows the results of placebo regressions on the number of lists and the seat concentration in local councils for the period 1985–1992, when there were no changes in signature requirements. I find no evidence of a pre-existing jump in these outcomes at the 1000-inhabitants threshold.

4.3. Signature requirements and electoral competition

This section examines the impact of signature requirements on the number of candidates and electoral competition. Table 2 reports the RD estimates for a set of outcomes of interest, described in Section 4.1. Each row in the table corresponds to one dependent variable. Column (1) displays the estimates for the baseline specification: local linear regression using the mean-squared-error (MSE) optimal bandwidth proposed by Calonico et al. (2014b). Column (2) shows the estimate using a covariate-adjusted estimator and MSE optimal bandwidth (Calonico et al., 2019). Column (3) and column (4) report estimates for covariate-adjusted local linear regressions using a fixed bandwidth of 250 and 150 inhabitants, respectively. As opposed to the first two, these last columns provide estimates using the same effective sample and number of observations across all different outcomes. Covariate-adjusted regressions include regional dummy variables and an indicator for the first election in the municipality as controls (reported in Table A.3). Table A.6 in the appendix reports p-values and q-values (Benjamini and Hochberg, 1995) for the first two models.[36]

RD results show that signature requirements significantly reduce the number of candidates. The baseline estimate shows a fall in the number of candidates of 0.21, ten percent of the mean in municipalities just below the threshold. To assess if the fall in the number of candidates is driven solely by frivolous candidates, I estimate the effect of signature requirements on the number of "non-marginal" candidates and the "effective" number of candidates (Laakso and Taagepera, 1979). RD estimates indicate that signature requirements significantly reduce both of these measures, showing that also people who potentially receive substantial support are affected by the introduction of these requirements.

To assess if signature requirements are reducing the potential cases of misrepresented majorities, I estimate their effect on three aspects of elections: (a) the frequency of races with more than two candidates; (b) wasted votes (c) the frequency of elections where the number of wasted votes is larger than the difference between the winner and the runner-up. RD estimates show no significant impact of signature requirements on these dimensions. Coefficients are negative for the three variables across all different specifications, showing that signature requirements might be "simplifying" voters' problem by reducing the need of strategic considerations. However, standard errors are large and it is not possible to reject the null hypothesis of no effect.

Signature requirements have a clearer impact on a different margin: the frequency of unopposed races. The introduction of these requirements leads to a sharp increase in the number of one-candidate elections. RD baseline estimate indicates that the frequency of unopposed races almost doubles at the cutoff, jumping 8 percentage points (from 10 to 18 percent). This increase underscores one potential risk of stricter barriers to entry: reducing "too much" the number of candidates. While, as discussed above, having too many candidates might be prejudicial, it is harder to argue in favor of unopposed races. Electoral contestation and, in particular, the presence of at least two valid alternatives is usually considered an essential feature of well-functioning democracies.

Fig. 1 shows the distribution of the number of candidates and "non-marginal" candidates in elections for municipalities just around the threshold (with 950 to 1050 inhabitants), and helps contextualize the above results. The histograms reveal two key facts about mayoral elections in these municipalities: First, even in the absence of signature requirements, there are few candidates running (almost 80 percent of the races have just two candidates). Second, most candidates get substantial support, with runners-up obtaining, on average, more than 230 votes (or almost 8 times the number of signatures needed to run in cities above the threshold). This electoral context implies that changes in the number of candidates are likely to result in important changes in the extent of political competition. Indeed, Table 2 shows that signature requirements lead to a significant fall in electoral competition, as measured by the winner's vote share and the winner's margin. In the baseline specification, average winners' share increases 6.7 percentage points; and average winners' margin increases 11 percentage points, from 29 to 40 percent.

[35] To avoid computing coefficients based on very few observations, I include dummy variables for regions with more than 2% of the observations in the sample: Piedmont, Lombardy, Veneto, Liguria, Marche, Lazio, Abruzzo, Campania, Calabria and Sardinia.

[36] The q-values provide the false discovery rate, that is, the proportion of false positives among all positive results (or type I errors). Given a set of test statistics and their q-values, rejecting the null hypothesis for all tests whose q-value is less than or equal to some threshold α ensures that the expected value of the false discovery rate is α. I estimate the q-values jointly considering all (28) primary outcomes and following the procedure proposed by Benjamini et al. (2006) as described in Anderson (2008).

Table 2
Effects of signature requirements on number of candidates and electoral competition.

	Mean	(1)	(2)	(3)	(4)
Candidates (amount)	2.08	−0.21*** (0.0781)	−0.23*** (0.0792)	−0.22*** (0.0859)	−0.19* (0.117)
Effective candidates (index)	1.89	−0.16** (0.0637)	−0.18*** (0.0645)	−0.19*** (0.0668)	−0.17* (0.0883)
Non-marginal candidates (amount)	1.69	−0.23*** (0.0758)	−0.23*** (0.0741)	−0.24*** (0.0780)	−0.21** (0.100)
Race with > 2 candidates	0.16	−0.071 (0.0478)	−0.076 (0.0482)	−0.071 (0.0499)	−0.041 (0.0650)
Wasted votes (share)	0.021	−0.010 (0.00708)	−0.0088 (0.00730)	−0.0090 (0.00729)	−0.0013 (0.00893)
Race with potential spoiler	0.083	−0.037 (0.0347)	−0.023 (0.0353)	−0.042 (0.0341)	−0.0087 (0.0414)
Unopposed race	0.095	0.078* (0.0404)	0.096** (0.0374)	0.12** (0.0522)	0.15** (0.0700)
Winner's share	0.63	0.067*** (0.0241)	0.077*** (0.0237)	0.081*** (0.0251)	0.081** (0.0335)
Winner's margin	0.29	0.11*** (0.0435)	0.13*** (0.0418)	0.15*** (0.0471)	0.16** (0.0629)
Bandwidth		MSE	MSE	250 Inhab.	150 Inhab.
Polynomial order		One	One	One	One
Covariates		No	Yes	Yes	Yes

In columns (1)–(4), each row reports the estimate of a separate regression. Robust standard errors adjusted for clusters at the municipality level are in parentheses. Estimates are obtained from local regressions with triangular kernel. Main and pilot bandwidths are defined as indicated in row "Bandwidth". MSE stands for mean squared error optimal bandwidth computed using the procedure by Calonico et al. (2014b, 2019). Mean is the average value of the dependent variable for municipalities with 850 to 1000 inhabitants. Covariates include dummy variables indicating the region of the municipality (Piedmont, Lombardy, Veneto, Liguria, Marche, Lazio, Abruzzo, Campania, Calabria and Sardinia) and an indicator variable taking value one for the first election in the municipality after the introduction of the signature requirements. Stars denote statistical significance level: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

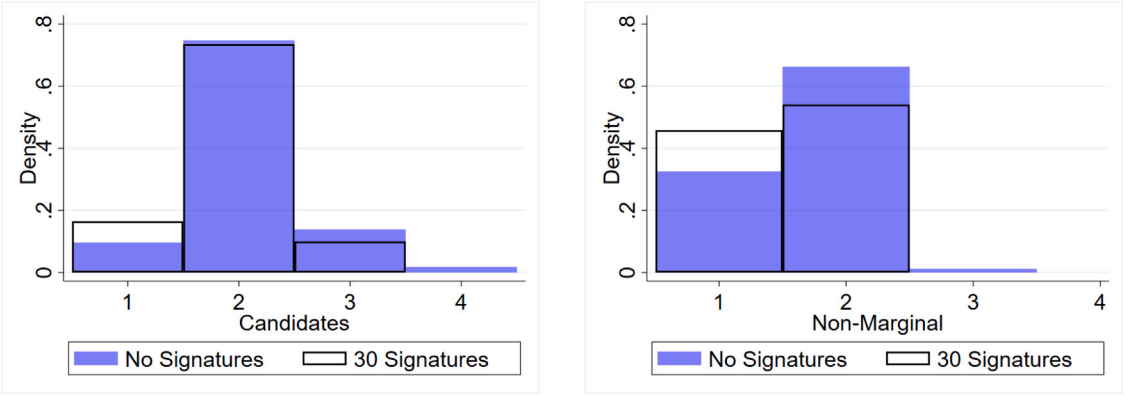

Fig. 1. Signature requirements and number of candidates.
[a] Left panel: raw number of candidates. Right panel: non-marginal candidates (as defined in Section 3.1). Frequencies computed using information from elections in municipalities with 950 to 1050 inhabitants. Number of elections below (above) the threshold: 166 (170).

Fig. A.2 provides the graphical representation of the RDD. A jump at the 1000-inhabitants threshold can be clearly seen for each of the variables. To further assess the robustness of the results to different bandwidths, I estimate the RD effects for each variable using bandwidths between 50 and 300 inhabitants (every 10 inhabitants). The different coefficients (and their 95-percent confidence interval) are displayed in Fig. A.3. The graphs show that coefficients maintain their statistical significance and are stable across specifications. Lastly, I estimate placebo RD effects at 300 arbitrary thresholds (specifically, at every value in the ranges 700–850 and 1150–1300) and I compare them with the true coefficient. This exercise helps to assess the reliability of the design by checking if there is evidence of systematic discontinuities at other cutoffs. The expectation is to find few jumps similar to the baseline results. Fig. A.8 (first five graphs) shows the distribution of the placebo RD effects: for each variable, as expected, the distribution of the false coefficients is centered around zero and the value of the true coefficient lies at (or very close to) one of the extremes of the distribution. Table A.7 reports some summary statistics of the placebo effects and facilitates the comparison with the true coefficient.

Table 3
Effects of signature requirements on candidates' characteristics.

	Mean	(1)	(2)	(3)	(4)
Female (share)	0.11	−0.012	0.0044	−0.0022	−0.021
		(0.0289)	(0.0277)	(0.0276)	(0.0329)
Young (< 46 years old, share)	0.55	−0.088**	−0.099**	−0.12**	−0.12*
		(0.0399)	(0.0395)	(0.0477)	(0.0613)
Education (years)	13.4	0.18	−0.027	−0.16	−0.25
		(0.274)	(0.260)	(0.284)	(0.346)
Surname frequency (share of local pop.)	0.018	0.0021	0.0014	0.0017	0.0049
		(0.00356)	(0.00324)	(0.00337)	(0.00422)
No experience in Local govt. (share)	0.34	−0.059**	−0.056*	−0.052	−0.077*
		(0.0301)	(0.0289)	(0.0331)	(0.0411)
Propensity to win (index)	0.46	0.012	0.011	0.0045	−0.00055
		(0.0135)	(0.0136)	(0.0165)	(0.0204)
Bandwidth		MSE	MSE	250 Inhab.	150 Inhab.
Polynomial order		One	One	One	One
Covariates		No	Yes	Yes	Yes

In columns (1)–(4), each row reports the estimate of a separate regression. Robust standard errors adjusted for clusters at the municipality level are in parentheses. Main and pilot bandwidths are defined as indicated in row "Bandwidth". MSE stands for mean squared error optimal bandwidth computed using the procedure by Calonico et al. (2014b, 2019). Mean is the average value of the dependent variable for municipalities with 850 to 1000 inhabitants. Covariates include dummy variables indicating the region of the municipality (Piedmont, Lombardy, Veneto, Liguria, Marche, Lazio, Abruzzo, Campania, Calabria and Sardinia) and an indicator variable taking value one for the first election in the municipality after the introduction of the signature requirements. Stars denote statistical significance level: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

Overall, results show that signature requirements have a large and significant impact on local electoral races, which goes beyond the goal of ensuring the representativeness of the candidates and avoiding frivolous ones. These findings underscore that signature requirements act also as a barrier to entry for serious potential candidates, who might be deterred from running for office. This is particularly important in settings as the analyzed here where the perks of office might not compensate the additional administrative burden. This has two important implications: First, the normative evaluation of this policy should carefully weigh the potential benefits of avoiding frivolous candidates against the potential costs of discouraging serious contenders. Second, the fact that "only the most marginal parties seem to have any difficulty gathering the requisite number of signatures" (European Commission for Democracy through Law, 2002, p. 16) cannot be used as a sound criterion for such evaluation.

4.4. Signature requirements and selection

To further assess the impact of signature requirements on local politics, I estimate their effect on a set of candidates' and mayors' personal characteristics. Table 3 reports RD estimates of the effects for candidates' characteristics (using averages across candidates for each election). Table 4 reports results for mayors. Both tables show estimates using alternative specifications, with each row corresponding to one dependent variable. Table A.6 in the appendix reports p-values and q-values (Benjamini and Hochberg, 1995).

Signatures requirements do not impact on the gender distribution of candidates and mayors. More than 90 percent of candidates and mayors are male, both above and below the cutoff. The clearest findings in terms of political selection refer to governmental experience and age. Coefficients on the share of young candidates (that is, younger than the median age of a candidate in the sample, 46 years old) are negative across specifications both for mayors and candidates (although only consistently significant – at standard significance levels – for candidates). This result is consistent with older candidates being more able to bear the costs associated to signatures collection, something that could be explained, for example, by them having better connections among neighbors or more spare time to devote to the associated bureaucratic procedures. I assess if having deeper social ties with the community moderates the impact of signature requirements on persons' decision to run by checking if the "surname frequency" of mayors and candidates increases at the cutoffs: coefficients are consistently positive but imprecise, giving no clear conclusions on whether signature requirements favor people with deeper social ties (as measured by this variable). Signature requirements do seem to affect candidates with no prior political experience the most. Baseline estimates show that the fraction of candidates with no previous experience in local governments falls 5.9 percentage points at the cutoff, a 17 percent decrease relative to the mean just below the threshold. This jump translates to a similar (but less precisely estimated) fall in the share of mayors with no previous experience. Mayors' average education, on the other hand, falls with the introduction of signature requirements.[37]

To observe if signature requirements impact on candidates' general appeal or quality, I estimate their effect on a measure of candidates' "propensity to win". RD estimates show a slight increase in the average propensity to win at the cutoff, which is not statistically significant at standard significance levels. The absence of a significant change is again consistent with signature

[37] Fig. A.4 provides the graphical representation of the main results of the RDD. Fig. A.5 reports the robustness of the results to different bandwidths. Table A.9 reports summary statistics of the placebo effects estimated at 300 arbitrary thresholds (every value in the ranges 700–850 and 1150–1300) and their comparison with the true coefficient.

Table 4
Effects of signature requirements on mayors' characteristics.

	Mean	(1)	(2)	(3)	(4)
Female (share)	0.089	0.0048	0.013	0.022	0.046
		(0.0431)	(0.0403)	(0.0483)	(0.0633)
Young (< 46 years old, share)	0.52	−0.092	−0.11*	−0.12	−0.12
		(0.0630)	(0.0629)	(0.0868)	(0.115)
Education (years)	13.8	−0.75	−0.91*	−0.95*	−0.99*
		(0.498)	(0.471)	(0.488)	(0.590)
Surname frequency (share of local pop.)	0.018	0.0011	0.00055	0.0016	0.0092*
		(0.00430)	(0.00411)	(0.00432)	(0.00550)
No experience in local govt. (share)	0.22	−0.051	−0.052	−0.042	−0.043
		(0.0396)	(0.0392)	(0.0494)	(0.0649)
Propensity to win (index)	0.57	0.014	0.014	0.026	0.0039
		(0.0252)	(0.0251)	(0.0323)	(0.0414)
Bandwidth		MSE	MSE	250 Inhab.	150 Inhab.
Polynomial order		One	One	One	One
Covariates		No	Yes	Yes	Yes

In columns (1)–(4), each row reports the estimate of a separate regression. Robust standard errors adjusted for clusters at the municipality level are in parentheses. Estimates are obtained from local regressions with triangular kernel. Main and pilot bandwidths are defined as indicated in row "Bandwidth". MSE stands for mean squared error optimal bandwidth computed using the procedure by Calonico et al. (2014b, 2019). Mean is the average value of the dependent variable for municipalities with 850 to 1000 inhabitants. Covariates include dummy variables indicating the region of the municipality (Piedmont, Lombardy, Veneto, Liguria, Marche, Lazio, Abruzzo, Campania, Calabria and Sardinia) and an indicator variable taking value one for the first election in the municipality after the introduction of the signature requirements. Stars denote statistical significance level: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

requirements not just discouraging frivolous or unattractive candidates. As mentioned in the previous section, most candidates in these municipalities (both with and without signature requirements) receive a substantial amount of votes and therefore it is not surprising to see that the average probability of winning does not significantly change at the cutoff.

4.5. Signature requirements and voter participation

I then estimate the impact of signature requirements on voters' electoral participation, as measured by turnout, blank and null votes, and candidate votes (Pons and Tricaud, 2018). Table 5 reports the RD estimates for alternative specifications, and Fig. A.6 provides graphical evidence of the effects. Table A.6 in the appendix reports p-values and q-values (Benjamini and Hochberg, 1995). Baseline RD estimates indicate that signature requirements lead to a drop of 3.6 percentage points in turnout, and a 1 percentage points increase in null and blank votes. These effects add up to a large and significant fall in the number of candidate votes: 4.5 percentage points. The results for turnout and candidate votes are stable and statistically significant across different bandwidths (as shown in Fig. A.7). Fig. A.8 (last 3 graphs) shows the distribution of the RD effects estimated at placebo cutoffs for the different variables: again, as expected, placebo effects are centered around zero and the true effects lie at or very close the extremes of the distributions.[38]

The observed drop in turnout and in the number of candidate votes could be explained both by a rational response to the fall in electoral competition or by an expressive reaction to the absence of a candidate of choice. While these results are not informative of the relative empirical validity of alternative models of voting behavior, they provide additional insights. The large drop in voter participation confirms that the impact of signature requirements on competition and selection are non-trivial. Given that it is fair to assume that signature requirements do not have a direct impact on voter participation, this drop points to citizens responding to the characteristics of the electoral race and the supply of political candidates when deciding whether or not to vote. This intuitive fact has not been easily verified empirically, since the pool of candidates, the competitiveness of the election, and the turnout rates are generally jointly determined and affected by the same factors (leading to potential reverse causality and omitted variable biases).

These results have both research and policy implications: First, when assessing the potential institutional drivers of turnout, it is necessary to go beyond the usual elements examined in the literature (Blais, 2006; Cancela and Geys, 2016) and examine all the different features that might affect the supply of candidates — as, for example, gender quotas (De Paola et al., 2014). Second, these results point to a critical risk of introducing barriers to entry in politics: reducing voters' engagement. Electoral participation is an essential feature of healthy democracies (Diamond and Morlino, 2005; Lijphart, 1997), and, therefore, policies that have the potential of affecting it should be carefully evaluated.

[38] In the case of turnout and valid votes, there seem to be some "discontinuities" at a few other thresholds (also evident in graphs (a) and (c) in Fig. A.6). It is important for the reliability of the results that these jumps are far away from the 1000-inhabitants threshold. Furthermore, for candidate votes, only 4.3 percent of the placebo effects are larger in absolute value than the true one (Table A.8).

Table 5
Effects of signature requirements on voters' participation.

	Mean	(1)	(2)	(3)	(4)
Turnout (share)	0.82	−0.036**	−0.028**	−0.033**	−0.032*
		(0.0151)	(0.0139)	(0.0149)	(0.0172)
Blank/Null (share)	0.057	0.010	0.013*	0.017*	0.017
		(0.00869)	(0.00709)	(0.00975)	(0.0133)
Candidate votes (share)	0.76	−0.045***	−0.043**	−0.050***	−0.049**
		(0.0159)	(0.0168)	(0.0182)	(0.0221)
Bandwidth		MSE	MSE	250 Inhab.	150 Inhab.
Polynomial order		One	One	One	One
Covariates		No	Yes	Yes	Yes

In columns (1)–(4), each row reports the estimate of a separate regression. Robust standard errors adjusted for clusters at the municipality level are in parentheses. Estimates are obtained from local regressions with triangular kernel. Main and pilot bandwidths are defined as indicated in row "Bandwidth". MSE stands for mean squared error optimal bandwidth computed using the procedure by Calonico et al. (2014b, 2019). Mean is the average value of the dependent variable for municipalities with 850 to 1000 inhabitants. Covariates include dummy variables indicating the region of the municipality (Piedmont, Lombardy, Veneto, Liguria, Marche, Lazio, Abruzzo, Campania, Calabria and Sardinia) and an indicator variable taking value one for the first election in the municipality after the introduction of the signature requirements. Stars denote statistical significance level: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

Table 6
Effects of signature requirements on budget allocation and implementation.

	Mean	(1)	(2)	(3)	(4)
Investment (share)	0.33	−0.0027	−0.0053	−0.010	−0.0064
		(0.0174)	(0.0175)	(0.0157)	(0.0207)
Current expenditure (share)	0.54	−0.0038	0.00096	0.0022	0.00022
		(0.0172)	(0.0165)	(0.0152)	(0.0201)
Investment payments (speed)	0.16	0.070***	0.073***	0.068***	0.054**
		(0.0186)	(0.0172)	(0.0172)	(0.0208)
Current exp. payments (speed)	0.81	0.0036	0.0040	0.0050	−0.0019
		(0.00707)	(0.00671)	(0.00788)	(0.0101)
Bandwidth		MSE	MSE	250 Inhab.	150 Inhab.
Polynomial order		One	One	One	One
Covariates		No	Yes	Yes	Yes

In columns (1)–(4), each row reports the estimate of a separate regression. Robust standard errors adjusted for clusters at the municipality level are in parentheses. Estimates are obtained from local regressions with triangular kernel. Main and pilot bandwidths are defined as indicated in row "Bandwidth". MSE stands for mean squared error optimal bandwidth computed using the procedure by Calonico et al. (2014b, 2019). Mean is the average value of the dependent variable for municipalities with 850 to 1000 inhabitants. Covariates include dummy variables indicating the region of the municipality (Piedmont, Lombardy, Veneto, Liguria, Marche, Lazio, Abruzzo, Campania, Calabria and Sardinia) and an indicator variable taking value one for the first election in the municipality after the introduction of the signature requirements. Stars denote statistical significance level: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

4.6. Signature requirements, budget allocation and administrative efficiency

Finally, I assess whether signature requirements impact the budget allocation and the municipal administrative efficiency. The first two rows in Table 6 report the estimated impact of signature requirements on the share of investments and current expenditures in municipalities' total expenditure. The estimated coefficients are small (less than one percentage point in absolute value) and not statistically different from zero (at standard significance levels), indicating no significant impact of signature requirements in these variables.

I then estimate the impact of signature requirements on two administrative efficiency measures, the speed of payments for investment and current expenses. Results reported in the third and fourth rows in Table 6 show that signature requirements lead to a significant increase in the speed of investment payments and have no effect on the payment speed of current expenditures. In the case of investment, RD estimates show that the speed of payment increases seven percentage points at the cutoff. The improvement in the speed of payments for investments is substantial. Municipalities show, on average, significant delays in compliance in this type of expense. Among municipalities between 850 and 1000 inhabitants, the percentage of investment expenses paid in the year of their accrual is only 16 percent: signature requirements lead to almost a 50 percent increase relative to the mean just below the threshold. In the case of current expenses, the situation is different. On average, municipalities comply with more than 80 percent of those payments and variation across municipalities is relatively small.[39] While these results point to a significant positive effect of signature requirements on administrative efficiency, it is important to weigh this effect against the observed impact on political representation and participation.

[39] The interquartile range goes from 76 percent to 86 percent (10 percentage points), and the standard deviation is 7.4 percentage points.

5. Political representation: The costs and benefits of signature requirements

The observed effects of signature requirements on electoral outcomes (especially those in the number and characteristics of candidates) can be understood through the lenses of citizen-candidate models (Osborne and Slivinski, 1996; Besley and Coate, 1997). These models provide a theoretical framework to examine how running costs influence the entry decision of potential candidates under plurality voting. For most parameter configurations, these models admit two-candidate elections, giving theoretical support to Duverger's law (Duverger, 1963). However, if running costs are too low, more people might decide to run for office and the presence of spoiler candidates turns into a possibility. If, instead, running costs are too high, one-candidate equilibria (with the sole candidate proposing policies distant from the "median" position) become possible. Therefore, the normative value of a policy that modifies running costs should consider its impact on both these margins and the relative costs of having an excessive or an insufficient number of candidates.

I propose a theoretical framework to capture this basic trade-off. The main idea is that, in a plurality election, the effective competition is among two candidates, an intuition that, according to Riker (1982) goes back to Henry Droop in the nineteenth century.[40] The second idea is that adding a second candidate to a one-candidate election cannot reduce voters' welfare and might actually improve it. In elections with two candidates, the only non-weakly dominated strategy is to vote sincerely. Therefore, the extra candidate cannot harm voters: she will only be elected if preferred by the majority. The final idea is that third candidates can harm voters by splitting the votes of the supporters of one of the top two. As mentioned in the introduction, Hall and Snyder (2015) and Pons and Tricaud (2018), among others, provide empirical evidence on voting behavior in multi-candidate elections that supports this last point.

The framework focuses on the "quantity" dimension of the pool of candidates, neglecting most of the discussion on its "quality". In classic citizen-candidate models (Osborne and Slivinski, 1996; Besley and Coate, 1997), changes in entry costs might impact on the profile of candidates without necessarily changing the number of candidates. The main intuition obtained from these models in this regard is that, as entry costs increase, equilibria with more extreme candidates become possible. The literature on politicians' wages and candidate selection also provides useful insights on the relationship between entry costs and the politicians' quality, especially if these costs are heterogeneous across candidates (Besley, 2004; Caselli and Morelli, 2001, 2004). In these cases, the joint distribution of entry costs and governmental ability become crucial to understand if increasing barriers to entry could increase or decrease the average quality of candidates. Despite the theoretical importance of these channels, I focus on the quantity dimension since results from the previous section indicate that, in the examined setting, the most relevant (and precise) impacts of signature requirements occur in this margin. The following framework tries to capture how signature requirements might impact on the number of candidates and obtain normative implications, examining how some characteristics of the political context moderate this relationship.

General Setting. Individuals in a municipality elect their mayor under plurality voting: the person with the most votes among those who enter the election gets the position. They are divided in 3 groups $\{A, B, C\}$, each one with a preferred policy in the set $\{a, b, c\}$. Preferences are as following:

$$A : a \succ b \sim c \qquad B : b \succsim c \succ a \qquad C : c \succsim b \succ a$$

People in group A strongly prefer a over the other two alternatives (and they are indifferent between b and c). People in B weakly prefer b over c, and strongly prefer any of these two over policy a, while people in C weakly prefer c over b, but also strongly prefer any of these over a.

Each group is potentially represented by one candidate, who is committed to implement the group's preferred policy if elected. The model has two stages: an entry stage and a election stage. For simplicity, I assume that candidate A always participates in the election. Therefore, in the entry stage, only candidates B and C decide whether to enter or not in the electoral race.

Election Stage. Elections might have one, two or three candidates. In one-candidate elections, there is no uncertainty: candidate A runs alone and is elected mayor. In two-candidate elections, candidate A is only supported by her group regardless of who she is running against. She gets an expected share of votes equal to $\alpha \in (1/3, 2/3)$, which represents the fraction of citizens in group A. Her contender (candidate B or C) receives the support of the other two groups. The result of the election is influenced by the realization of a random variable $\mu \sim U[-\xi, \xi]$, which represents a popularity shock that drives the support of swing voters in the different groups.[41] The actual share of votes for candidate A is equal to $\alpha + \mu$, and the probability that she wins a two-candidate election is:

$$p_2 \equiv \quad P(\alpha + \mu > 1/2) = \frac{\alpha - 1/2 + \xi}{2\xi}$$

From the formula, we obtain that the greater is α, the higher are the chances that candidate A wins the election. In three-candidate elections, candidate A still receives a share $\alpha + \mu$ of the votes, but candidates B and C split the rest of the votes: with probability

[40] According to Riker (1982, p. 756), Henry Droop wrote in 1869: "Each elector has practically only a choice between two candidates or sets of candidates. As success depends upon obtaining a majority of the aggregate voters of all the electors, an election is usually reduced to a contest between the two most popular candidates or sets of candidates. Even if other candidates go to the poll, the electors usually find out that their votes will be thrown away, unless given in favor of one or other of the parties between whom the election really lies".

[41] In the following analysis, I restrict the attention to cases where $\xi > \max\{\frac{1}{2} - \alpha, \alpha - \frac{\gamma}{1+\gamma}\}$. This restriction implies that there is no sure winner. The uncertainty is large enough so that candidate A's probability of winning is strictly between 0 and 1. Parameter γ is defined in the following paragraph.

1/2 candidate B (C) receives a share $\gamma \in (1/2, 1]$ of these votes and candidate C (B) obtains the rest. This simple voting behavior can be contrasted to the results by Bouton and Ogden (2017), who propose a model of ethical voting in multi-candidate elections in a "divided majority" setting.[42] In their model, there are two types of equilibria: a sincere voting one (each person supports her preferred candidate) and Duverger's law equilibria (voters in B and C coordinate over one of the two candidates). This last type of equilibria is less likely to occur whenever the utility differential between b and c is large, the utility differential between a and the other two policies is small, candidate A is a not an extremely serious threat, and groups B and C are of similar sizes. The difficulty to coordinate could be further augmented if there is limited strategic behavior from voters. Parameter γ in this model captures all these different factors that might enhance or undermine the ability of voters in groups B and C to coordinate. In three-candidate races, the winning probability of candidate A is[43]:

$$p_3 \equiv \quad P(\alpha + \mu > \gamma(1 - \alpha - \mu)) = \frac{\alpha - \frac{\gamma}{1+\gamma} + \xi}{2\xi}$$

The expression shows that the greater is γ and the smaller is α, the lower is the probability that candidate A wins in a three-candidate race. In the extreme case, with $\gamma = 1$, candidate A's probability of winning is not affected by the entry of a third candidate.

Entry Stage. In the entry stage, candidates B and C decide simultaneously whether to enter the electoral race or not. Candidates are office-motivated. The value of office (V) is drawn from a distribution with cumulative density function F_V and is observed by both candidates before taking the entry decision. They compare the expected value of running (that is, the probability of winning multiplied by V) against the administrative burdens (i.e. the learning, compliance and psychological costs) of doing so (given by parameter σ). The pure-strategy Nash equilibrium of the game can be characterized by two threshold values V_1 and V_2, such that for all $V < V_1$ neither of the potential contenders runs and for all $V > V_2$ both do it. The value of these two thresholds is given by:

$$V_1 = \frac{\sigma}{1 - p_2} \qquad V_2 = \frac{2\sigma}{1 - p_3}$$

The probabilities of observing a one-candidate race (π_1) and a three-candidates race (π_3) are:

$$\pi_1 \equiv F_V(\frac{\sigma}{1 - p_2}) \qquad \pi_3 \equiv 1 - F_V(\frac{2\sigma}{1 - p_3})$$

Political context and the effect of greater administrative burdens. The above expressions show that running costs (σ) affect both the frequency of unopposed races and the frequency of elections with more than two candidates, and that this relationship is moderated by the distribution of the value of office (V) and contenders' expected probability of winning the election (which depend on the features of the political environment, α and γ). An increase in the administrative burden faced by potential candidates (σ) will more strongly increase the probability of observing an unopposed race (and reduce the likelihood of a three-candidate race) in settings in which α is larger and candidate A is the favorite. In such scenarios, candidates B and C will weigh the increase in the running costs against their relatively low probability of winning and more often abandon the race. The extent of coordination among voters of candidates B and C (γ) influences how the frequency of three-candidate races responds to a change in the cost of running: the more difficult is for these groups to coordinate (i.e. lower γ), the greater will be the decrease in three-candidate races following a rise in the administrative burdens of running.

Misrepresentation of the majority. To obtain normative implications regarding the effects of signature requirements, I consider how the probability that the majority is misrepresented is affected by a change in running costs, and how this depends on the other characteristics of the political context. In races with one candidate, candidate A wins with probability one. However, in many cases, candidate A would lose if she faced the competition of one of the other two potential candidates. The difference in the probability that candidate A wins gives a measure of the "loss" of having a one-candidate race. This loss (L_1) is equal to:

$$L_1 \equiv |1 - p_2| = \frac{1/2 - \alpha + \xi}{2\xi}$$

The expression indicates that the greater is α (that is, the expected support of candidate A), the smaller is the loss of having a one-candidate race. Intuitively, if candidate A is the clear favorite and wins most contested elections, the loss of not having a contender is low.

In the case of three-candidate races, vote splitting and the associated wasted votes also generate a misrepresentation of the majority and candidate A wins more often than in two-candidate races. The loss of having three-candidates races (L_3) is:

$$L_3 = |p_3 - p_2| = \xi \frac{1 - \gamma}{1 + \gamma}$$

The expression indicates that the greater is γ (the more able are groups B and C to coordinate), the smaller is the loss of having a third candidate. In the extreme case, with $\gamma = 1$, members of the groups B and C do not waste any vote and there is no loss of adding candidates. The overall loss (L), given a set of parameter values, is defined as the expected fraction of races where the majority is misrepresented:

$$L(\sigma) \quad \equiv \quad \pi_1(\sigma) \cdot L_1 + \pi_3(\sigma) \cdot L_3$$

[42] The situation described here corresponds to a "divided majority" setting whenever $\alpha \in (1/3, 1/2)$.

[43] Note that the contender that receives a share $1 - \gamma$ of their votes never wins.

A change in running costs impacts on the extent of misrepresentation of the majority in two ways. The potential reduction of three-candidate races and wasted votes ("positive" margin) comes at the expense of an increase in the frequency uncontested elections ("negative" margin). The relative importance of these two forces depends on the political context, and, in particular, on the extent of coordination and concentration of the political groups.[44]

6. Empirical results: Political concentration and signature requirements

I now assess how the local political landscape shapes the impact of signature requirements in the context of small Italian municipalities. I build a measure of political concentration for each municipality in the sample using information on the council seat distribution in the year 1992 (before the jump in signature requirements was introduced). I compute the Hirschman–Herfindahl seat concentration index (HHI) for each municipality, and consider separately those municipalities above and below an index equal to 0.40: this threshold ensures that in cities below it (that is, municipalities with "dispersed" political power) there were at least three groups in the council and there was no group with more than two thirds of the seats. I obtain RD estimates of the effect of signature requirements in each of the two subsamples.

I consider the concentration of the political power as a feature related to the main political parameters introduced in the framework described in Section 5. The presence of more groups and no absolute majorities in the council can be associated both to unclear favorites (low α) and to more dispersed preferences and lower coordination across groups (low γ). In such settings, the model indicates that an increase in the administrative burdens for potential candidates would induce a relatively low decrease in the number of uncontested races and a potentially large decrease in the frequency of three-candidates races. The opposite results are expected in settings with clear favorites (high α) and/or cohesive opposition groups (low γ). The impact of signature requirements on the pool of candidates and electoral competition is therefore likely to depend on the extent of political concentration.

Municipalities with Dispersed Political Power.

I report RD results for municipalities with dispersed political power (that is, with a seat concentration lower than 0.40) in Table 7. In these municipalities, signature requirements significantly reduce the frequency of elections with more than 2 candidates. Baseline RD estimates show that the frequency of these races drops 17 percentage points at the cutoff, a 85 percent fall relative to the mean just below the threshold. Signature requirements also significantly reduce wasted votes and the frequency of races with potential spoiler candidates. The RD coefficient on the number uncontested races is positive but smaller in absolute value and imprecise, and therefore it is not possible to reject the null hypothesis of no effect at standard significance levels.

These results are in line with the model in Section 5 and point to signature requirements acting on the "positive" margin and helping to simplify voters' problem, potentially reducing vote splitting and the misrepresentation of the majority. The absence of significant changes in voter participation also points in this direction.

Municipalities with Concentrated Political Power.

Results for municipalities with concentrated political power are reported in Table 8. In these municipalities, signature requirements do not significantly affect the number of races with more than two candidates, the share of wasted votes or the fraction of elections with potential spoiler candidates. Instead, the frequency of unopposed races increases sharply at the cutoff. Baseline RD estimate shows that the frequency of one-candidate elections jumps 11 percentage points with the introduction of signature requirements, doubling with respect to the mean in municipalities below the threshold. These changes in the extent of political competition are accompanied by a drop in voters' electoral participation. Turnout falls 5.3 percentage points and the share of candidate votes fall 6.8 percentage points at the cutoff. In municipalities with concentrated political power, signature requirements impact on the "negative" margin. These results highlight the potential costs of barriers to entry for potential candidates: reducing both electoral contestation and voter participation, two essential dimensions of healthy democracies.

Considering the specification using mean squared error (MSE) optimal bandwidth and covariates, which arguably provides the most statistical power (Calonico et al., 2019), the differences in treatment effects between the two subsamples (high and low political concentration) are statistically significant (at standard significance levels) for the frequency of races with more than 2 candidates, the share of wasted votes, the frequency of races with potential spoilers and the number of candidate votes. While not all the differences in the treatment effects between the two subsamples are statistically significant, overall, both the model and the empirical results provide supportive evidence to the idea that the impact of signature requirements might be moderated by the extent of political concentration.

[44] For example, assuming a uniform distribution with support $[0, \bar{V}]$ for the value of office V (with $\bar{V}$ large enough so that $\pi_3 > 0$) the expression of the losses can be expressed as:

$$L = L_3 + \frac{\sigma}{\bar{V}}[3 - 2\frac{1-p_2}{1-p_3}]$$

This expression shows that, under this distributional assumption, the increase in running costs reduces the overall loss whenever the chances that a contender wins (B or C) are seriously affected by the inclusion of a third candidate, which occurs, for example, if p is sufficiently low:

$$\frac{\partial L}{\partial \sigma} < 0 \iff \frac{1-p_3}{1-p_2} < \frac{2}{3} \iff \frac{\gamma}{1+\gamma} < \frac{1}{3}(1+\alpha+\xi)$$

Table 7
Municipalities with dispersed political power: Effects of signature requirements on electoral competition and voters' participation.

	Mean	(1)	(2)	(3)	(4)
Candidates (amount)	2.13	−0.27** (0.104)	−0.33*** (0.0997)	−0.35*** (0.101)	−0.40*** (0.143)
Effective candidates (index)	1.95	−0.26*** (0.0890)	−0.31*** (0.0864)	−0.33*** (0.0883)	−0.33*** (0.115)
Non-marginal candidates (amount)	1.70	−0.16 (0.0966)	−0.27*** (0.102)	−0.25** (0.106)	−0.28** (0.130)
Race with > 2 candidates	0.20	−0.17** (0.0655)	−0.21*** (0.0636)	−0.23*** (0.0668)	−0.24*** (0.0834)
Wasted votes (share)	0.030	−0.029*** (0.0107)	−0.035*** (0.0107)	−0.035*** (0.0110)	−0.027** (0.0130)
Race with Potential spoiler	0.14	−0.15*** (0.0532)	−0.17*** (0.0545)	−0.19*** (0.0582)	−0.14** (0.0719)
Unopposed race	0.079	0.047 (0.0642)	0.048 (0.0560)	0.10 (0.0743)	0.17 (0.104)
Turnout (share)	0.82	−0.0039 (0.0232)	−0.0080 (0.0191)	−0.0077 (0.0214)	−0.013 (0.0265)
Blank/Null (share)	0.060	0.0066 (0.0140)	0.0069 (0.0128)	0.0058 (0.0143)	0.010 (0.0192)
Candidates' votes (share)	0.76	−0.0083 (0.0244)	−0.010 (0.0212)	−0.014 (0.0279)	−0.023 (0.0367)
Bandwidth		MSE	MSE	250 Inhab.	150 Inhab.
Polynomial order		One	One	One	One
Covariates		No	Yes	Yes	Yes

In columns (1)–(4), each row reports the estimate of a separate regression. Robust standard errors adjusted for clusters at the municipality level are in parentheses. Estimates are obtained from local regressions with triangular kernel. Main and pilot bandwidths are defined as indicated in row "Bandwidth". MSE stands for mean squared error optimal bandwidth computed using the procedure by Calonico et al. (2014b, 2019). Mean is the average value of the dependent variable for municipalities with 850 to 1000 inhabitants. Covariates include dummy variables indicating the region of the municipality (Piedmont, Lombardy, Veneto, Liguria, Marche, Lazio, Abruzzo, Campania, Calabria and Sardinia) and an indicator variable taking value one for the first election in the municipality after the introduction of the signature requirements. Stars denote statistical significance level: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

7. Concluding remarks

This paper examines the causal effect of signature requirements on the number of candidates, electoral competition, candidates' selection, voter participation, and budget allocation and administrative efficiency. I use data on small Italian municipalities and apply a RDD, exploiting that these requirements are only present in municipalities with more than 1000 inhabitants.

I find that signature requirements significantly reduce the number of candidates, decrease electoral competition, and lead to a more experienced pool of candidates. Signature requirements lead also to a large drop in voters' electoral participation, measured both as turnout and the number of candidate votes. In terms policy choices and implementation, I observe no impact on budget composition (as captured by the share of investments and current expenditures) but an increase in the speed of investment payments, an indicator for administrative efficiency.

The results on political participation and representation point to signature requirements acting as a barrier to entry for serious potential candidates and not only as a screening tool for marginal ones. The positive effects of this policy are observed in municipalities with fragmented political systems, where signature requirements lead to fewer wasted votes and fewer potential spoilers. The downside is observed in municipalities with concentrated councils: signature requirements increase the frequency of uncontested races and reduce voter participation.

These findings highlight that the potential impact of signature requirements exceeds the goals of ensuring the representativeness of candidates and avoiding frivolous ones. The normative evaluation of this policy should therefore carefully weigh the benefits of avoiding frivolous candidates against the costs of discouraging non-marginal ones, a trade-off that, as argued, is likely to be affected by local political factors.

The paper underscores the importance of institutional details in shaping political outcomes: The introduction of signature requirements – and its associated administrative burden – has a large and significant impact on local electoral races, changing the observed extent of both contestation and participation (two core dimensions of democracy). In doing so, it provides evidence of the impact of the political candidates' supply on voter participation, a relationship seldom studied in the literature. Finally, the paper provides empirical and theoretical support to the notions that there are no one-size-fits-all institutions and that understanding the local political environment is critical to design an efficient institutional arrangement.

Table 8
Municipalities with concentrated political power: Effects of signature requirements on electoral competition and voters' participation.

	Mean	(1)	(2)	(3)	(4)
Candidates (amount)	2.04	−0.18*	−0.19**	−0.18*	−0.14
		(0.0927)	(0.0949)	(0.106)	(0.139)
Effective candidates (index)	1.84	−0.077	−0.14**	−0.13	−0.14
		(0.0780)	(0.0734)	(0.0791)	(0.0975)
Non-marginal candidates (amount)	1.69	−0.22**	−0.25***	−0.25***	−0.22*
		(0.0910)	(0.0881)	(0.0928)	(0.116)
Race with > 2 candidates	0.13	−0.0070	−0.0014	0.0068	0.021
		(0.0588)	(0.0578)	(0.0588)	(0.0762)
Wasted votes (share)	0.014	0.0035	0.0033	0.0040	0.0035
		(0.00802)	(0.00773)	(0.00776)	(0.00934)
Race with Potential Spoiler	0.032	0.060*	0.035	0.039	0.039
		(0.0325)	(0.0275)	(0.0292)	(0.0286)
Unopposed race	0.11	0.11**	0.13***	0.15**	0.14*
		(0.0482)	(0.0477)	(0.0644)	(0.0824)
Turnout (share)	0.81	−0.053***	−0.051***	−0.048***	−0.050**
		(0.0199)	(0.0180)	(0.0179)	(0.0208)
Blank/Null (share)	0.055	0.013	0.020**	0.026**	0.024
		(0.00927)	(0.00838)	(0.0124)	(0.0164)
Candidates' Votes (share)	0.76	−0.068***	−0.076***	−0.075***	−0.074***
		(0.0215)	(0.0212)	(0.0217)	(0.0260)
Bandwidth		MSE	MSE	250 Inhab.	150 Inhab.
Polynomial Order		One	One	One	One
Covariates		No	Yes	Yes	Yes

In columns (1)–(4), each row reports the estimate of a separate regression. Robust standard errors adjusted for clusters at the municipality level are in parentheses. Estimates are obtained from local regressions with triangular kernel. Main and pilot bandwidths are defined as indicated in row "Bandwidth". MSE stands for mean squared error optimal bandwidth computed using the procedure by Calonico et al. (2014b, 2019). Mean is the average value of the dependent variable for municipalities with 850 to 1000 inhabitants. Covariates include dummy variables indicating the region of the municipality (Piedmont, Lombardy, Veneto, Liguria, Marche, Lazio, Abruzzo, Campania, Calabria and Sardinia) and an indicator variable taking value one for the first election in the municipality after the introduction of the signature requirements. Stars denote statistical significance level: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Appendix A. Additional tables and figures

Table A.1
Validation check: Density of the running variable (manipulation test).

	(1) b/se/p	(2) b/se/p
Density jump	−.0000511	−.0000388
	(.0001041)	(.0001426)
	[0.623]	[0.786]
N	2693	2693
Effective N	1009	1315
Polynomial order	One	Two

Results of manipulation test using the local polynomial density estimators proposed in Cattaneo et al. (2020). Robust standard errors reported between parentheses. P-Value reported between squared brackets.
Stars denote significance level: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

Table A.2
Validation check: Placebo RD effects on predetermined sociodemographic indicators.

	Mean	(1)	(2)	(3)	(4)
Density	94.6	77.3	79.7	78.1	50.5
		(90.62)	(89.10)	(88.91)	(67.40)
Men–Women	97.6	−1.36	−1.39	−1.44	−1.56
		(1.241)	(1.180)	(1.220)	(1.499)
Less 6yr. (%)	5.20	0.17	0.065	0.16	0.33
		(0.211)	(0.188)	(0.232)	(0.292)
More 75yr. (%)	9.50	0.27	0.34	0.33	0.26
		(0.572)	(0.483)	(0.585)	(0.758)
Old Dep. Ratio	31.2	1.43	0.59	1.05	1.00
		(1.956)	(1.675)	(1.945)	(2.590)
Family size	2.63	0.059	0.024	0.023	0.050
		(0.0524)	(0.0387)	(0.0430)	(0.0526)
BA Degree (%)	14.8	0.15	0.34	0.43	0.99
		(0.990)	(0.874)	(0.897)	(1.071)
Labor force (%)	47.7	−0.78	−0.28	−0.16	1.08
		(1.197)	(0.945)	(1.048)	(1.412)
Unemp. (%)	14.8	1.44	0.17	0.054	−1.09
		(2.097)	(0.810)	(1.107)	(1.421)
High-skill (%)	15.5	0.24	0.69	0.72	0.94
		(0.866)	(0.902)	(1.042)	(1.226)
Low-skill (%)	11.7	−0.64	−2.46**	−2.03**	−2.49**
		(1.536)	(0.991)	(0.916)	(0.997)
Bandwidth		MSE	MSE	250 Inhab.	150 Inhab.
Polynomial order		One	One	One	One
Covariates		No	Yes	Yes	Yes

In columns (1)–(4), each row reports the estimate of a separate regression. Robust standard errors adjusted for clusters at the municipality level are in parentheses. Estimates are obtained from local regressions with triangular kernel. Main and pilot bandwidths are defined as indicated in row "Bandwidth". MSE stands for mean squared error optimal bandwidth computed using the procedure by Calonico et al. (2014b, 2019). Mean is the average value of the dependent variable for municipalities with 850 to 1000 inhabitants. Covariates include dummy variables indicating the region of the municipality and an indicator variable taking value one for the first election in the municipality after the introduction of the signature requirements. Density: inhabitants per km^2. Men–Women: ratio of males to females (multiplied by 100). Less 6yr: % resident population under 6 years old. More 75yr: % of resident population aged 75 and older. Old Dep. Ratio: ratio of the population aged 65 and older to the population of working age (15–64) (multiplied by 100). Family size: average household size. BA Degree: % of college graduates and high school graduates in the population aged 6 and older. Labor Force: labor market participation. Unemp.: unemployment rate. High-Skill: % of employment in high-medium skilled occupations. Low-Skill: % of employment in low-skill occupations. Stars denote statistical significance level: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

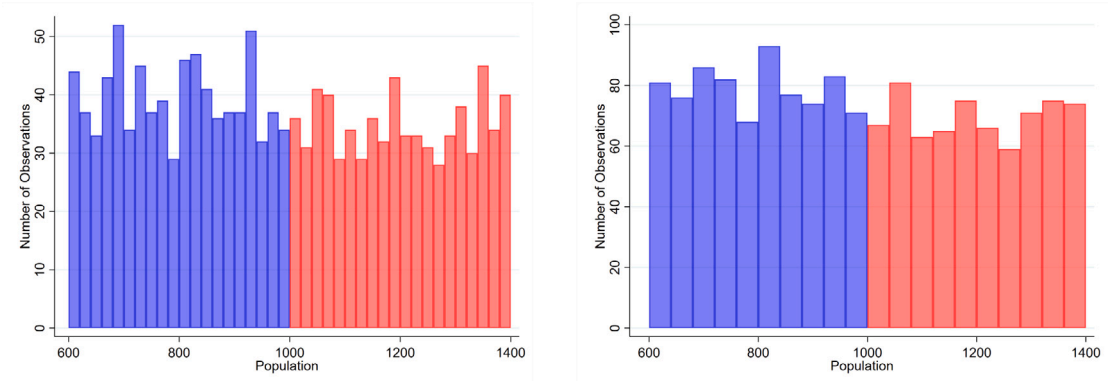

Fig. A.1. Validation check: Density of the running variable (histogram).
[a] Left panel: distribution of municipalities by population (1991 census), using 20-inhabitants bins. Right panel: distribution of municipalities by population (1991 census), using 40-inhabitants bins.

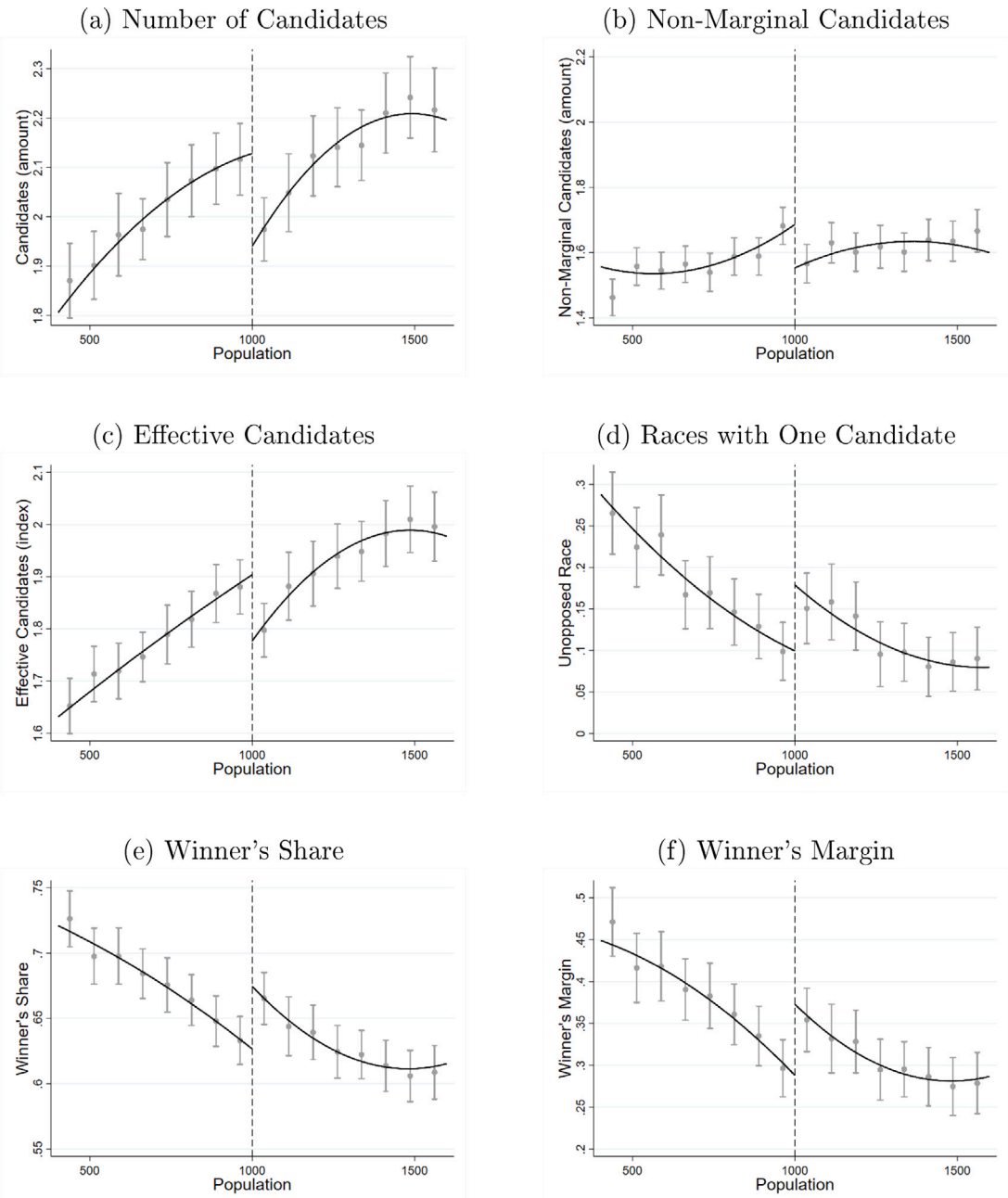

Fig. A.2. The effect of signature requirements on political competition.
The above figures provide a graphical representation of the regression discontinuity design. The dependent variables are indicated in the title of each graph, as defined in Section 4.3. The horizontal axis indicates municipalities' population size according to the 1991 Census. Each point denotes the average of the dependent within a 50-inhabitants bin and its 95% confidence interval. The line shows a second-order global polynomial estimated on each side of the discontinuity.

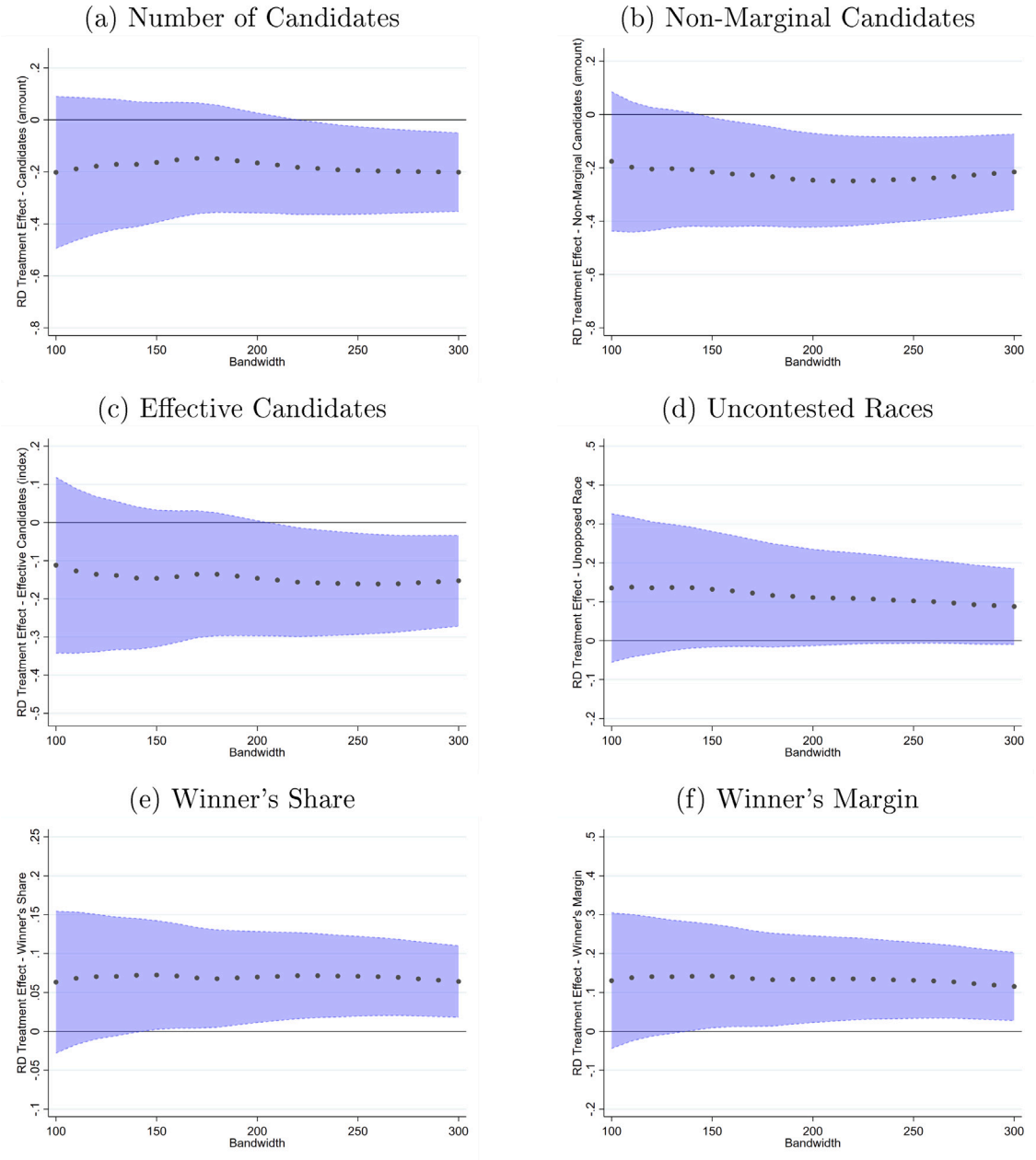

Fig. A.3. Robustness: RD effects for different bandwidths (electoral competition).
The above figures show the sensitivity of the estimated coefficients to the bandwidth choice. Dots represent the estimated treatment effect of the signature requirements using different bandwidths (reported in x-axis). Main and pilot bandwidths are set to be equal. All estimates are obtained from local linear regressions with triangular kernel and no covariates. The shaded areas represent the 95% confidence interval.

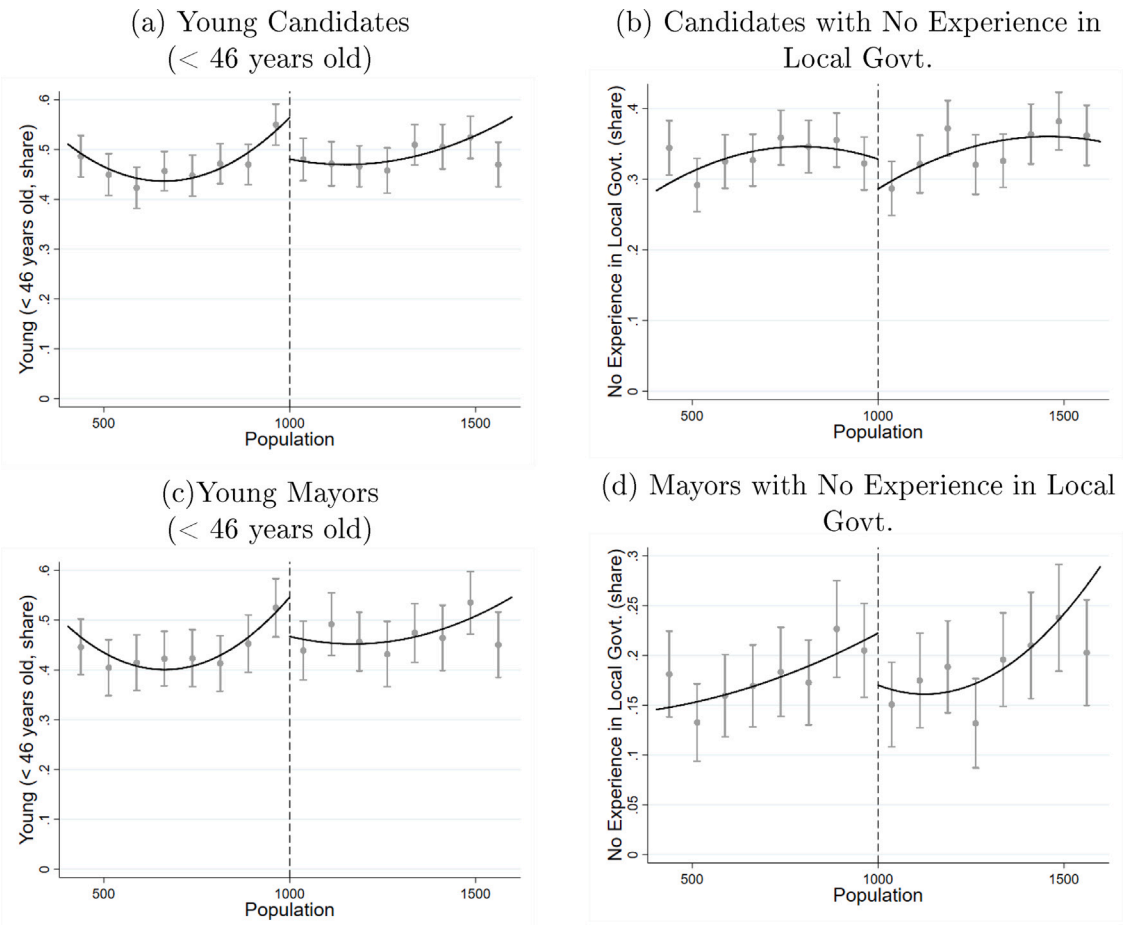

Fig. A.4. The effect of signature requirements on candidates' characteristics.
The above figures provide a graphical representation of the regression discontinuity design. The dependent variables are indicated in the title of each graph. The horizontal axis indicates municipalities' population size according to the 1991 Census. Each point denotes the average of the dependent within a 50-inhabitants bin and its 95% confidence interval. The line shows a second-order global polynomial estimated on each side of the discontinuity.

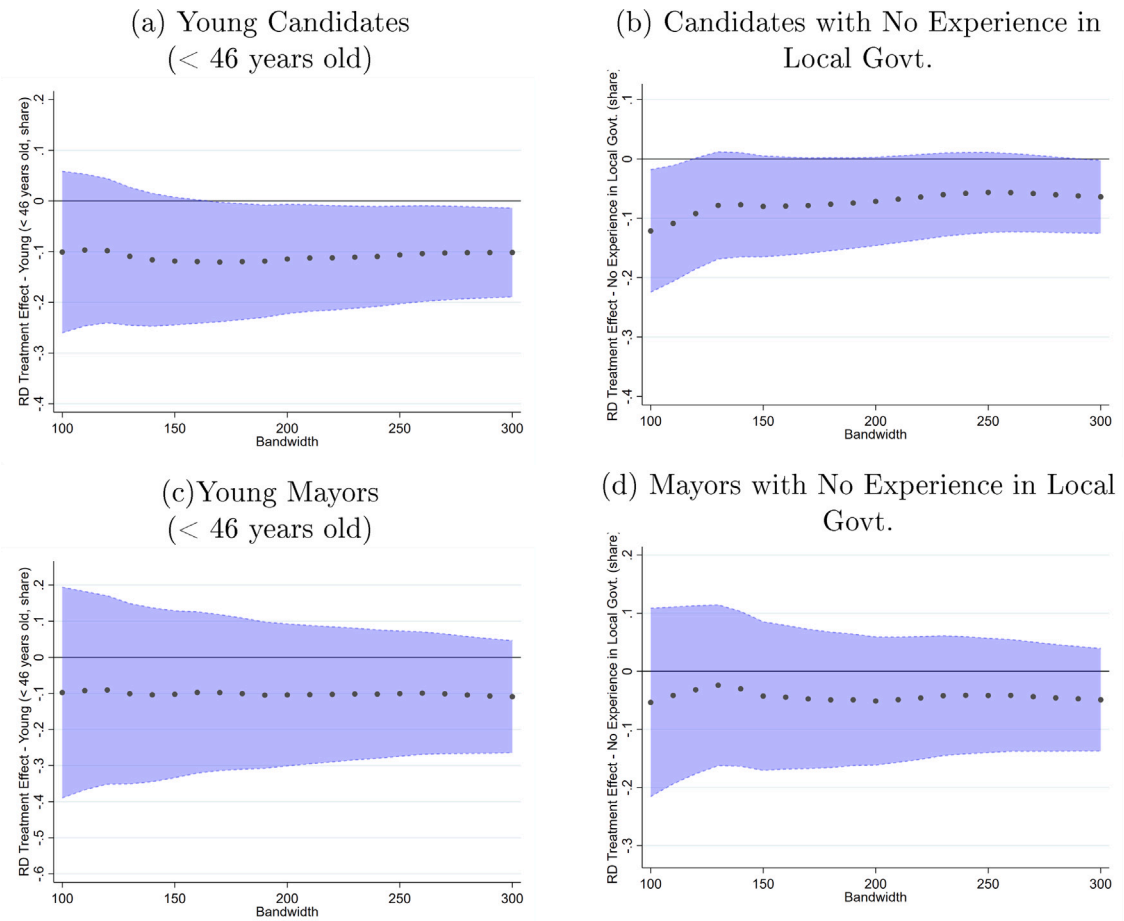

Fig. A.5. Robustness: RD effects for different bandwidths (candidates' selection).
The above figures show the sensitivity of the estimated coefficients to the bandwidth choice. Dots represent the estimated treatment effect of the signature requirements using different bandwidths (reported in x-axis). Main and pilot bandwidths are set to be equal. All estimates are obtained from local linear regressions with triangular kernel and no covariates. The shaded areas represent the 95% confidence interval.

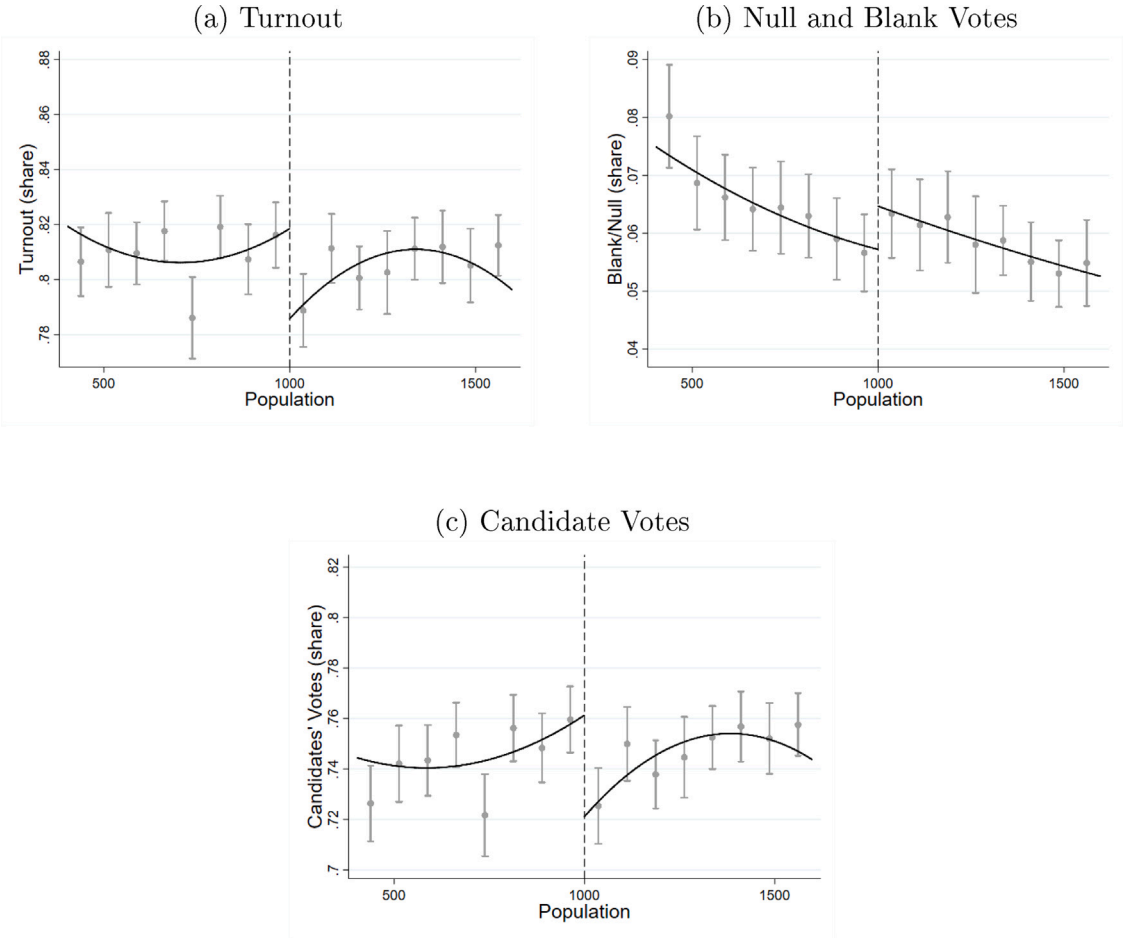

Fig. A.6. The effect of signature requirements on political participation.
The above figures provide a graphical representation of the regression discontinuity design. The dependent variables are (a) turnout, (b) the percentage of blank and null votes, and (c) the percentage of valid votes. The horizontal axis indicates municipalities' population size according to the 1991 Census. Each point denotes the average of the dependent within a 50-inhabitants bin and its 95% confidence interval. The line shows a second-order global polynomial estimated on each side of the discontinuity.

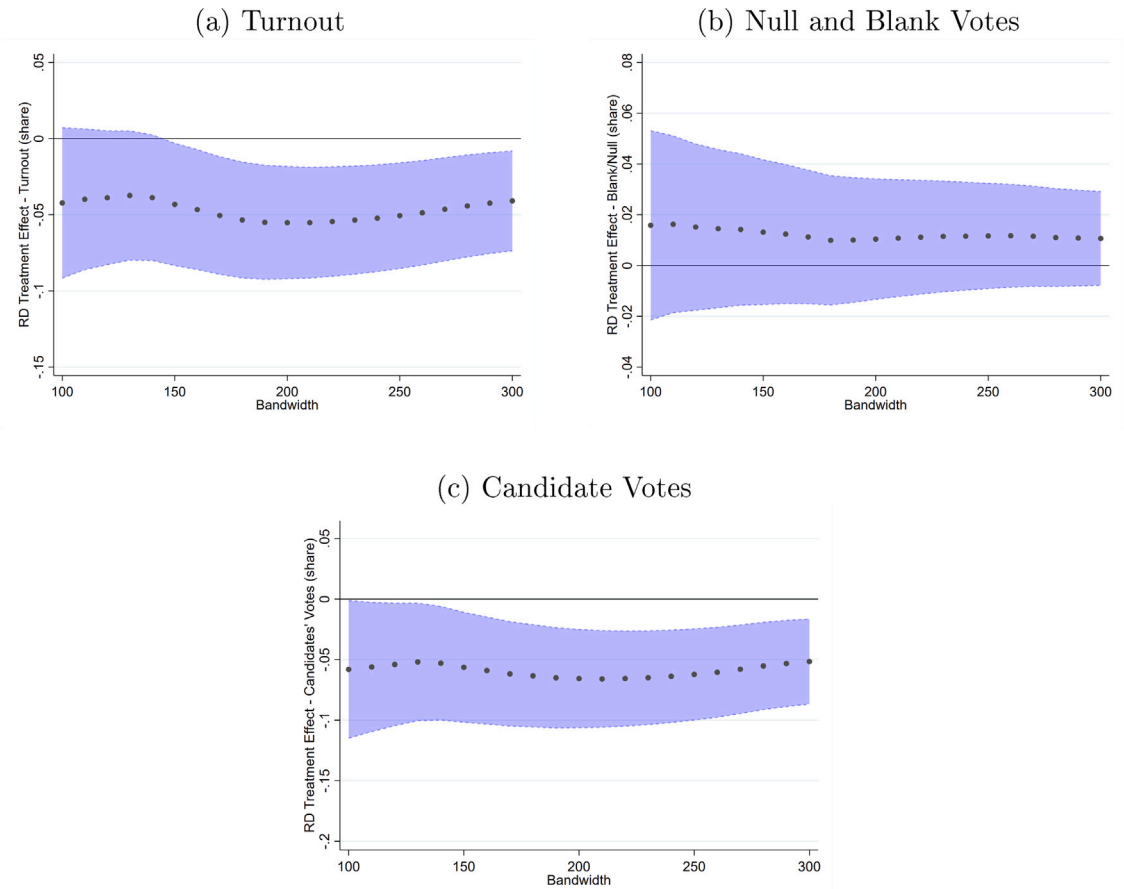

Fig. A.7. Robustness: RD effects for different bandwidths (political participation).
The above figures show the sensitivity of the estimated coefficients to the bandwidth choice. Dots represent the estimated treatment effect of the signature requirements using different bandwidths (reported in x-axis). Main and pilot bandwidths are set to be equal. All estimates are obtained from local linear regressions with triangular kernel and no covariates. The shaded areas represent the 95% confidence interval.

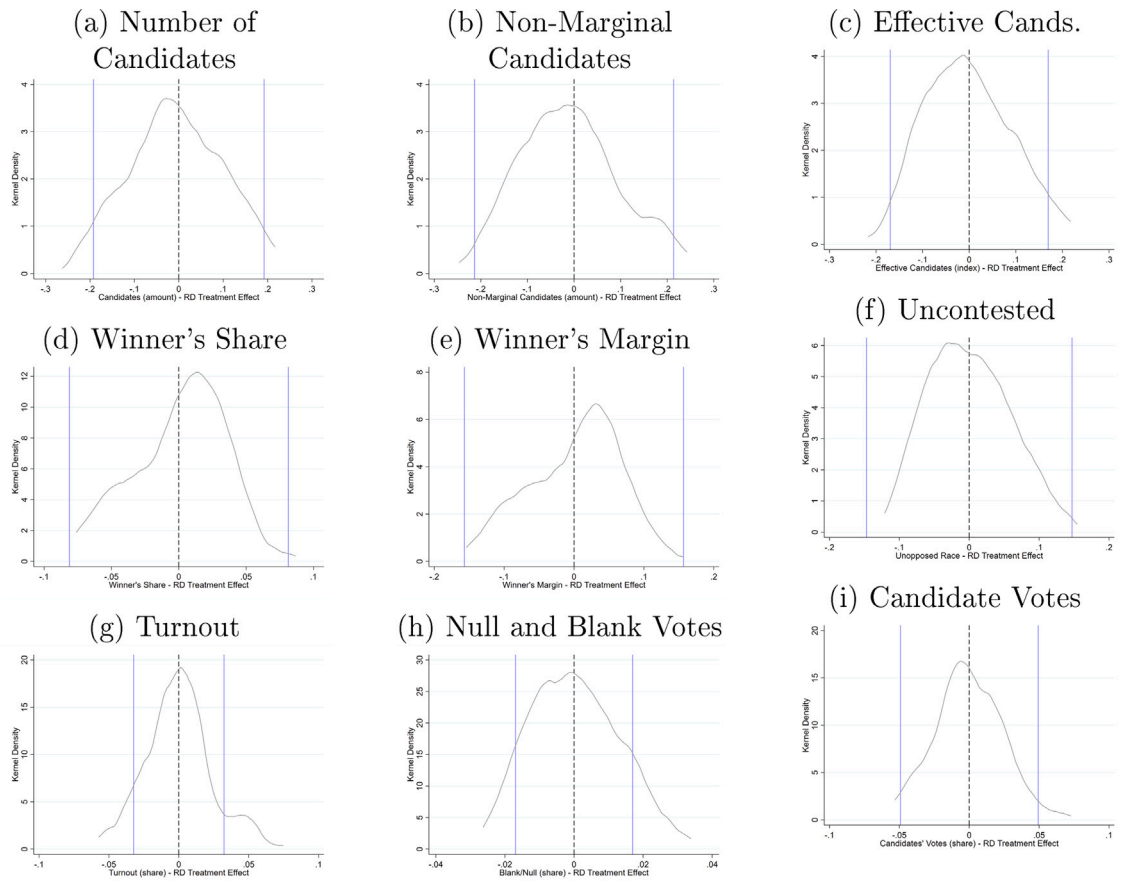

Fig. A.8. Robustness: RD effects at placebo thresholds (main variables).
The above figures provide the kernel density of the point estimates computed at 300 placebo cutoffs (for each population value in ranges 700–850 and 1150–1300). The vertical blue lines show the value of the true coefficient and its opposite. The vertical dotted line indicates value zero. All estimates (both the true coefficient and the placebo ones) are obtained from a covariate-adjusted local linear regressions with a 150-inhabitants bandwidth. Covariates include dummy variables indicating the region of the municipality (Piedmont, Lombardy, Veneto, Liguria, Marche, Lazio, Abruzzo, Campania, Calabria and Sardinia) and an indicator variable taking value one for the first election in the municipality after the introduction of the signature requirements.

Table A.3
Validation check: Placebo RD effects on variables used as covariates.

	Mean	(1)	(2)	(3)
Piedmont	0.22	−0.084	−0.093	−0.098
		(0.0638)	(0.0777)	(0.0999)
Lombardy	0.27	−0.024	−0.020	−0.023
		(0.0786)	(0.0830)	(0.107)
Veneto	0.036	0.024	0.011	−0.014
		(0.0318)	(0.0339)	(0.0395)
Liguria	0.036	−0.032	−0.050	−0.063
		(0.0241)	(0.0310)	(0.0421)
Marche	0.047	0.022	−0.0086	−0.011
		(0.0349)	(0.0426)	(0.0574)
Lazio	0.024	0.013	0.015	0.061**
		(0.0257)	(0.0247)	(0.0242)
Abruzzo	0.059	0.0059	−0.0044	−0.061
		(0.0367)	(0.0434)	(0.0498)
Campania	0.083	−0.0014	0.034	−0.0019
		(0.0458)	(0.0552)	(0.0738)
Calabria	0.071	0.0097	0.016	0.046
		(0.0345)	(0.0408)	(0.0475)
Sardinia	0.065	−0.022	−0.027	−0.0022
		(0.0443)	(0.0574)	(0.0778)
First Election	0.50	−0.0084	−0.0082	−0.011
		(0.0106)	(0.0137)	(0.0196)
Bandwidth		MSE	250 Inhab.	150 Inhab.
Polynomial order		One	One	One
Covariates		No	No	No

In columns (1)–(3), each row reports the estimate of a separate regression. Robust standard errors adjusted for clusters at the municipality level are in parentheses. Estimates are obtained from local regressions with triangular kernel. Main and pilot bandwidths are defined as indicated in row "Bandwidth". MSE stands for mean squared error optimal bandwidth computed using the procedure by Calonico et al. (2014b, 2019). Mean is the average value of the dependent variable for municipalities with 850 to 1000 inhabitants. Stars denote statistical significance level: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

Table A.4
Validation check: Placebo RD effects in pre-1993 outcome variables.

	Mean	(1)	(2)	(3)	(4)
Council Concentration (HH Index)	0.51	0.0100	0.012	0.022	0.089
		(0.0437)	(0.0422)	(0.0473)	(0.0606)
Lists in Council (number)	3.50	0.096	0.071	−0.027	−0.42
		(0.249)	(0.246)	(0.294)	(0.372)
Bandwidth		MSE	MSE	250 Inhab.	150 Inhab.
Polynomial order		One	One	One	One
Covariates		No	Yes	Yes	Yes

In columns (1)–(4), each row reports the estimate of a separate regression. Robust standard errors adjusted for clusters at the municipality level are in parentheses. Estimates are obtained from local regressions with triangular kernel. Main and pilot bandwidths are defined as indicated in row "Bandwidth". MSE stands for mean squared error optimal bandwidth computed using the procedure by Calonico et al. (2014b, 2019). Mean is the average value of the dependent variable for municipalities with 850 to 1000 inhabitants. Covariates include dummy variables indicating the region of the municipality (Piedmont, Lombardy, Veneto, Liguria, Marche, Lazio, Abruzzo, Campania, Calabria and Sardinia) and an indicator variable taking value one for the first election in the municipality after the introduction of the signature requirements. Stars denote statistical significance level: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

Table A.5
Candidates' characteristics and propensity to win election.

	Coeff.	Mg. Effect
Female	−0.096	−0.031
	(0.0742)	(0.0239)
Age (years)	0.037**	0.012**
	(0.0170)	(0.00555)
Age squared (years)	−0.00047***	−0.00015***
	(0.000177)	(0.0000579)
College	0.33***	0.11***
	(0.0672)	(0.0220)

(*continued on next page*)

Table A.5 (*continued*).

	Coeff.	Mg. Effect
High school	0.16**	0.053**
	(0.0661)	(0.0214)
Experience in local govt.	0.028***	0.0093***
	(0.00706)	(0.00229)
Politician	0.13**	0.045**
	(0.0594)	(0.0203)
Sindaco	1.09***	0.40***
	(0.0663)	(0.0226)
Surname freq. (share local pop.)	0.75	0.25
	(0.951)	(0.311)
Constant	−1.51***	
	(0.401)	
Observations	4077	4077

Column (1) reports the coefficient of a probit model with dependent variable an indicator of winning the election. Column (2) reports the marginal effect at the covariates mean. The model is estimated using information on electoral races during the period 1993–2000 in municipalities with 2000 to 3000 inhabitants. Stars denote statistical significance level: *** $p < 0.01$, ** $p < 0.05$ and * $p < 0.1$.

Table A.6
Primary outcomes — p-values and q-values.

Variable	*Model 1*		*Model 2*	
	p-value	*q*-value	*p*-value	*q*-value
Number of candidates and electoral competition				
Candidates (amount)	0.008	0.038	0.004	0.019
Effective candidates (index)	0.012	0.041	0.005	0.021
Non-marginal candidates (amount)	0.002	0.027	0.002	0.015
Race with > 2 candidates	0.140	0.226	0.113	0.156
Wasted votes (share)	0.157	0.233	0.227	0.251
Race with potential spoiler	0.284	0.366	0.512	0.478
Unopposed race	0.054	0.115	0.011	0.031
Winner's share	0.005	0.035	0.001	0.015
Winner's margin	0.008	0.038	0.002	0.015
Candidates' characteristics				
Female (share)	0.689	0.526	0.872	0.598
Young (< 46 years old, share)	0.027	0.067	0.012	0.031
Education (years)	0.502	0.431	0.918	0.598
Surname frequency (share of local pop.)	0.546	0.452	0.667	0.572
Experience in local govt. (years)	0.078	0.156	0.115	0.156
Propensity to win (index)	0.392	0.407	0.417	0.386
Mayors' characteristics				
Female (share)	0.912	0.642	0.738	0.598
Young (< 46 years old, share)	0.143	0.226	0.079	0.131
Education (years)	0.133	0.226	0.053	0.101
Surname frequency (share of local pop.)	0.790	0.612	0.894	0.598
Experience in local govt. (years)	0.168	0.234	0.159	0.189
Propensity to win (index)	0.570	0.452	0.573	0.488
Political participation				
Turnout (share)	0.018	0.051	0.045	0.094
Blank/Null (share)	0.237	0.312	0.061	0.108
Candidates' Votes (share)	0.005	0.035	0.010	0.031
Budget composition and administrative efficiency				
Investment (share)	0.877	0.639	0.761	0.598
Current expenditure (share)	0.825	0.615	0.954	0.6
Investment payments (speed)	0.000	0.005	0.000	0.001
Current exp. payments (speed)	0.611	0.468	0.548	0.488

The table presents the p-values and q-values for all primary outcomes for model 1 (MSE-optimal bandwidth, no covariates) and Model 2 (MSE-optimal bandwidth, with covariates). P-values are estimated using bias-corrected robust confidence intervals (Calonico et al., 2014b, 2019). Q-values are estimated jointly considering the 28 outcomes and following the procedure proposed by Benjamini et al. (2006) as described in Anderson (2008).

Table A.7
Robustness: RD effects at placebo thresholds (electoral competition).

	True cutoff		Placebo cutoffs (coefficients)		
	(1) Coeff.	(2) p-value	(3) Mean	(4) SD	(5) % > | True|
Candidates (amount)	−0.19	0.10	−0.00	0.10	0.06
Effective candidates (index)	−0.17	0.06	−0.00	0.09	0.06
Non-marginal candidates (amount)	−0.21	0.03	−0.01	0.11	0.04
Race with > 2 candidates	−0.04	0.52	−0.00	0.08	0.62
Wasted votes (share)	−0.00	0.88	−0.00	0.01	0.89
Race with potential spoiler	−0.01	0.83	−0.00	0.07	0.90
Unopposed race	0.15	0.04	−0.00	0.06	0.00
Winner's share	0.08	0.02	0.00	0.03	0.00
Winner's margin	0.16	0.01	0.00	0.06	0.00

Each row in the table corresponds to one dependent variable. Columns (1) and (2) report the RD coefficient computed at the true cutoff (1000 inhabitants) and its *p*-value. Columns (3) and (4) report the mean and standard deviation of RD coefficients computed at 300 placebo cutoffs (for each population value in ranges 700–850 and 1150–1300). Column (5) indicates the fraction of placebo coefficients that have an absolute value greater than the absolute value of the true coefficient. All estimates (both the true coefficient and the placebo ones) are obtained from a covariate-adjusted local linear regressions with a 150-inhabitants bandwidth. Covariates include dummy variables indicating the region of the municipality (Piedmont, Lombardy, Veneto, Liguria, Marche, Lazio, Abruzzo, Campania, Calabria and Sardinia) and an indicator variable taking value one for the first election in the municipality after the introduction of the signature requirements.

Table A.8
Robustness: RD effects at placebo thresholds (voter participation).

	True cutoff		Placebo cutoffs (coefficients)		
	(1) Coeff.	(2) p-value	(3) Mean	(4) SD	(5) % > | True|
Turnout (share)	−0.03	0.06	0.00	0.02	0.18
Blank/Null (share)	0.02	0.20	0.00	0.01	0.19
Candidates' votes (share)	−0.05	0.03	−0.00	0.02	0.04

Each row in the table corresponds to one dependent variable. Columns (1) and (2) report the RD coefficient computed at the true cutoff (1000 inhabitants) and its *p*-value. Columns (3) and (4) report the mean and standard deviation of RD coefficients computed at 300 placebo cutoffs (for each population value in ranges 700–850 and 1150–1300). Column (5) indicates the fraction of placebo coefficients that have an absolute value greater than the absolute value of the true coefficient. All estimates (both the true coefficient and the placebo ones) are obtained from a covariate-adjusted local linear regressions with a 150-inhabitants bandwidth. Covariates include dummy variables indicating the region of the municipality (Piedmont, Lombardy, Veneto, Liguria, Marche, Lazio, Abruzzo, Campania, Calabria and Sardinia) and an indicator variable taking value one for the first election in the municipality after the introduction of the signature.

Table A.9
Robustness: RD effects at placebo thresholds (candidates' selection).

	True cutoff		Placebo cutoffs (coefficients)		
	(1) Coeff.	(2) p-value	(3) Mean	(4) SD	(5) % > | True|
Candidates: Young (< 46 years old)	−0.12	0.05	0.00	0.08	0.12
No experience in local govt.	−0.08	0.06	0.01	0.05	0.17
Mayor: Young (< 46 years old)	−0.12	0.31	−0.00	0.10	0.27
No experience in local govt.	−0.04	0.51	0.00	0.06	0.41

Each row in the table corresponds to one dependent variable. Columns (1) and (2) report the RD coefficient computed at the true cutoff (1000 inhabitants) and its *p*-value. Columns (3) and (4) report the mean and standard deviation of RD coefficients computed at 300 placebo cutoffs (for each population value in ranges 700–850 and 1150–1300). Column (5) indicates the fraction of placebo coefficients that have an absolute value greater than the absolute value of the true coefficient. All estimates (both the true coefficient and the placebo ones) are obtained from a covariate-adjusted local linear regressions with a 150-inhabitants bandwidth. Covariates include dummy variables indicating the region of the municipality (Piedmont, Lombardy, Veneto, Liguria, Marche, Lazio, Abruzzo, Campania, Calabria and Sardinia) and an indicator variable taking value one for the first election in the municipality after the introduction of the signature.

Table A.10
Primary outcomes — definitions and sources.

Variable	Definition
Number of candidates and electoral competition	
Candidates	Number of candidates running for mayor.
Effective candidates	Inverse of the sum of the squared vote shares of all candidates (that is, the inverse of the Herfindahl–Hirschman vote concentration index). If one candidate gets all of the votes, the effective number candidates is equal to one. If all candidates split votes in equal parts, the effective number of candidates is equal to the number of candidates.
Non-marginal candidates	Number of candidates who obtain the votes of more than 25% of the registered voters or get at least 85% of the winner's amount of votes.
Race with > 2 candidates	Indicator (dummy) variable taking the value of 1 for elections with three candidates or more.
Wasted votes	Votes going to candidates other than the two top (as a percentage of registered voters).
Race with potential spoiler	Indicator (dummy) variable taking the value of 1 for elections in which the number of wasted votes is larger than the vote difference between the winner and the runner-up.
Unopposed race	Indicator (dummy) variable taking the value of 1 for elections with only one candidate.
Winner's share	Percentage of votes obtained by the winning candidate.
Winner's margin	Difference between the amount of votes obtained by the winner and the runner-up (as a percentage of the sum of the votes of the winner and the runner-up).
Note: These variables are computed at the election-municipality level using information from the Historical Elections Archives (Italian Ministry of the Interior).	
Candidates' characteristics	
Female	Indicator (dummy) variable taking the value of 1 for female candidates.
Young (< 46 years old)	Indicator (dummy) variable taking the value of 1 for candidates 45 years old or younger.
Education (years)	Years of schooling as follows: PhD (20 years), Graduate school (18), Bachelor's degree (17 years), Short bachelor's degree (16), Post-high school professional diploma (15), High school (13), Post-middle school professional diploma (13), Middle school (8), Post-elementary vocational diploma (6.5), Elementary school (5).
Surname frequency	Percentage of tax-reporting adults in the municipality sharing the surname.
Experience in local govt.	Years of experience in local governments (as either mayor, council member or advisor) from 1985 up to the time of the election.
Propensity to win	Probability of winning the election as predicted by a linear regression model on gender, age, schooling, experience in government, incumbency, and surname frequency estimated on electoral races in the period 1993–2000 in municipalities with 2000 to 3000 inhabitants (see Table A.5).
Note: These variables are computed at the year-municipality level using information from the Register of Local Administrators (Italian Ministry of the Interior).	
Variable	Definition
Political participation	
Turnout	Votes casted (including null and blank) as a percentage of registered voters.
Blank/Null	Blank or null votes as a percentage of registered voters.
Candidate votes	Non-blank valid votes as a percentage of registered voters.
Note: These variables are computed at the election-municipality level using information from the Historical Elections Archives (Italian Ministry of the Interior).	
Budget composition and administrative efficiency	
Investments	Share of investments in municipalities' total expenditure.
Expenditure	Share of current expenditures in municipalities' total expenditure.
Speed of investment payments	Ratio between cash basis and accrual basis investment expenditures.
Speed of current exp. payments	Ratio between cash basis and accrual basis current expenditures.
Note: These variables are computed at the candidate level using information from the annual municipal budgets (Italian Ministry of the Interior).	

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