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Divided They Fall. Fragmented Parliaments and Government Stability

Felipe Carozzi
Davide Cipullo
Luca Repetto

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www.cemfi.es

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Abstract

This paper studies how political fragmentation affects government stability. Exploiting variation in the number of parties induced by a 5% vote share entry threshold in Spanish local councils, we show that the entry of an additional party in Parliament increases the probability of unseating the incumbent by 4 percentage points. We also document that mayors with more resources at their disposal for legislative bargaining are half as likely to be unseated. Challengers are younger, better educated, and more likely to win the following elections, suggesting that instability may induce positive selection on politicians. We interpret our results in light of a two-period bargaining model of coalition formation featuring government instability.

JEL Codes: H1, H7, R50.

Keywords: Government stability, fragmentation, no-confidence votes, policy uncertainty, alignment effect.

Felipe Carozzi
London School of Economics
F.Carozzi@lse.ac.uk

Davide Cipullo
Uppsala University
davide.cipullo@nek.uu.se

Luca Repetto
Uppsala University
luca.repetto@nek.uu.se

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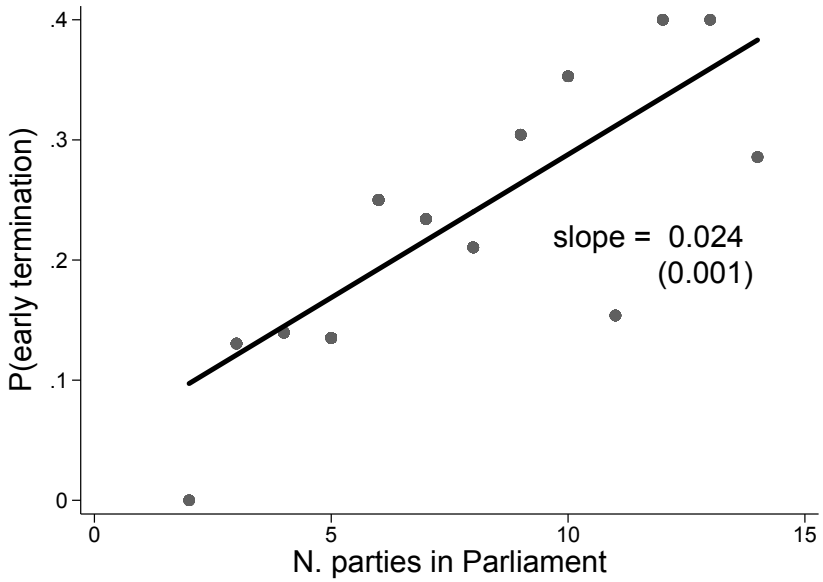
1. Introduction

Political instability is widely held to be a major obstacle to global economic development (UN, 2018). Frequent government turnover can be harmful because it increases uncertainty about policy which could, in turn, discourage investment and reduce growth. On the other hand, the ability to unseat and replace unfit politicians is one of the pillars of democratic rule. Striking a balance between stability and accountability is a significant challenge for parliamentary democracies.

Historically, unstable governments have been associated with fragmented parliaments. The German Weimar Republic went through 16 governments in just over a decade and had as many as 15 parties achieving representation. The fragmented Parliament of the French Fourth Republic witnessed 21 cabinets in just 12 years, before the introduction of a presidential regime in 1958. More recently, Spain experienced its first successful vote of no confidence in 2018, after the two-party system was challenged by the entry of new parties in Congress. This association between government instability and fragmentation appears to be more than anecdotal. Figure 1 below plots a binned scatter plot of the number of parties represented in Parliament against the probability of early termination for 29 European parliaments for the period 1944-2010. The large positive correlation suggests that fragmentation is harmful for government stability. However, to date we lack rigorous evidence on whether this relationship is indeed causal.

FIGURE 1

NUMBER OF PARTIES IN PARLIAMENT AND GOVERNMENT EARLY TERMINATION



Notes: Probability of early termination of the government in 29 European Parliaments, 1944-2010. The scatter plot points are bin averages of the dependent variable for each value of the number of parties. The solid line is the estimated regression of an indicator for the legislature ending prematurely on the number of parties with representation in the Parliament. We report the estimated slope and its standard error in parentheses (total number of observations: $N = 362$ legislatures). Early termination is defined as a change in government such that both the prime minister and the supporting coalition change. Source: authors' elaboration using the European Representative Democracy Data Archive (Andersson, Bergman and Ersson, 2014).

This paper studies the determinants of government stability in parliamentary democracies. We start by investigating the role of legislative fragmentation. Our analysis is motivated by the fact that fragmentation has become a prominent feature of parliaments all over the world. Over the last decades, fragmentation has risen steadily, reaching unprecedented levels. In OECD countries, the average number of parties with representation in Parliament has grown from 7 in the late 1940s to 9 in the 1980s, and exceeds 10 as of 2019 (see figure E.1 in appendix E). The main contribution of this paper is to present causal evidence that fragmentation increases government instability. Additionally, we explore how instability shapes the selection of politicians in office and investigate the potential trade-off between stability and accountability.

To guide the empirical analysis, we build on Baron and Ferejohn (1989) and Persson and Tabellini (2002) and develop a simple two-period sequential game of coalition formation in which parties bargain over the allocation of budgetary resources. The probability that the incumbent is unseated with a vote of no confidence in the second period depends on the number of parties with representation in Parliament via two channels. First, more fragmented legislatures are less likely to have stable single-party majorities. Secondly, coalition governments elected by more fragmented parliaments are more likely to be unseated, as coalition members tend to be smaller and can be persuaded to support a no-confidence vote by being offered a lower share of the budget. An additional testable implication of our model is that incumbents with more bargaining resources at their disposal are less likely to be removed from office.

Our empirical strategy relies on two different regression discontinuity designs (RDD). We construct a dataset with information from several sources on over 50,000 Spanish municipal governments, spanning all full terms between 1979 and 2014. This setting is ideal for our purposes because Spanish municipalities are institutionally akin to small parliamentary democracies, with the equivalent of a parliament and an executive. In addition, it allows us to overcome some important limitations of previous empirical work on the determinants of government stability. First, government breakdowns – such as no-confidence votes or *coups* – are rare events, thus the available variation in cross-country studies is limited. We take advantage of the richness of our data, which contain information on a large number of local governments and provide us with over 1,000 successful no-confidence votes. Second, it is typically hard to find credible sources of exogenous variation in the determinants of stability.[1] We exploit institutional features of Spanish municipalities to generate quasi-experimental variation that can be used to identify the causal effects of both fragmentation and the amount of bargaining resources available to the incumbent.

To study the effect of fragmentation — measured as the number of parties with representation – we exploit a discontinuity in the probability that a party obtains a seat in the

[1]For example, Taylor and Herman (1971) estimate the effect of fragmentation on stability using a limited set of controls. Merlo (1998) analyse the duration of Italian national governments using a duration model controlling for government characteristics such as majority status or aggregate time-series variables. Diermeier, Eraslan and Merlo (2003) use data on 255 governments for 9 Western European countries to estimate a structural model of government formation.

local council generated by a 5% vote share admission threshold. Municipalities in which one party obtained a vote share just above the threshold have, on average, more parties in the council than those where the party fell just below the threshold. We use this variation in a regression-discontinuity design, and find that the entry of an additional party leads to a 4 percentage point increase in the probability that the local government is replaced. This effect is large, amounting to twice the corresponding baseline probability. In line with model predictions, the decrease in stability results both from a change in the probability of a single-party majority, and from a reduction in the duration of minority or coalition governments when no such majority exists.

To evaluate whether the amount of bargaining resources at the disposal of the incumbent affects stability, we test whether mayors aligned with other tiers of government are less likely to be unseated. Municipal governments belonging to the coalition in power at the regional level have been shown to receive more transfers (studies documenting an alignment effect for Spain include Solé-Ollé and Sorribas-Navarro 2008; Curto-Grau, Solé-Ollé and Sorribas-Navarro 2018). Therefore, alignment provides parties with additional resources that can be used in the bargaining process. Comparing municipalities that are aligned with those that are not in a close-elections RDD, we show that being aligned has a large, positive effect on stability: aligned mayors are 5 percentage points less likely to be unseated by a vote of no confidence than unaligned ones, consistent with model predictions.

Finally, votes of no confidence and other early terminations can affect the selection of politicians in office by removing lower-quality incumbents. We use proxies for politicians' quality which have frequently been used in the literature – such as education and pre-office occupation – to show that municipalities with low quality mayors are more likely to experience votes of no confidence.[2] Additionally, we study the consequences of unseating the incumbent on both the quality of the newly established government and the electoral performance of the parties involved. Difference-in-difference estimates show that unseated governments are replaced by mayors of higher quality. Moreover, the parties of unseated mayors are heavily punished in the next elections, being 28 percentage points less likely to win again. Conversely, challengers that are successful at unseating the incumbent enjoy large electoral rewards. This reinforces the notion that the legislature tends to replace low quality incumbents.

Our results suggest the existence of a trade-off between stability and selection, and provide an immediate policy implication. Designers of electoral rules can use the admission threshold to Parliament as a tool to achieve more stability, at the cost of hindering the replacement of unfit incumbents.[3] Keeping the observed vote share distributions fixed, we estimate that increasing the vote share threshold from 5% to 6% would reduce the number of parties and, correspondingly, the probability of unseating the government by 0.75 percent-

[2]Examples of papers using similar measures of quality include Dal Bó, Dal Bó and Snyder (2009); Gagliarducci and Paserman (2011); Dal Bó et al. (2017).

[3]Of course, high admission thresholds also present the problem of leaving a large part of the electorate without representation in the Parliament.

age points, one-fourth of the baseline probability. Similarly, lowering the threshold from 5% to 4% would increase the probability of unseating by one-sixth of the baseline.

The analysis of government instability here is partly motivated by concerns over the impact of stability on economic outcomes. Political instability can generate policy uncertainty, which in turn may slow down investment (Bernanke, 1983; Bloom, Bond and Van Reenen, 2007; Julio and Yook, 2012), hiring (Baker, Bloom and Davis, 2016), bank lending (Bordo, Duca and Koch, 2016) and, ultimately, growth (Bloom, 2014). Cross-country evidence documenting a positive association between political stability and growth directly can be found in Barro (1991), Alesina et al. (1996) and, more recently, Arezki and Fetzer (2019). We contribute to this literature by providing evidence on some key drivers of government instability.

Our paper contributes directly to the literature studying the determinants of government turnover. Theoretical models of legislative bargaining featuring government instability in a parliamentary setting can be found in Lupia and Strøm (1995), Baron (1998) and Diermeier and Merlo (2000). All of these models feature legislative bargaining between three parties, and include shocks to economic or electoral prospects that can induce renegotiations and votes of no confidence. More recently, Francois, Rainer and Trebbi (2015) presented a simple model of coalition formation with the risk of coups or revolutions to understand power sharing arrangements in African countries. Our model contributes to this literature by explicitly studying how an increase in the number of parties with representation affects stability. The main predictions are derived without specifying parties' preferences for specific coalition partners, though we include party-level heterogeneity in bargaining resources.

On the empirical front, causal interpretation of the results in most reduced-form studies of the drivers of government stability requires relatively strong assumptions (see for example Taylor and Herman 1971 and Merlo 1998).[4] Merlo (1997) and Diermeier, Eraslan and Merlo (2003) build on the theoretical models outlined above to obtain structural estimates of a government formation model. While these estimates can be used to perform constitutional experiments, they rely on strong identification assumptions. Finally, Baron, Bowen and Nunnari (2017) and related work explore the determinants of coalition stability in the lab. Our contribution to this line of research lies in providing rigorous causal evidence on key drivers and consequences of government stability.

Finally, we contribute to the literature on the effects of political factors on policy outcomes and public resource allocation. Ferreira and Gyourko (2009) and Snowberg, Wolfers and Zitzewitz (2007) study partisan differences in policies. Bracco et al. (2015) and Curto-Grau, Solé-Ollé and Sorribas-Navarro (2018) – among others – document large impacts of partisan alignment with upper tiers of government on transfers. Finally, Gehring and Schneider (2018) show that EU commissioners allocate more funds to their home countries. Ethnic favouritism often also biases the allocation of transfers (see, e.g., Burgess et al. 2015). In this paper, we take another approach by focusing on government stability as the main outcome of interest and emphasizing the bargaining process rather than ideological or ethnic factors

[4] One exception in this regard is the work by Gagliarducci and Paserman (2011), which focuses specifically on estimating how the gender of the executive head affects government stability.

as the driver of resource allocation.

2. Theoretical Framework

We start by presenting a coalition formation game which links government instability with the number of parties represented in Parliament. There are two periods, in each of which, with some probability, a party is chosen as the agenda setter or *formateur*. The agenda setter has the right to propose a transfers allocation to other parties to form a governing coalition. The setting draws from the seminal work by Baron and Ferejohn (1989), and has features in common with Diermeier and Merlo (2000). Government instability in our context is driven by the possibility that the incumbent is unseated and replaced by a different party via a no-confidence vote.

The number of parties affects government stability through two channels: i) it changes the probability that a single party has a majority of seats, and ii) it has an effect on the size of the minimum winning coalition needed to secure a majority when no party has a majority of its own. Smaller coalitions are cheaper to form, but also easier to unpick by a competitor. As a result, the entry of an additional party in Parliament decreases stability. We illustrate the case in which the number of parties increases from 3 to 4 and leave the treatment of other cases for appendix A.

The model has two additional implications: first, that the amount of resources available to the incumbent for bargaining affects the stability of the coalition; and second, that lower quality agenda-setters are more likely to be voted out of office by challengers of better quality.

2.1. Model setup and timing

This is a sequential, two-period game of coalition formation with complete information. There are J parties with seat-shares $[s_1, ..., s_J]$ satisfying $\sum_{j=1}^{J} s_j = 1$ and $s_1 > s_2 > ... > s_J$. We can think of parties as representing groups of voters, each with a specific and exclusive policy-agenda. In each period, the pay-off function for party j is $u_j^t = g_j^t + \omega \mathbb{1}\{j = m\}$, where g_j^t is the approved party-specific transfer in period t, and m is the party-index of the mayor in that period. Parameter $\omega > 1$ captures ego rents from holding office and implies that the agenda setter will always prefer to be in power. Future pay-offs are discounted by $\beta \leq 1$.

There are two potential *formateurs*, party 1 and 2, which coincide with the parties with the highest and second highest seat shares, respectively. Parties 1 and 2 are heterogeneous in the resources they can allocate among coalition members, denoted as θ_1 and θ_2, respectively. θ_1 and θ_2 are continuously distributed on the interval [0,1] and we assume that they are drawn before the start of the game and known by all players.

The timing of the sequential game is as follows. In the first period, party 1 can attempt to form a coalition by offering a vector of transfers $g^1 = [g_1^1, ..., g_J^1]$ with $g_j^1 \geq 0, \forall j$ and $\sum_{j=1}^{J} g_j^1 \leq \theta_1$. Other parties decide whether or not to accept the proposal by party 1. If the proposal is accepted by the majority of the Parliament, a coalition is formed and each party receives its pay-off. If the proposal does not gather enough support, a default policy is implemented, in which parties receive a fraction of the total budget corresponding to their seat share, so

that $g^1 = [\theta_1 s_1, ..., \theta_1 s_J]$. This assumption ensures that parties' reservation transfers are increasing in their seat shares.

In the second period, with probability μ, party 2 has an opportunity to become a new *formateur* and make an alternative proposal $g^2 = [g_1^2, ..., g_J^2]$ satisfying $g_j^2 \geq 0, \forall j$ and $\sum_{j=1}^{J} g_j^2 \leq \theta_2$. If the proposal is accepted by a strict majority of seats, a new coalition headed by party 2 is formed and we say that there was a successful vote of no confidence. In this case, period 2 payments are g^2. If this proposal is not accepted, or party 2 is unable to make a proposal (an event with probability $1 - \mu$), then period 2 pay-offs are the same as those determined in period 1 (this assumption regarding the next period default option is analogous to the one in Anesi and Seidmann 2015).[5]

The model can be solved by backward induction. In general, the equilibrium strategies and the probability of a vote of no confidence will depend on the values of bargaining resources available to each party (θ_1, θ_2) and on the seat shares.

2.2. Equilibrium with 3 parties

We now assume that $J = 3$ and solve for the equilibrium by backward induction. In period 2, with probability $(1 - \mu)$, party 2 is not selected as the new agenda setter and pay-offs are the same as in period 1, so $g^2 = \overline{g}^1$. With probability μ, party 2 can attempt to form a new coalition to replace party 1. With $J = 3$, this amounts to making an offer to party 3.[6] Party 2 makes a proposal to maximize its utility:

$$\max_{g^2} \ \mathbb{1}\{s_2 + s_3 \mathbb{1}\{g_3^2 > \overline{g}_3^1\} > 0.5\} \ (g_2^2 + \omega - \overline{g}_2^1) + \overline{g}_2^1$$
$$s.t. \sum_{j=1}^{3} g_j^2 \leq \theta_2.$$

Because g_2^2 is one of the elements in g^2 and enters additively in the objective function, the budget constraint holds with equality. Given that party 3 is indifferent between staying in the current coalition or joining the new one, party 2 can gain its support by offering the continuation value $\overline{g}_3^1$ carried over from period 1. Whether or not party 2 has enough resources to make this offer depends on whether $\theta_2 > \overline{g}_3^1$. If this condition is satisfied, party 2 will propose $g^2 = [0, \theta_2 - \overline{g}_3^1, \overline{g}_3^1]$ and attempt to create a new coalition. Note that forming a new coalition is always incentive compatible for party 2 given $\omega > 1$. This proposal will only succeed if party 1 does not have single-party majority, so that $s_1 < 0.5$. If either condition is not met, party 1 remains in power and everyone receives its continuation value.

Having characterized decisions in period 2, we move to period 1. Equilibrium strategies in this period, as well as the probability of a vote of no confidence, will depend on the values

[5] Our assumption that party 1 and party 2 have the chance to be agenda setters sequentially departs from the probabilistic formulation in Baron and Ferejohn (1989) and the related literature. In our model, this is necessary to ensure we can characterize the equilibria in (θ_1, θ_2) space, disregarding potential heterogeneity in other parties' types.

[6] Note that the new coalition will never include party 1, because there is no feasible transfer g_1^2 larger than party 1's continuation value, given ego rents $\omega > 1$.

of θ_1 and θ_2 and on the seat shares. There are two cases that warrant separate attention: single-party majorities and coalition governments. In the case where $s_1 \geq 0.5$, party 1 can always form a *single-party majority*, and allocate all transfers to itself, earning a pay-off of $\omega+\theta_1$ in both periods, with other parties obtaining zero. Note that single-party majorities are not contestable, in the sense that party 2 cannot form an alternative coalition that achieves the majority of seats.

If $s_1 < 0.5$, a multi-party majority coalition is needed. In period 1, party 1 makes a proposal g^1 to distribute the available resources θ_1. Party 1 will always be able to make a proposal that gathers a majority by offering the default transfer $s_3\theta_1$ to party 3. The problem faced by party 1 when forming an initial coalition can be written as:

$$\max_{g^1} (g_1^1 + \omega)\Big(1 + \beta(1 - \mu \mathbb{1}\{\theta_2 > g_3^1\})\Big) \tag{1}$$

$$s.t. \sum_{j=1}^{3} g_j^1 \leq \theta_1. \tag{2}$$

In the case with $s_1 < 0.5$, equilibrium choices, as well as the onset of a vote of no confidence, will depend on specific values for s_3, θ_1 and θ_2. Specifically, there are three different types of coalitions that can arise in equilibrium.

If $\theta_2 \leq s_3\theta_1$, party 2 cannot unseat party 1 in period 2, because it does not have enough resources to pay the default option to party 3. Party 1 can propose $g^1 = [(1 - s_3)\theta_1, 0, s_3\theta_1]$, and rule for both periods with certainty. This is the maximal pay-off party 1 can receive in this case, because i) offering transfers smaller than $s_3\theta_1$ to party 3 will lead to the default policy, which is strictly dominated for party 1, and ii) offering higher transfers to party 3 (or transfers to party 2) leads to a smaller pay-off. We call this equilibrium a *safe minimum cost coalition*.

If $\theta_2 > \theta_1$, there is no transfer to party 3 in period 1 that can prevent a vote of no confidence in period 2 (i.e., $\theta_2 > g_3^1$). As a result, any coalition formed by party 1 will be contestable. The dominating strategy among the set of contestable coalitions is a *contestable minimum cost coalition*. As above, this arises when offering $s_3\theta_1$ to party 3.

Finally, there is a range of values such that $\theta_2 \in (s_3\theta_1, \theta_1)$ in which party 1 can form a *safe blocking coalition*.[7] A vector of transfers leads to a *blocking* coalition if it prevents party 2 from mounting a successful vote of no confidence in period 2. Party 1 can form a blocking coalition by offering θ_2 to party 3. In that case, party 2 cannot buy the support of this party in period 2 so the coalition is safe. Blocking coalitions are only possible if $\theta_2 \leq \theta_1$. Whether or not they are incentive compatible will depend on the pay-off from contestable minimum cost coalitions. When choosing between blocking and contestable coalitions, party 1 faces an inter-temporal trade-off between current transfers and future rents from office.

[7] In this case, party 1 forms a more expensive coalition that cannot be undone in period 2. This strategy is similar to the formation of a supermajority (Groseclose and Snyder, 1996). However, in our case, the size of the coalition is unchanged but allies enjoy larger transfers relative to those in a minimum cost coalition.

Expected pay-offs for party 1 in each coalition are given by:

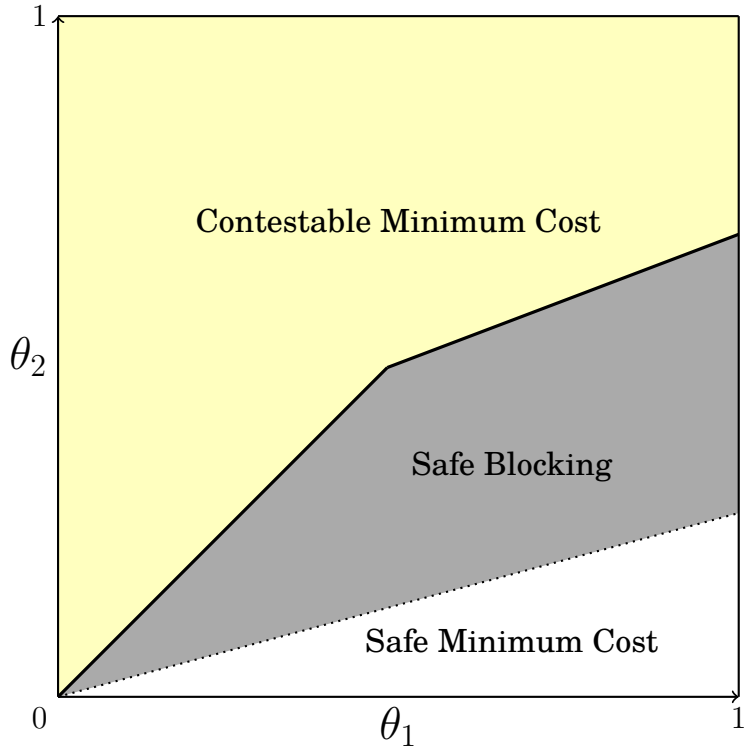
$$
\begin{aligned}
V_{mc}^{S} &= [\omega + \theta_1(1 - s_3)](1 + \beta) \\
V_{mc}^{C} &= [\omega + \theta_1(1 - s_3)][(1 + \beta)(1 - \mu) + \mu] \\
V_{block}^{S} &= [\omega + \theta_1 - \theta_2](1 + \beta),
\end{aligned}
$$

where V_{mc}^{S} is the pay-off for minimum cost safe coalitions, which is feasible when $\theta_2 \leq s_3\theta_1$. V_{mc}^{C} is the pay-off for minimum cost contestable coalitions, which are always feasible. Finally, V_{block}^{S} is the pay-off for safe blocking coalitions, which are feasible when $\theta_2 \leq \theta_1$.

Note that V_{mc}^{S} is larger than the other two expressions when $\theta_2 < s_3\theta_1$, so that safe minimum cost coalitions will always be played when that condition is met. This is represented as the region below the dotted line in figure 2.

FIGURE 2

COALITIONS IN THE (θ_1,θ_2) SPACE - 3 PARTIES



Notes: Optimal party 1 coalition strategies in period 1 in the (θ_1, θ_2) space. Case with $s_1 < 0.5$.

Regarding the choice between blocking and contestable coalitions, party 1 will only play a blocking coalition if the costs of securing power in both periods are low enough relative to the additional own transfers obtained when risking a contestable coalition. The incentive compatibility condition $V_{block}^{S} \geq V_{mc}^{C}$ is satisfied if and only if:

$$
\theta_2 \leq h(\theta_1, s_3) \equiv \frac{\mu\omega\beta}{1 + \beta} + \frac{s_3(1 + \beta - \mu\beta) + \mu\beta}{1 + \beta}\theta_1 \tag{3}
$$

This takes the form of a linear constraint, with a positive intercept and increasing in θ_1. Recall that a blocking coalition is only feasible if $\theta_1 \geq \theta_2$. Combining both conditions we can

obtain the set of (θ_1, θ_2) pairs such that safe blocking coalitions are played in equilibrium. This is the gray area between the solid and dotted lines in figure 2. A kink in the boundary of this region is found in the intersection of constraints 3 and $\theta_1 = \theta_2$.[8]

This completes the list of possible equilibria in the 3 party case. The solid line in figure 2 separates safe and contestable coalitions in the case with no single-party majorities. For a given triplet of seat shares with $s_1 < 0.5$, the probability of a vote of no confidence is given by the complement of the integral of the joint (θ_1, θ_2) distribution taken over the region under the solid line, multiplied by μ. Define $\pi(\mathbf{s})$ as the function mapping seat share vector s to a probability of a vote of no confidence. In the 3 party case, this can be written as:

$$\pi(\mathbf{s}) = \mu\Big(1 - \Big(\int_0^{\theta_k}\int_0^{\theta_1} g(\theta_1,\theta_2)\ d\theta_2\, d\theta_1 + \int_{\theta_k}^{1}\int_0^{h(\theta_1,s_3)} g(\theta_1,\theta_2) d\theta_2 d\theta_1\Big)\Big) \tag{4}$$
$$\text{with}\ \ \theta_k = \frac{\mu\omega\beta}{(1-s_3)(1+\beta-\mu\beta)},$$

where $g(\theta_1, \theta_2)$ is the joint density function of (θ_1, θ_2), $h(\theta_1, s_3)$ is defined in 3, s is a seat share vector satisfying $s_1 < 0.5$ and θ_k is the value of θ at the kink resulting from the intersection between constraints.

2.3. Equilibrium with 4 parties

Consider the case of 4 parties, with seat shares $[s_1, s_2, s_3, s_4]$. As before, if $s_1 \geq 0.5$, party 1 cannot be unseated and stays in office in both periods. When $s_1 < 0.5$, party 1 needs to form a coalition. In the case with 4 parties, party 1 has two options to form a majority. It can always form a majority with party 3, since necessarily, $s_1 + s_3 \geq 0.5$.[9] Alternatively, it can form a majority with party 4 whenever $s_1 + s_4 \geq 0.5$.

In either case, we can proceed analogously as with 3 parties. The expected pay-offs from forming each type of coalition are the same as in the 3 parties-case but replacing, in all expressions, s_3 with $s_* = s_3 + (s_4 - s_3)\mathbb{1}\{s_1 + s_4 \geq 0.5\}$.

The term s_* is simply the seat share of either party 3 or 4, depending on which one allows party 1 to form the minimum winning coalition. This change can modify both the feasibility of safe minimum cost coalitions (which now requires $\theta_2 \leq s_*\theta_1$) and the pay-off from contestable coalitions. The pay-off from forming a blocking coalition for party 1 is the same as in the 3-party case, as the transfer required to block party 2 from unseating continues to be θ_2, regardless of the identity and seat share of the party receiving it.[10]

The condition for party 1 to prefer a safe blocking coalition over a contestable minimum cost coalition is now given by $h(\theta_1, s_*)$, where function $h(.)$ is defined as in 3. As above, this

[8] This kink will only be interior to the unit square under the assumption that $\beta\Big(\mu(1+\omega-1/3)-(2/3)\Big) < 2/3$, which follows from substituting θ_1 and θ_2 by 1 in 3 and replacing s_3 by its upper bound (1/3). If the kink is outside of the unit square, then the propositions below are still technically satisfied because the statements on probabilities are weak and not strict.

[9] To see why, note that if it were the case that $s_1 + s_3 < 0.5$, then necessarily $s_2 + s_4 \geq 0.5$. Given that $s_1 \geq s_2$ and $s_3 \geq s_4$, this leads to a contradiction.

[10] If $s_1 + s_4 < 0.5$ then party 3 is offered θ_2 in period one, as in the 3 party case. If $s_1 + s_4 > 0.5$, then party 1 can split θ_2 in any way between parties 3 and 4 as long as the proposed transfer exceeds the default option for one of the two. This split has no influence on the pay-off for party 1 or the probability of a vote of no confidence.

will only be feasible when $\theta_1 \geq \theta_2$. Combining both constraints we can obtain the equivalent of the solid line in figure 2 in the 4 party case. In the case in which $\theta_2 \leq s_*\theta_1$, party 1 forms a safe minimum cost coalition as above. The probability of a vote of no confidence is analogous to the one in expression 4, replacing, again, s_3 with s_* when appropriate.

Given that $s_* \leq s_3$, the entry of party 4 may create scope for a smaller coalition or not. This, in turn, will affect the probability of a no-confidence vote and the amount of transfers necessary to secure the support of coalition members, creating a mechanism that links the number of parties to government stability.

2.4. Testable Implications

The equilibrium analysis above yields some implications that can be tested empirically. Comparing the probability of no-confidence vote in the 3 and 4 parties case, we obtain the first proposition.

Proposition 1 - Fragmentation and Stability

Assume two seat share vectors $\mathbf{s} = (s_1, s_2, s_3)$ and $\mathbf{s}' = (s'_1, s'_2, s'_3, s'_4)$ such that $s_j \geq s'_j \ \ \forall j = \{1, 2, 3\}$ and $s'_4 > 0$. Let $\pi(\mathbf{s})$ be the probability of a vote of no confidence as a function of $\mathbf{s}$. For a given joint distribution $g(\theta_1, \theta_2)$ with positive density in the unit square, we have that $\pi(\mathbf{s}') \geq \pi(\mathbf{s})$.

Proof: see appendix A.

Proposition 1 states that the entry of a fourth party results in an increase in the probability of a vote of no confidence. Party entry is assumed to decrease the seat share of at least one of the other three parties. For example, the difference between $\mathbf{s}'$ and $\mathbf{s}$ could be due to the introduction of a vote share threshold that causes a party to be left without representation in Parliament.

We leave the formal proof for the appendix but provide an intuitive account here. Moving from 3 to 4 parties in Parliament can result in an increase in the probability of a vote of no confidence via two channels: i) the entry causes party 1 to lose a single-party majority, and/or ii) it increases the pay-off from forming a contestable minimum cost coalition.

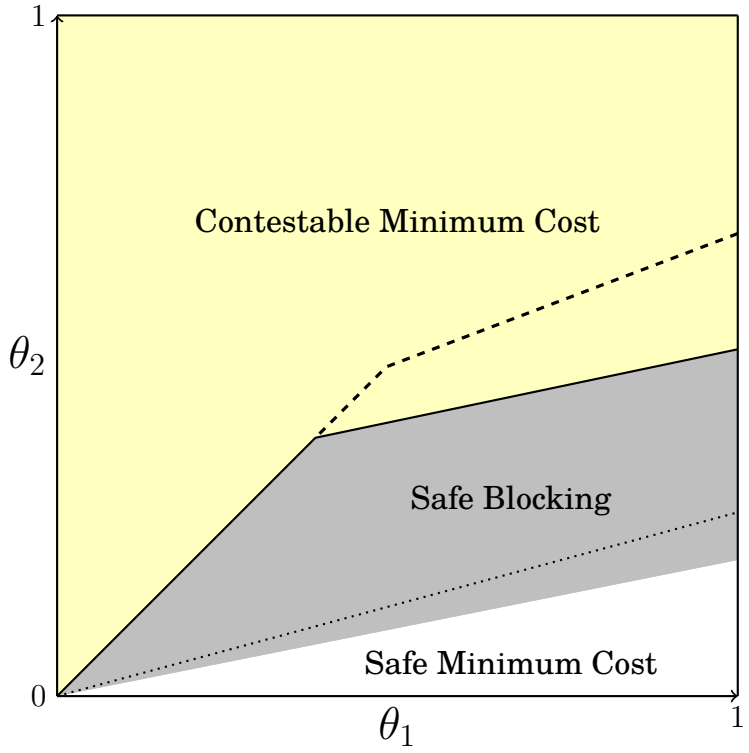
In the latter case, the change in stability results from a change in the size and cost of a contestable minimum cost coalition. This is illustrated in figure 3, where we see that the region of stable government in the (θ_1, θ_2) space becomes smaller when increasing the number of parties from 3 to 4.

In addition to the statement in proposition 1, we can show that the change in the probability of unseating the government will depend on which party loses seats when a new party enters Parliament. Specifically, the increase in probability of a vote of no confidence will be largest when either party 1 or party 3 lose seats. This is formalized in the following lemma.

Lemma 1 - Heterogeneity by Party Losing Seats

Starting from a seat distribution in the 3-party case $\mathbf{s} = (s_1, s_2, s_3)$, consider the entry of a fourth party that results in either of these two different seat share distributions: $\mathbf{s}' =$

FIGURE 3
COALITIONS IN (θ_1,θ_2) SPACE - 3 TO 4 PARTIES



Notes: Optimal party 1 coalition strategies in period 1 in the (θ_1, θ_2) space. Case with $s_1 < 0.5$. Shaded areas correspond to the strategies in the case of 4 parties. The dashed line represents the boundary of the safe blocking coalition region in the case with 3 parties. Similarly, the dotted line is the boundary of the safe minimum cost coalition region with 3 parties.

(s'_1, s_2, s'_3, s'_4) or $\mathbf{s}'' = (s_1, s''_2, s_3, s'_4)$, satisfying $s'_1 + s'_4 = s_1$ and $s'_3 = s_3$, or $s'_3 + s'_4 = s_3$ and $s'_1 = s_1$. In addition, assume $s''_2 = s_2 - s'_4$. For a given joint distribution $g(\theta_1, \theta_2)$ with positive density in the unit square, we have that $(\pi(\mathbf{s}') - \pi(\mathbf{s})) - (\pi(\mathbf{s}'') - \pi(\mathbf{s})) \geq 0$.

Proof: see appendix A.

Another consequence of the equilibrium strategies depicted in figure 2 is that no-confidence votes are less likely the more bargaining resources are available to party 1. Hence, higher values of θ_1 are associated with (weakly) lower probabilities of a vote of no confidence. This is formalized in proposition 2.

Proposition 2 - Bargaining Resources and Stability

Suppose we have two legislatures, both with seat share vector s, and qualities $\Theta' = (\theta'_1, \theta'_2)$ and $\Theta'' = (\theta''_1, \theta'_2)$, such that $\theta''_1 > \theta'_1$. The probability of unseating the government during period 2 in the legislature with Θ'' is lower than or equal to the probability that the government is unseated with Θ'.

Proof: see appendix A.

One example of this difference in bargaining resources, related to our application below, occurs if party 1 manages a larger budget than party 2. Another possibility is that the

incumbent politician is of better quality than the challenger, and hence able to provide more transfers to allies because they use resources more effectively. Available resources can also be loosely interpreted as measuring bargaining skills.

We test both propositions by implementing two different regression-discontinuity designs in the following, using data on over 50,000 local elections in Spain. In both exercises, we use an indicator for a successful vote of no confidence as dependent variable. To study the effect of *fragmentation*, we exploit the existence of a 5% vote share threshold for entering the local council to generate exogenous variation in the number of parties.

We also provide complementary results showing evidence in support of the predictions in lemma 1. To quantify the effect of political resources laid out in proposition 2, we use a close elections regression-discontinuity design to vary exogenously the alignment status of the incumbent party with other levels of government. This has been shown to increase the municipal budget through fiscal transfers (Curto-Grau, Solé-Ollé and Sorribas-Navarro 2018, Bracco et al. 2015). The municipalities in our sample share key institutional features with parliamentary democracies in Europe and elsewhere.

3. Institutional Setting and Data

3.1. Institutional Setting

Spanish local governments

Municipalities are the lowest level of territorial administration of Spanish local government and are autonomous, as recognized in the Spanish constitution. Their functions include urban planning, upkeep of transport networks, local services (e.g. sport facilities), waste disposal and public transit.[11] Municipal financing is based on municipal taxes (the largest of which are a business tax and a property tax) and fiscal federalism transfers from the national and regional governments. As of 1996, the mid-point of our sample, there were 8,098 municipalities in Spain, covering all of the Spanish territory.

Municipalities are governed by a municipal council (*pleno* or *concejo municipal*) and a mayor (*alcalde*). In municipalities with more than 250 inhabitants, council members are directly elected by citizens via a closed-list proportional system, with municipal elections taking place every four years.[12] The average size of councils elected under the closed-list system is roughly 10, with the number of members ranging from 7 in the smaller towns up to a maximum of 57 in Madrid. Council seats are assigned following a D'Hondt rule with a 5% entry threshold, meaning that parties with a vote share below 5% will not be represented in the council. This type of entry threshold is also used in the elections to the national Parliament in Spain and in most of the Parliaments in Europe and elsewhere.[13]

[11] See details in law number 7/1985 (April 2, 1985, *Ley Reguladora de las Bases del Régimen Local).*

[12] Municipalities with less than 250 inhabitants use an open list system instead, where voters can express multiple preferences for different candidates. These municipalities will not be used in our analysis. See Chapter IV of *Ley Orgánica del Régimen Electoral General*.

[13] In 2015, the European Parliament adopted resolution 2015/2035 recommending, among other things, a vote share threshold. As of 2019, 15 countries in the EU 27 had a threshold, with 5% being the most common. Germany used to have a 3% threshold, but it was ruled unconstitutional in 2018. Finally, 11 countries have

We will use this threshold in our regression-discontinuity analysis of the effect of legislative fragmentation on stability.

Mayors direct the administration, local service provision, and manage a substantial fraction of the municipal budget. Their salaries are subject to population caps, but range between EUR 40,000 and EUR 100,000 per year, a relatively generous amount compared to the median wage in Spain of EUR 19,000 (2009 data, see http://www.ine.es/prensa/np720.pdf) The mayor is elected by the council among its members, under a majority rule. If one party has the majority of seats in the council, its candidate is automatically elected mayor. If no party has a majority, there is a bargaining process, by which a mayor can be elected with the support of different parties.[14] If no candidate can secure majority support, the most voted party appoints the mayor. Mayors are usually local leaders of the party branch which, together with the closed-list system, helps promote party discipline.[15]

The institutional features of Spanish local government imply municipalities share the key features of parliamentary systems, with the head of the executive being elected by a collective, legislative body in a proportional system. Parliamentary systems with these characteristics are in place in most OECD countries and in large non-OECD countries such as India or Pakistan.[16]

No-confidence votes

Under Spanish law, at any moment, the municipal council can unseat the incumbent mayor and replace her with a new one via a no confidence vote (*moción de censura*).[17] Successful *mociones* have to be approved by an absolute majority of the members of the municipal council. Council members can only sign one such motion per term. Votes of no confidence are *constructive*, in the sense that they have to explicitly include an alternative candidate mayor, who will assume the office when the incumbent steps down. Another event that can lead to early termination of the incumbent government is the motion of confidence (*cuestión de confianza*), which can be proposed by the mayor in certain cases to seek the explicit support of the council, for example, when negotiating the yearly budget. If a mayor loses such a vote, the council can elect a new mayor. While the initiator of these two types of motion is different (the opposition in the case of *mociones* and the government in the *cuestiones de confianza*), the political consequence in both cases is that the incumbent is replaced if the council gathers enough support for an alternative candidate. For this reason, throughout the paper we will generically refer to successful votes of no-confidence when observing the identity of the mayor in office and their party changes during the term, without distinguishing between the

none.

[14] See Fujiwara and Sanz (Forthcoming) for a detailed study of the bargaining process in the formation of Spanish municipal governments.

[15] In their comparative analysis of local government leaders, Mouritzen and Svara (2002) classify Spanish mayors as strong, where a strong-mayor is defined as "an elected official who is the primary political leader of the governing board and possesses considerable executive authority".

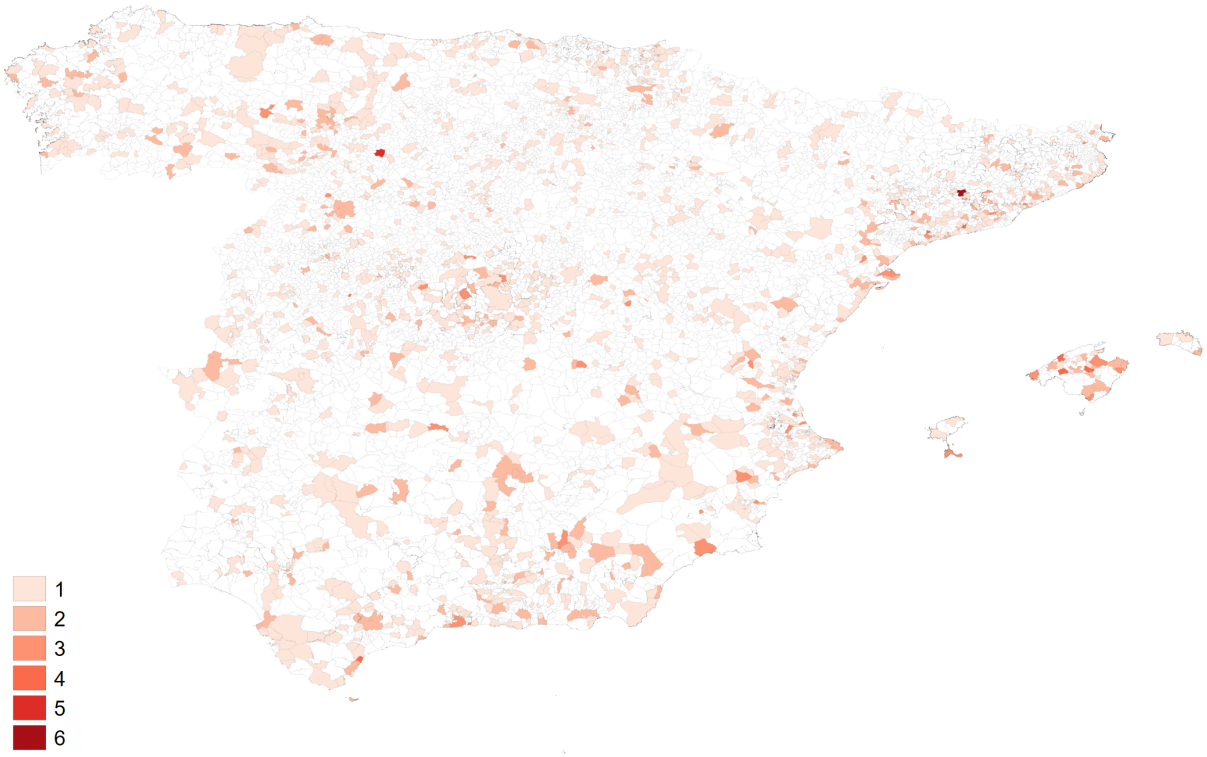
[16] Within the OECD, only Chile, France, Mexico, South Korea, Turkey and the United States are presidential democracies. Other examples of parliamentarism outside the OECD include Serbia and South Africa.

[17] The relevant pieces of legislation can be found in Art. 197 of *Ley Orgánica del Régimen Electoral* and Arts. 33 and 123 of *Reguladora de las Bases del Régimen Local*.

two motions. Our dataset identifies a total of 1,066 such no-confidence votes taking place between 1979 and 2014, distributed across the country, as shown in figure 4. While these events can lead to a change in the local executive, the municipal election schedule is fixed and there is no possibility of early elections.

FIGURE 4

DISTRIBUTIONS OF VOTES OF NO-CONFIDENCE ACROSS MUNICIPALITIES



Notes: Number of successful votes of no-confidence in each municipality between 1979 and 2014. Source: authors' elaboration on *Instituto Geográfico Nacional de Españ (Ministerio de Fomento)* geodata.

The political landscape in Spain

In the last decades, Spanish local politics were largely dominated by two large national parties, the centre-left socialists *PSOE*, and the center-right popular party *PP*. These parties provided over 65% of all mayors in our sample. The third party running in all jurisdictions in this period is *IU*, a left-wing platform including the Spanish communist party.[18] Several regional parties can be important players in their area of influence. For example, the centre-right coalition *CIU* ruled over 50% of all municipalities in Catalonia between 1979 and 2014. About 89% of all mayors come from parties that also participate in elections at national or regional level. Regional elections are held every 5 years, and usually do not coincide with municipal elections. It has been thoroughly documented that partisan alignment between a municipality's government and its regional counterpart can lead to substantial increases

[18]In earlier elections, the center right party was labelled *Alianza Popular* and *Partido Demócrata Popular*, while the left party was labelled *Partido Comunista d'España*.

in transfer revenues for the former (see Solé-Ollé and Sorribas-Navarro 2008 and Curto-Grau, Solé-Ollé and Sorribas-Navarro 2018). This result motivates our use of alignment as a shock in the incumbent's bargaining power that may affect stability. Aligned parties receive more resources from other government levels, and this may provide an advantage either in negotiations to choose a mayor, or eventually, when averting a vote of no-confidence.

3.2. Data

Our dataset consists of a panel of municipalities covering the period 1979-2014. The time dimension corresponds to each legislature, indexed by the year of the corresponding municipal election (1979 to 2011). Our main data sources consist of electoral records, data on individual mayors and mayoral changes, municipal demographics (population, density, etc.) and data on regional and national party presence. Data on electoral outcomes in municipal elections are obtained from the Ministry of Internal Affairs, the body responsible for disseminating information on electoral results. We complement it with information on mayors and their political party of affiliation from the same source. Data on budgets for a subset of years are obtained from the Ministry of Finance, and yearly municipal populations from the residential registry.

Because of the different electoral system in small towns, we only include in our dataset municipalities with more than 250 inhabitants. This leaves us with up to 9 election of each of the 6,400 municipalities in the sample, for a total of about 51,000 elections. We impose additional sample restrictions based on missing data, or inconsistencies between sources and lose 664 elections (1.6% of the remaining total). For each election in our sample, we have complete election information, including the vote shares of all parties and their number of seats in each council. We also have data on the day in which each mayor takes office.[19] These usually happen shortly after elections, but occasionally mayors change during the legislature. We identify votes of no confidence as instances in which there is both a change in the identity *and* the party of the mayor.[20]

Panel A of table 1 provides municipal level descriptives for our sample. The average municipal population over the 1979-2014 period was 6.403 inhabitants, with an average surface of 202 km^2. In some cases, municipalities cross the 250 population threshold during the sample period, merge, or are newly formed, so we have an unbalanced panel with an average of 8.06 elections per municipality in our sample (out of a maximum of 9). Panel B includes descriptives on local governments. The average number of parties running in each municipal election is 3.2. The average election distributes 10 council seats, with specific council sizes determined by population thresholds (see, e.g., Foremny, Jofre-Monseny and Solé-Ollé 2017). The average council includes 2.65 parties, although the number varies substantially by town, with some having up to 9 parties with seats.[21] In 54% of municipalities, the elected

[19] For a more detailed description of data sources and sample selections, see the Data Appendix (section D).

[20] We have also explored an alternative definition which excludes cases when the mayor in unseated immediately after taking office, obtaining analogous results.

[21] As figure E.2 in the Appendix shows, the number of parties elected in municipality council is 4 or less in more than 96% of cases. Hence, situations like the ones derived in the model's equilibrium with three and four

TABLE 1

DESCRIPTIVES STATISTICS

	Mean	Std. dev.	Min	Max
A. General information				
Mean Population 000s (1979-2014)	6.40	50.84	0.3	3115
Surface (in km2)	202.58	229.03	0.1	1798
# of Elections in sample	8.06	2.13	1.0	9
Observations	6379			
B. Municipal Elections and Local Government				
# of Parties Running	3.22	1.63	1	25
# of Parties in Council	2.65	1.03	1	9
# of Council Seats	10.07	4.21	7	59
Party Alignment with regional gov. (%)	54.42	49.80	0	100
Vote of No Confidence (%)	2.07	14.24	0	100
Single-party Majority (%)	76.11	42.64	0	100
1st Mayor - PP (%)	28.89	45.33	0	100
1st Mayor - PSOE (%)	35.04	47.71	0	100
1st Mayor - IU (%)	2.66	16.10	0	100
1st Mayor - CIU (%)	6.47	24.61	0	100
Observations	51434			
C1. Local Government - Stable Mayor				
Single-party Majority (%)	77.69	41.63	0	100
# of Parties in Council	2.63	1.02	1	9
Party Alignment with regional gov. (%)	54.62	49.79	0	100
Observations	50369			
C2. Local Government - Vote of No Confidence				
Single-party Majority (%)	10.52	30.69	0	100
# of Parties in Council	3.50	0.98	1	8
Party Alignment with regional gov. (%)	45.30	49.80	0	100
Observations	1065			

Notes: Panel A provides average figures at the municipal level for all municipalities that appear at least once in our sample. Panel B provides descriptives on electoral outcomes at the municipality-council level. Panels C splits the sample in panel B into council that approved at least one vote of no confidence during the term (C2), and those that did not (C1).

mayor is aligned with the regional government. Importantly, successful no-confidence votes are passed in 2% of all legislatures.

The last two panels show characteristics of municipalities that had stable governments throughout the 4 year term (C1) and those that experienced a vote of no confidence (C2), respectively. We first observe that municipalities where a no-confidence vote is passed have more fragmented councils (3.5 vs. 2.6 parties in council) and are less likely to be aligned with the regional government (54% vs. 45% of the times). Unsurprisingly, motions of no-confidence are much more common in councils where no party has the absolute majority of the seats. Some votes of no confidence take place in municipalities featuring a single-party majority, largely as a consequence of *transfugas*, council members that switch partisan

parties are prominent in our sample.

affiliation during the term.[22]

While encouraging, it is hard to extrapolate substantial conclusions from these mean comparisons. The number of parties in the council, or a town's alignment status, may themselves be affected by other observable or unobservable characteristics of the town, its region or its politicians. Observing local level political or economic conditions in detail is difficult, so observational methods like regression or matching are unlikely to be successful here. Likewise, a panel approach would require assuming that unobserved heterogeneity is fixed, which is unlikely to be the case for 30 years, in a changing political and economic landscape. For this reason, in the following we recur to fuzzy regression-discontinuity methods, which allow us to exploit exogenous variation in both council fragmentation and political resources. The limitation of this approach, as usual, is that all estimates are local, in the sense that causal effects are to be interpreted as local average treatment effects for the sub-population of compliers around the discontinuity (Angrist and Imbens, 1994).

4. Empirical Analysis

In this section, we provide both a description of our empirical approach and its main results. We test whether the predictions laid out in proposition 1, lemma 1, and proposition 2 of the model are supported by the data. We provide evidence that: i) governments formed by more fragmented legislatures are more likely to be unseated by a no-confidence vote, and ii) governments with more political resources are less likely to be voted out of office. In the final part of the analysis, we study the characteristics of unseated governments, the quality of the mayors that replace them, and their electoral performance in the subsequent elections. In doing so, we provide evidence suggesting that there is a trade-off between stability and accountability.

4.1. ***Legislative fragmentation decreases stability***

Proposition 1 states that an increase in fragmentation leads to a decrease in stability. To obtain causal estimates of the effect of fragmentation – measured as the number of parties in the council – on government stability, we exploit the existence of a 5% vote share threshold for admission to the local council. This threshold causes parties with vote shares just below 5% to be excluded from the council, generating exogenous variation in the number of parties with representation.

To implement our regression-discontinuity design, we first calculate, in each municipality i and for each term t, the difference between the vote share of each party p and 5%. This variable is denoted as V_{pit} and serves as our running variable. Because every observation is a party-municipality-election triple, each municipality will appear in the sample as many times as the number of parties that ran in the election.[23]

[22] Cruz (2010) reports that in the region of Galicia, over the period 1987-2011 *all* votes of no confidence in single-party majorities, were related to *transfugas*. Yet this is not a pervasive phenomenon. According to Passarelli et al. (2017), only 5.3% of candidates for the council changed party between the 2007 and 2011 elections.

[23] An alternative is to define the running variable only for the party that is closest to the 5% entry threshold. Estimates obtained using this and other approaches are reported in section 5.

Our baseline specification relates Y_{it}, an indicator equal to one if the mayor of municipality is unseated during term t, to our measure of fragmentation, N_{it}, the number of parties with seats in the council, as follows:

$$Y_{it} = \alpha_1 + \tau_1 N_{it} + \beta_1 V_{pit} + \beta_2 V_{pit} D_{pit} + \epsilon_{pit}. \tag{5}$$

The number of parties N is instrumented with an indicator D for a party being above the 5% threshold as follows:

$$N_{it} = \alpha_0 + \gamma_1 D_{pit} + \delta_1 V_{pit} + \delta_2 V_{pit} D_{pit} + u_{pit}. \tag{6}$$

The instrument D is constructed for each party, election, and municipality. The instrument is relevant – that is, correlated with the number of parties – because the number of parties in the council is affected by how many parties have obtained a vote share larger than 5%, hence having $D = 1$. The predictive power of the instrument is especially strong close to the 5% threshold. As an example, imagine the case in which there are two parties with vote shares close to 5%. If, by chance, they both get more that 5% – so $D = 1$ for both – and the proportional rule assigns both of them a seat in the council, then the number of parties N will be relatively large. If, on the contrary, one of the parties receives a vote share just below 5% ($D = 0$), it will be relegated out of the council, and N will be relatively small. A detailed description of how we construct the instrument is given in section B of the appendix.

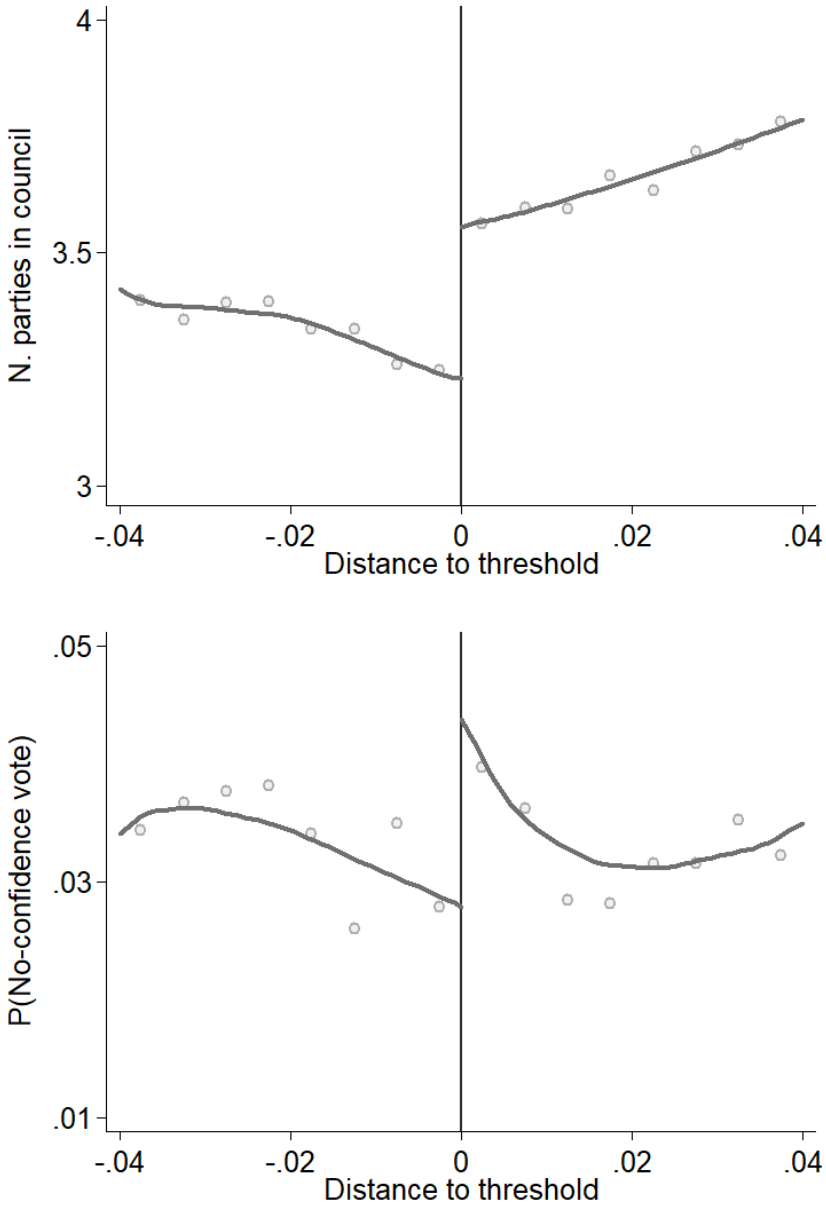
Given the uncertainty of election results due to voters' unknown preferences, election day weather conditions, or last-minute events, it is reasonable to assume that parties are unable to perfectly anticipate their results, or to manipulate vote shares to locate on either side of the 5% threshold. We show in figure E.3 in appendix E that manipulation is unlikely by testing for a jump in the density of the running variable at the threshold. Both visual inspection and formal tests using the procedures in McCrary (2008) and Cattaneo, Jansson and Ma (2017) indicate that there is indeed no significant jump at the threshold. Figure E.4 and table E.1 in the appendix present further evidence of the validity of our RD design by showing covariate balancing. Specifically, we do not observe any discontinuity at the cut-off for a number of pre-election outcomes and municipal characteristics.

The top panel of figure 5 illustrates our first stage by plotting the number of parties with seats in the council against our running variable. We see that the number of parties exhibits a clear jump at the threshold, when a party obtains at least 5% of the votes and is eligible to enter the council. It is important to note, that receiving at least 5% of the votes is not always enough to receive a seat. Especially in small councils, the number of available seats is so small that the allocation rule might leave parties with 5% of the votes with no seats at all. For this reason, our design is akin to a *fuzzy* RD design with a continuous treatment.[24]

[24] An alternative approach is to calculate the running variable as the minimum vote share change required, to lose (win) the last (first) seat in the council (see, e.g., Fiva, Folke and Sørensen 2018). This approach requires specifying a vote transfer rule when reducing (increasing) parties' vote shares. It is also uninformative about the effect of the 5% threshold on stability. We provide results using this method in section 5.

FIGURE 5

THE EFFECT OF FRAGMENTATION ON STABILITY - FIRST-STAGE AND REDUCED-FORM



Notes: In both panels, the horizontal axis corresponds to the distance between a party's vote share and 5%. The upper panel illustrates our first stage, where the vertical axis measures the number of parties represented in the council. The lower panel plots the reduced-form, which relates the probability that the mayor is unseated to the instrument. Dots are averages in 0.5% bins of the running variable and lines are nonparametric local linear regressions estimated on both sides of the threshold.

The size of the jump is about 0.3, in line with the regression estimates of the first-stage coefficients reported in table E.2 in the appendix.

The bottom panel of figure 5 plots the reduced-form relationship between our outcome and the running variable. We observe a clear discontinuity in the probability of unseating the mayor at the threshold. Rescaling the reduced form by the first-stage coefficient shows that the entry of a marginal party in the council leads to an increase in the probability of a

TABLE 2
2SLS ESTIMATES - FRAGMENTATION AND STABILITY

	(1) Mayor uns.	(2) Mayor uns.	(3) Mayor uns.	(4) Mayor uns.
A. Full Sample				
N. Parties	0.038**	0.038**	0.040**	0.040**
	(0.017)	(0.017)	(0.017)	(0.017)
Mean of dep.var.	0.033	0.033	0.033	0.033
Bandwidth	0.021	0.021	0.021	0.021
Obs.	14882	14882	14882	14882
B. No Single-Party Majorities				
N. Parties	0.079*	0.089*	0.088**	0.087**
	(0.042)	(0.046)	(0.044)	(0.044)
Mean of dep.var.	0.091	0.091	0.091	0.091
Bandwidth	0.017	0.017	0.017	0.017
Obs.	4111	4111	4111	4111
C. Single-Party Majorities				
N. Parties	0.007	0.005	0.003	0.003
	(0.015)	(0.012)	(0.010)	(0.010)
Mean of dep.var.	0.002	0.002	0.002	0.002
Bandwidth	0.016	0.016	0.016	0.016
Obs.	6586	6586	6586	6586
Fixed Effects	N	N	Y	Y
Controls	N	Y	N	Y

Notes: 2SLS estimates of the effect of number of parties on the probability of unseating the mayor (equation 5). The dependent variable is an indicator taking value 1 if the mayor was unseated by a vote of no confidence during the legislature. Panel A: full sample. Panel B: only legislatures where no single party has more than half the seats. Panel C: only legislatures where there is a party with at least half the seats. Controls and FE are included as indicated in each column. Controls: surface and population (in logs). FE: number of available seats and year-region fixed effects. The optimal bandwidth is calculated using the CCT criterion. Standard errors are clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.

no-confidence vote of about 4%.

We now turn to formal estimation of parameter τ_1. Following Lee and Lemieux (2010), our preferred estimation method is local linear regression, with different linear terms on the running variable estimated at either side of the threshold. We estimate the baseline model in equations 5 and 6 by two-stage least squares using only observations within a bandwidth h from the threshold. We use Calonico, Cattaneo and Titiunik (2014)'s optimal bandwidth to select h in all cases and show that results are robust to bandwidth choice in section 5. Standard errors are clustered at the municipality level to take into account the repeated observations within each municipality and the possible within-municipality serial correlation in the data.

We report estimates of our second-stage coefficient in panel A of table 2 starting, in column 1, by estimating the baseline model without controls. The effect of fragmentation on stability is sizeable. We estimate that the entry of an additional party in the council increases the probability that the mayor is unseated by roughly 4 percentage points. This estimate is

largely unaffected by adding, in column 2, population and surface (in logs), and fixed effects for the number of available seats and election year-region fixed effects, in columns 3 and 4. The inclusion of controls and fixed effects is not required for consistency of the estimates but improves precision slightly.

This is the main result of our paper. Given that the average probability of unseating the mayor in the whole sample is 2.1% – 3.3% around the threshold – the estimated effect of 4 percentage points for the entry of an additional party in the council of is large, and suggests that fragmentation has a substantial effect in harming government stability.

The effect of fragmentation on stability operates via two channels, as in the theoretical model above. In the first place, the entry of an additional party decreases the probability that there is a single-party majority.[25] Secondly, the number of parties can also affect stability in cases where no single-party majority is possible through its effect on the composition of the ruling coalition.

In panel B of table 2, we estimate the effect of fragmentation on the sample of legislatures in which all parties have less than 50% of the seats in the council. In this way, we ensure that estimates of the effect of fragmentation are not the result of changes in the probability of a single-party in office. We find a large effect of fragmentation on stability, with point estimates being over twice the size of the ones reported in Panel A of table 2. This is consistent with model predictions, with the number of parties making coalitions less stable.[26]

Finally, in panel C of table 2, we report estimates for the sample of municipalities where one party has more than half of the council seats. In these cases, the opposition typically cannot gather enough support to win a no-confidence vote against the mayor, so the entry of a new party should not have any impact on stability. Reassuringly, we find no impact of fragmentation on government stability: the estimated effect of an additional party in this case is very small and statistically indistinguishable from zero at conventional levels in all specifications.

Lemma 1 of the model yields testable predictions regarding how the effect of fragmentation depends on which party loses seats upon a new entry. Specifically, the effect of the number of parties should be larger when either party 1 or party 3 loses seats compared to cases in which party 2 does. To test this prediction empirically, we first identify the marginal party, defined as the party with vote share closest to 5%, for each municipality-election pair. Then, we calculate the counter-factual seat allocation in the event that this party jumped exogenously just above (or below) this threshold. The difference between the actual and the counter-factual seat allocations identifies the parties losing (or gaining) seats as a result of the marginal party crossing the threshold.

In table E.4 in the appendix, we estimate the effect of fragmentation on stability sepa-

[25] Estimates showing the entry of an additional party reduces the probability of a single-party majority by 11 percentage points. See table E.3 in appendix E.

[26] Selecting the sample in this way is potentially problematic because the probability of a single-party majority is also affected by fragmentation. However, this exercise can still be informative regarding the effect of fragmentation for municipalities without single-party majorities. An alternative specification in which we add an indicator for this outcome as a control in our specification leads to analogous results.

rately for three sub-samples. In column 1, we restrict the sample to observations in which the entry or exit of the marginal party leads party 1 to either lose or win the corresponding seats. We observe a positive and significant effect of the number of parties on the probability that the government is unseated. The coefficient is of similar magnitude to the baseline effect reported in Panel A of table 2. Estimates for party 2 – reported in column 2 – show that the number of parties has essentially no effect on the probability of a vote of no confidence. The corresponding coefficient is negative, tiny and not statistically significant at conventional levels. In the case of party 3, the effect is comparable in magnitude to the one obtained in column 1 but less precisely estimated due to the smaller sample size. Overall, these results are largely consistent with the predictions of Lemma 1. We interpret them as providing evidence that party entry fuels instability through changes in the size and composition of the ruling coalition.

4.2. ***Bargaining resources increase stability***

Another determinant of stability is the amount of resources available for negotiation to the agenda setter. These resources can either be monetary – for example in the form of additional transfers from upper tiers of government – or they can be more generally thought of as resulting from the quality of the politician or her political connections. Proposition 2 in the model shows formally that governments run by incumbents with relatively more resources at their disposal are more stable. In the following, we turn to study the effect of a key drivers of these political resources on government stability: the effect of partisan alignment with upper tiers of government.

Previous work has consistently shown that aligned local governments (i.e., those sharing the same party affiliation with the coalition ruling in some upper tier of government) receive additional transfers to sustain their budgets (Solé-Ollé and Sorribas-Navarro 2008, Curto-Grau, Solé-Ollé and Sorribas-Navarro 2018, Bracco et al. 2015). These transfers could be used directly to buy support from other parties, for example by funding specific projects or policies.[27] Alignment may also yield other forms of support from the regional party, ranging from political support, aid in setting up campaigns, and coordination with other municipalities in the region. All these factors may improve the bargaining position of the aligned candidate.

The alignment status of a municipality is likely to be correlated with unobservable determinants of government stability. Hence, to obtain exogenous variation in alignment, we implement a regression-discontinuity design with close elections, in which we compare municipalities where the coalition in power at the regional level just won the municipal elections (and obtained the mayor) with municipalities where it just lost. Defining A as an indicator for the mayor being aligned, i.e., belonging to one of the parties in the coalition ruling at the regional level (the *regional coalition bloc*), the relationship between stability and alignment

[27] We test for the presence of an alignment effect on transfers in our data, essentially replicating the result in Curto-Grau, Solé-Ollé and Sorribas-Navarro (2018). The results for these estimates are reported in table E.7 in the appendix and show a large positive effect of alignment status on capital transfers, with aligned municipalities receiving 22-32% more transfers.

status is as follows:

$$Y_{it} = \alpha_2 + \tau_2 A_{it} + \beta_3 W_{it} + \beta_4 W_{it} D_{it} + \epsilon_{it}, \tag{7}$$

where W is the running variable, defined as the distance to the municipal seat majority of the regional coalition bloc in office at the time, and D is an indicator for when $W \geq 0$. As above, Y is an indicator taking value 1 if the mayor was unseated during a legislature. Given that having the seats majority does not always guarantee the mayoralty (so that, in our notation, $A = 0$ even if $D = 1$), this design is also a fuzzy-RDD, and the alignment variable is instrumented with D in the following first-stage equation:

$$A_{it} = \alpha_3 + \gamma_2 D_{it} + \delta_3 W_{it} + \delta_4 W_{it} D_{it} + u_{it}, \tag{8}$$

To construct our running variable, we build on recent work that adapted the close-elections RDD method to proportional systems (see, for example, Folke 2014 and Fiva, Folke and Sørensen 2018). In particular, we follow Curto-Grau, Solé-Ollé and Sorribas-Navarro (2018) and redistribute votes to (or from) the opposition bloc until a majority change happens. We first calculate the total vote share of the regional government and opposition blocs in the municipality by aggregating the corresponding vote shares of parties belonging to each of the two blocs.

If the regional government bloc has a majority, defined as having more votes than the opposition bloc, we redistribute a fraction of its votes to the opposition, until a majority change is reached and the opposition becomes the bloc with most votes. Similarly, we add votes instead of subtracting them in the case where the regional government bloc does not have a majority in the municipality.[28] The running variable W is then defined as the minimum vote share increment (or decrement) needed to obtain a majority change.

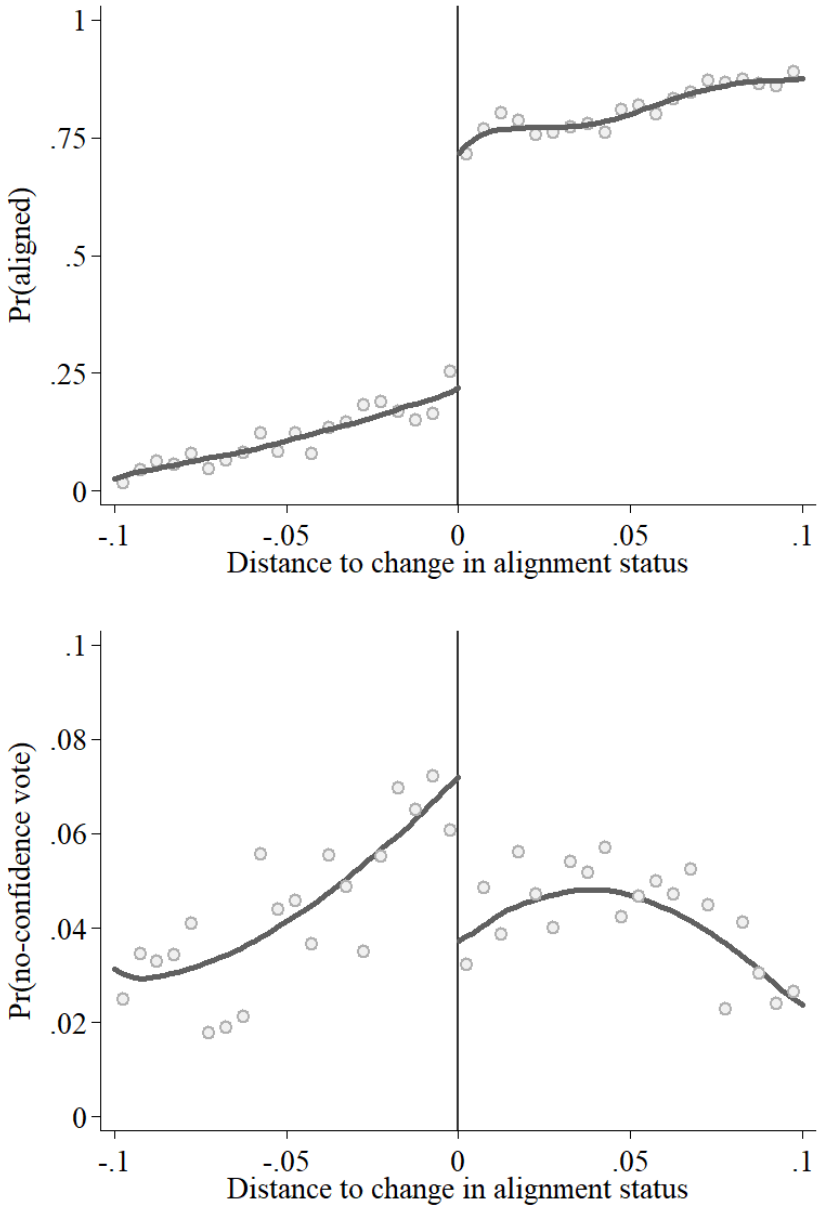
Figure E.5 in appendix E reports the histogram of the running variable and shows that is exhibits no obvious discontinuity at the threshold. Formal tests (McCrary 2008; Cattaneo, Jansson and Ma 2017) fail to reject the null of no discontinuity with large p-values. Figure E.6 and table E.5 in the appendix show balancing of different covariates around the threshold. We inspect municipal characteristics, such as population or surface area, as well as outcomes of the electoral process. Reassuringly for the validity of the RD design, all estimates are statistically indistinguishable from zero at conventional significance levels.

The top panel of figure 5 illustrates the first-stage. There is a substantial jump in the probability of being aligned at the threshold. This is unsurprising, as municipalities where the regional bloc holds more seats than the regional opposition will typically be able to elect the mayor, who will be aligned by construction. The corresponding reduced form is shown in the bottom panel of figure 5. We observe a clear discontinuity between the fitted lines, indicating that municipal governments where the regional bloc has the majority are sub-

[28] Details on the calculation of the running variable can be found in appendix C. An alternative redistribution scheme is to assume that redistributed votes are not assigned to any party, but become blank votes. This approach yields very similar results.

Figure 6

The effect of alignment on stability - First-stage and Reduced-Form



Notes: In both panels, the horizontal axis corresponds to the vote share distance to a change in the council majority in the municipality. Observations to the left of the zero threshold are municipalities where the regional bloc coalition has the majority of votes in the municipal council. Correspondingly, to the right of the threshold are municipalities where the regional opposition has the majority. The top panel illustrates our first stage, where the vertical-axis measures the probability of the mayor belonging to the regional bloc. The bottom-panel plots the reduced-form, which relates the probability that the mayor is unseated to the running variable. Dots are averages in 0.5% bins of the running variable and lines are non-parametric local linear regressions estimated on both sides of the threshold.

stantially less likely to be unseated. By rescaling this reduced-form discontinuity by the first-stage, we obtain that partisan alignment can reduce the probability of a vote of no confidence by roughly 5%.

When obtaining formal estimates of parameters γ_2 and τ_2, we control for separately estimated linear terms in the running variable as before and restrict the sample to observations close to the threshold using the CCT bandwidth selector. We show results including controls and time or region effects. First-stage estimates of γ_2 are provided in table E.6 in the appendix. Municipalities where the regional coalition bloc has more seats than the regional opposition bloc are 52% more likely to be aligned. Adding controls, electoral-year times region and number of seats fixed effects to the specification has little impact on the estimated coefficients.

TABLE 3
2SLS ESTIMATES - ALIGNMENT AND STABILITY

	(1) Mayor uns.	(2) Mayor uns.	(3) Mayor uns.	(4) Mayor uns.
Aligned	-0.048***	-0.048***	-0.047***	-0.047***
	(0.015)	(0.015)	(0.015)	(0.015)
Mean of dep.var.	0.047	0.047	0.047	0.047
Bandwidth	0.078	0.078	0.078	0.078
Obs.	13054	13052	13054	13052
Fixed Effects	N	N	Y	Y
Controls	N	Y	N	Y

Notes: 2SLS estimates of the effect of alignment on votes of no confidence. The dependent variable is a indicator taking value 1 if the mayor was unseated by a vote of no confidence during the legislature. The optimal bandwidth is calculated using the CCT criterion. Controls and FE are included as indicated in each column. Controls: surface and population (in logs). FE: number of available seats and year-region fixed effects. Standard errors clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.

Two-stage least squares (2SLS) estimates of τ_2, the effect of alignment on the probability of a no-confidence vote, are reported in table 3. We find that alignment with the regional government results in a 4.8 percentage points decrease in the probability that the mayor is unseated. Relative to the baseline probability of unseating of about 2% in the full sample and of 4.7% around the threshold, the effect of alignment on stability is sizeable. If we think of alignment as providing politicians with resources useful for bargaining, then this result provides direct evidence in favour of proposition 2 in our model.

The result that alignment increases stability is a first piece of evidence in favour of proposition 2. In the following section, we explore another important dimension through which political resources also affect stability.

*4.3. **Quality selection induced by votes of no confidence***

Some parties and politicians will be more successful than others in averting or staging challenges. As shown in the previous section, external support may help governments to complete their term. Individual traits of the politician or of their party may also influence stability. In the model, politicians' quality θ_j can be interpreted more broadly as measuring valence or the ability to offer more public good with a given budget. Under this light, proposition 2 predicts that parties of relatively higher quality compared to that of the potential

challenger are less likely to be unseated. Successful contenders will typically be of relatively higher quality too, so that a vote of no confidence can induce a positive selection of the politicians in office at any point in time. If quality correlates with better policy, this channel in turn implies that instability can, under certain circumstances, be welfare-improving for voters.

To test to what extent stability relates to selection of politicians, we use three measures of quality at the individual level.[29] Our dataset includes educational attainment and occupation for council members and mayors elected in the 2007 and 2011 legislatures. For 2007, we also observe their past experience in office. To proxy for the quality of the mayor (θ_1), we construct an indicator for having college education, an indicator for holding a high-profile job, and a variable that counts the number of terms a politician has served as a councilor in the past. Measuring the challenger's quality (θ_2) is more challenging because the identity of the potential challenger is revealed only after a successful vote of no-confidence. As a proxy, we use averages of each of the three measures taken over the council members of the second largest party with representation in the council. While these variables may be measured with error, they should nonetheless be informative on the quality of the leader of the largest party in the opposition.

TABLE 4
NO-CONFIDENCE VOTES AND QUALITY OF INCUMBENT MAYOR AND CHALLENGER

	(1) Mayor Uns.	(2) Mayor Uns.	(3) Mayor Uns.
College	-0.004**		
	(0.002)		
Professional		-0.001	
		(0.002)	
Experience			-0.004***
			(0.001)
Mean of dep.var.	0.015	0.014	0.023
Obs.	25679	23005	18218

Notes: Estimates of the effect of the difference in quality between the incumbent and the challenger ($\theta_1 - \theta_2$) on the probability of a no-confidence vote. As proxies for this difference we use *College*, an indicator for the mayor having completed college; *Professional*, an indicator for the mayor having a high-profile job; and, finally, *Experience*, a count variable measuring the number of previous terms that the mayor has served in the council. *Experience* is only observed only between 2007 and 2010. All measures are computed as the difference between the value relative to the incumbent mayor and the average value among the members of the municipality council belonging to the second largest party. Controls and fixed effects included in all columns. Controls: surface and population (in logs). FE: number of available seats, year-region, and party of the first mayor indicators. Standard errors are clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.

In table 4, we measure $\theta_1 - \theta_2$ simply as the difference between the incumbent and the challenger's quality, measured as described above. We estimate the effect of this difference on stability using yearly data for the period 2007-2014, where information on these variables

[29] For a discussion of political selection and measurement of politicians' quality, see, e.g., Besley (2005), Dal Bó et al. (2017), and the references therein.

is available. Results show that, irrespective of the measure used, an increase in the difference between the quality of the incumbent and the challenger is positively associated with government stability. For example, a mayor with college degree confronting a challenger without one is 0.4 percentage points less likely to be removed from office. This effect is sizable, as the unconditional probability of a vote of no confidence is only 1.5% in this sample. The effect of previous experience is also negative and significant. These results are in line with the model prediction that incumbents of lower quality are more likely to be unseated before the next election.

Another hypothesis related this prediction is that challengers that are successful in unseating the incumbent are those of higher quality. To test this possibility empirically, we estimate a difference-in-differences model that relates the quality of the mayor in office with an indicator for a successful no-confidence vote as follows:

$$Quality_{it} = \beta_1 Y_{it} + \beta_2 Y_{it} \times Post_{it} + \eta_r \times \delta_t + \gamma' X_{it} + \varepsilon_{it},$$

TABLE 5
CONSEQUENCES OF NO-CONFIDENCE VOTE ON THE MAYOR'S CHARACTERISTICS

	Quality			Personal	
	(1) College	(2) Prof.	(3) Experience	(4) Age	(5) Female
Mayor Unseated	-0.098***	-0.109***	-0.715***	-0.521	0.055**
	(0.030)	(0.033)	(0.100)	(0.544)	(0.022)
Post × Unseated	0.062*	0.066*	-0.009	-1.208*	-0.007
	(0.035)	(0.038)	(0.141)	(0.670)	(0.026)
Mean of dep.var.	0.437	0.436	2.089	49.821	0.169
Obs.	33855	31262	21312	37578	42251

Notes: Difference-in-differences estimates of the effect of a no-confidence vote on observable characteristics of the mayor in office. *Experience* is observed only between 2007 and 2010. *College* is an indicator variable taking value 1 if the mayor has completed college; *Prof.* is an indicator variable taking value 1 if the mayor has a high-profile job; *Experience* is a count variable measuring the number of previous terms that the mayor has served in the municipality council; *Female* is an indicator variable taking the value 1 if the mayor is a woman. Controls and FE are included. Controls: surface and population (in logs). FE: number of available seats and year-region fixed effects. Standard errors are clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.

where $Quality_{it}$ is one of our quality measures, Y_{it} is a dummy taking value 1 for municipality-terms in which the mayor is unseated, $\eta_r \times \delta_t$ are a set of region-year fixed effects, and X_{it} is a set of controls. Because we want to explore within-term variation in mayor quality, we estimate this specification using a yearly panel, and define $Post_{it}$ as a dummy taking value 1 in the years of the term after a successful vote of no confidence has taken place.

Estimation results, reported in table 5 show that municipalities that experienced a vote of no confidence tend to have mayors with lower education, low-skill occupation, and having less experience in the municipality council. These results are in line with those reported in table 4.

The difference-in-differences interaction coefficient reveals that not only incumbents of

lower quality are more prone to being unseated, but that the challengers who replace them are of better quality. To start, new mayors are roughly 6% percentage points more likely to have attended college, 6% percentage points more likely to have a high-skill job, and 1.2 years younger than their unseated predecessors. Instead, they are not significantly different in terms of past experience and gender.

TABLE 6

THE EFFECT OF A NO-CONFIDENCE VOTE ON ELECTORAL PERFORMANCE

	(1) Mayor's share (t+1)	(2) Party 1 share (t+1)	(3) Mayor's party wins (t+1)	(4) Party 2 share (t+1)	(5) Party 2 wins (t+1)
Mayor Uns.	-0.088***	-0.024***	-0.280***	0.048***	0.213***
	(0.005)	(0.005)	(0.017)	(0.006)	(0.025)
Mean of dep. var.	0.513	0.517	0.744	0.338	0.544
Obs.	32646	32360	32646	29475	29475
Fixed Effects	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y

Notes: Estimates of the effect of a no-confidence vote on the electoral performance of the party of the mayor and the challenger. Mayor Uns. is an indicator equal to one if the mayor was replaced at some point during the term. Dependent variables are: in column 1, the vote share of the mayor's party in the next elections; in column 2, the vote share of the largest party; in column 3, an indicator equal to one if the party of the incumbent mayor appoints the mayor in the next election; in column 4, the dependent variable is the second most voted party's vote share in the next election. To ensure that we are measuring the effect of the no-confidence vote on the vote share of the challenger, in columns 4 and 5 we only include the no-confidence votes proposed by the second-largest party. In column, 5 the dependent variable is an indicator equal to one if the second-largest party is elected mayor in the next election. Controls and FE are included. Controls: surface and population (in logs). FE: number of available seats and year-region fixed effects. Standard errors are clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.

The lower quality of incumbents that are voted out of office is also reflected in their subsequent electoral performance. In table 6, regress different measures of electoral performance of the incumbent and challenger's parties in the next election on an indicator taking value 1 if the mayor is unseated in the current term. In all specifications, besides our usual controls and fixed effects, we control for the vote share of the first and second parties as well as fixed effects for the interaction of the mayor's party and term indicators. In this way, we absorb variation in electoral outcomes due to region-specific trends in party shares. At the same time, by conditioning on the vote shares of the two largest parties we control for the fact that more successful parties are more likely to win again and less likely to be unseated.

Compared with parties of mayors who ended their term regularly, parties of unseated mayors have a 8.8 percentage points lower vote share in the next election. The party of the challenger who successfully unseats the incumbent, instead, appears to be rewarded. As column 5 of table 6 shows, the vote share of the second largest party in the following election is 4.8 percentage points higher when this party successfully unseats and replaces the incumbent.[30]

[30]To ensure that we are properly measuring the effect on the vote share of a successful challenger (and not simply the effect on any second-largest party), in this specification we only consider no-confidence votes carried

An additional consequence of being unseated is that the incumbent advantage is, to a large extent, reversed. Conditional on running, the incumbent's party wins the following election 74% of the times. In column 3, we can see that this probability decreases by 28 percentage points when the incumbent is unseated. Similarly, the challenger party's chances to win the next elections increase greatly. After a successful no-confidence vote, the challenger's party obtains a 5 percentage points higher vote share and, conditional on running again, is 21 percentage points more likely to win.

These results are direct evidence of a large electoral punishment for the unseated mayor. This is consistent with two related but distinct mechanisms. First, voters seem to back the decision of replacing the incumbent, as they reward politicians stepping in after a vote of no confidence. Second, votes of no confidence may happen to politicians that would have had a worse electoral performance to begin with. It is not possible to test which of these channels drive the results in table 6, but the latter explanation would be consistent with the results we observe for quality.

Taken as a whole, the estimates in this section suggest that replacing the mayor has a positive effect on the quality of the government. New mayors that replace incumbents after a successful no-confidence vote are more educated, more likely to hold a high-skill job, and are younger. They also perform better in the following election. These results provide a different perspective on the consequences of government instability. Frequent government turnover may hurt policy stability but it can also be desirable, as long as it leads to new governments of better quality. We will come back to this trade-off between stability and accountability in the following sections.

5. Auxiliary Results and Robustness Checks

5.1. Auxiliary Results

The results in the previous section show that fragmentation and alignment have an effect of similar magnitude but different sign on the stability of the government. These effects may undo or reinforce each other. For example, alignment may help mayors deal with a fragmented council. To investigate whether the effect of fragmentation on stability varies by alignment status, we split our sample in *aligned* and *unaligned* municipalities, respectively, and estimate the effect of fragmentation separately.

Estimates are provided in table 7, where we define a municipal government as aligned if it belongs to the coalition in power at the regional level (panel A) or at the national level (panel B). For comparison with our baseline results, we first report estimates using the CCT bandwidth calculated in the full sample (columns 1 and 3) and then the one resulting from restricting the sample to aligned (column 2) and unaligned (column 4) municipalities. Estimates using both samples are positive, but the effect is more than twice as large for unaligned municipalities, suggesting that mayors use the transfers and advantages provided by alignment to survive a fragmented legislature.

out by the second-largest party.

To further explore this possibility, we look at how our estimates change when looking at alignment with the *national* government in panel B. The effect of fragmentation appears to be very modest for aligned municipalities, and much stronger for unaligned ones. The destabilizing effect of an additional party in the council seems to be offset almost completely by being aligned. It is only when the mayor is unaligned that the challenger has a chance to unseat and replace the incumbent. This could be due both to the additional difficulty in having to overthrow an aligned mayor, who has the support of the upper tiers of government and additional resources to distribute, but also to obstacles in gathering support for a no-confidence vote among the opposition parties. By unseating the aligned incumbent, the newly formed coalition would, in fact, have to give up to all the benefits that may come with alignment, including the additional transfers.

TABLE 7
FRAGMENTATION EFFECTS BY ALIGNMENT STATUS

	Aligned		Not Aligned	
	(1)	(2)	(3)	(4)
	Mayor Uns.	Mayor Uns.	Mayor Uns.	Mayor Uns.
A. Regional Partisan Alignment				
N. Parties	0.023	0.040*	0.102*	0.096*
	(0.028)	(0.024)	(0.053)	(0.050)
Mean of dep.var.	0.029	0.028	0.051	0.050
Bandwidth	0.011	0.016	0.011	0.012
Obs.	4419	6319	2668	2897
B. National Partisan Alignment				
N. Parties	0.016	0.013	0.086**	0.085***
	(0.039)	(0.033)	(0.035)	(0.032)
Mean of dep.var.	0.035	0.036	0.037	0.036
Bandwidth	0.011	0.014	0.011	0.012
Obs.	3336	4374	4012	4211
Bandwidth Choice	Fixed	CCT	Fixed	CCT
Fixed Effects	Y	Y	Y	Y
Controls	Y	Y	Y	Y

Notes: 2SLS estimates of the effect of fragmentation on stability, by alignment status. The dependent variable is an indicator taking value 1 if there was a vote of no confidence during the legislature. Alignment status indicated in table head. The optimal bandwidth is calculated using the CCT criterion in the full sample (columns 1 and 3), for comparison purposes, and using the CCT criterion on the subsample of aligned (col. 2) and unaligned (col. 4) municipalities only, respectively. Controls and FE are included in all specifications. Controls: surface and population (in logs). FE: number of available seats and year-region fixed effects. Standard errors clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.

A final note is due to discuss the role of party ideology in our context. The mechanism described in the theoretical model is able to explain the effect of fragmentation and bargaining resources on stability even when parties are identical in terms of ideology. However, in practice, parties can have very different ideological position, so that certain coalitions that could, on paper, be enough for a majority, are infeasible.

In table E.9 in appendix E, we estimate the reduced form of our model in equations 5 and 6 and include, as additional covariates, different measures of ideological distance between the marginal party, defined as the party that is closer to the threshold, and the largest party (please see the data appendix for details).

The information on ideology is taken from Polk et al. (2017) and is available only since 1999 and only for the parties that ran at the national level, so that the precision of the estimates is reduced in this exercise. Results in table E.9 show that the entry of a party that is ideologically distant from the first has an additional effect on the probability of no-confidence vote, but only if this distance is very large (defined as being above the 75th percentile of ideological distance). The entry of parties that are close ideologically, on the other hand, does not appear to increase stability, with a point estimate of the interaction between our instrument for crossing the threshold and an indicator for ideological closeness being very small and statistically insignificant.

These results suggest that, while ideological differences in the council might also be, in theory, an important driver of stability, we observe limited evidence that they play a first-order role. Putting together these results with the fact that we find, in our main analysis, that fragmentation decreases stability in the full sample of parties, suggests that our proposed mechanism operates regardless of ideological differences between parties.

5.2. Robustness Checks

We have conducted several additional checks to evaluate the robustness of our main results. We start by showing that our estimates of the effect of fragmentation and alignment on stability are unaffected by bandwidth choice as long as the bandwidths are reasonably narrow. To do so, we re-estimate our coefficients of interest varying bandwidth values. Figure E.7 displays estimates and 95% C.I. obtained for different bandwidths around the corresponding threshold. Panel A shows fuzzy-RD estimates of the effect of fragmentation (equation 5), while Panel B shows estimates of the alignment effect (equation 7). The CCT optimal bandwidth is indicated with a vertical dotted line in each case. In both cases, the coefficients are reasonably stable across bandwidths, and start to attenuate only using values of the bandwidth well above the optimal level. We conclude that our main results are not driven by specific bandwidth choices.

We now turn to a set of robustness checks which are specific to the fragmentation analysis. In the first place, we discuss who are the compliers in this exercise and how that affects our results. As shown in figure 5, crossing the 5% vote share threshold will lead to an average increase of roughly 0.3 in the number of parties in a municipal council. This number is less than 1 because obtaining more that 5% of the vote does not guarantee a seat in the council when the number of council members is small. For councils with 17 or more seats, the 5% threshold is usually effective, in the sense that the number of parties increases by essentially 1 when crossing the threshold. As a result, the compliers in the baseline estimates provided in table 2 are relatively large municipalities, with small municipalities barely contributing to the estimation of the parameter of interest.

As a first robustness check, we select our sample to municipality-election pairs in which the 5% threshold is likely to be binding (those with 17 or more seats in the council). Results are provided in panel A of table E.10. Column 1 records the first-stage coefficient which is almost three times as large as the coefficient one obtained using the full sample. In column 2 we report the 2SLS estimate of the effect of fragmentation on stability for this exercise. The point estimate of 3.2% is slightly lower than the baseline estimate of 4%, although the coefficients fall within each other's confidence intervals.

In order to explore how the identity of compliers affects our estimates, we conduct a separate analysis in which we construct a new running variable based on the effective entry threshold for each party in each election. The variable is built as follows: for each party represented in each council, we iteratively remove 0.1 percentage points of their vote share. We treat this removed vote share as if it was increasing blank votes (other alternatives are possible). In each step, we re-calculate the new seat share allocation. We keep going until the party leaves the council and record the total removed vote share as the running variable.[31]

In the case of parties that were originally *not* in the council, we instead add votes until they make it into the council. We can now re-estimate the effect of fragmentation on stability using this alternative running variable. Results are provided in panel B of table E.10 in the appendix. We observe that the first-stage coefficient in column 1 is now very close to 1. Interestingly, the 2SLS estimate is still positive and significant but substantially smaller than in the baseline, at only 1.3%. The difference in estimates can be seen as a result of including relatively smaller municipalities among the set of compliers. Therefore, from these results we can infer that the effect is smaller in smaller municipalities. That being said, an issue with this approach is that the specific choice of the way to re-assign votes will affect the running variables, and through it, the resulting estimates. In addition, using the 5% entry threshold in the baseline also clarifies how this institutional feature affects fragmentation.

In panel C of table E.10, we present results obtained when selecting the sample to only one party per municipal-election pair. Specifically, we keep in each case the party with vote share closest to the 5% entry threshold. This restricts the sample substantially relative to the baseline but the main effect of interest remains slightly below but close to the baseline coefficient at 3.6%. Finally, we provide results using weights equal to the number of parties within the CCT threshold running in a municipality to ensure that all municipalities have equal weights in estimation. The first-stage now is slightly weaker than before. Second-stage estimates are larger than in the baseline and significant at the 5% level. Collectively, the results in table E.10 in the appendix reassure us that our qualitative findings for the effect of fragmentation on stability are not driven to methodological choices made when producing our baseline estimates.

[31]The implicit effective threshold would simply be the difference between the original vote share and this running variable.

6. Conclusions

Understanding the determinants of government stability is crucial to design constitutional rules that balance the need to hold politicians accountable and efforts to limit policy uncertainty. In this paper, we show that the fragmentation of Parliament has a sizeable effect on government stability, and that incumbents with more resources – and, hence, bargaining power – are less likely to be removed from office. Additionally, politicians replacing unseated incumbents tend to be of higher quality and are rewarded by voters in the next elections.

Our results indicate that there exists a trade-off between government stability and selection of high-quality politicians into office. The entry thresholds present in most national parliaments can be used by policy-makers to locate along this trade-off. For instance, increasing the vote share required to enter Parliament would limit the influence of small parties and foster the creation of more stable coalitions.

Using the estimates reported in table 2 and the observed vote shares distribution, we conduct a simple counter-factual analysis to assess how a change in the entry threshold would affect stability in Spanish municipalities. Lowering the entry threshold from 5% to 4% and re-calculating the seat share allocations leads to an effective increase in the average number of parties with representation by 0.15. Correspondingly, the probability of a no-confidence vote increases by 0.5 percentage points. On the contrary, increasing the threshold from 5% to 6% would reduce the average number of parties by 0.2 and the probability of a no-confidence vote by 0.75 percentage points. Compared to the in-sample baseline probability of unseating the mayor of 2%, these results show that even moderate changes in the entry threshold can have substantial effects on stability.

While most countries use thresholds in the 3-5% range, in some cases they can be as high as 10%. Extrapolating results from our estimates suggests that part of the variation in stability that we observe across countries may be related to differences in these thresholds.

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Appendices

A. Theoretical Appendix

Proof of Proposition 1

In the first place, consider the case in which $s_1 \geq 0.5$. This condition implies party 1 forms a single party majority and $\pi(\mathrm{s}) = 0$. In this scenario, there are two relevant possibilities depending on whether $s'_1 \geq 0.5$ or not. If $s'_1 \geq 0.5$, we will have that $\pi(\mathrm{s}') = 0$ for the same reason. If, however $s'_1 < 0.5$, then we know $\pi(\mathrm{s}') \geq 0$ because for a section of (θ_1, θ_2) space, the probability of a vote of no confidence is different from 0. This completes the proof for the $s_1 \geq 0.5$ case.

In the case with $s_1 < 0.5$, the probability of a vote of no confidence will be larger than 0 under both s and s′. Two cases need attention when comparing these probabilities. Define $s_* \equiv s'_3 + (s'_4 - s'_3)\mathbb{1}\{s'_1 + s'_4 \geq 0.5\}$. If $s_* = s_3$, then integral 4 is identical for s^3 and s^4, so that $\pi(\mathrm{s}) = \pi(\mathrm{s}')$. If, however, $s_* < s_3$, then the region of (θ_1, θ_2) space corresponding to safe coalitions is smaller under s′ than under s. As indicated in figure 3, this occurs because the linear constraint $h(\theta_1, s_*)$ will have the same intercept and a smaller slope than constraint $h(\theta_1, s_3)$ (see 3 in the main text). Given that, by assumption, $g(\theta_1, \theta_2)$ has positive density everywhere in the unit square, the change in the regions of integration translate into $\pi(\mathrm{s}') > \pi(\mathrm{s})$ if $s_* < s_3$.

Proof of Lemma 1

The proof of lemma 1 proceeds on a case-by-case basis. We need to separately consider the case with and without a single-party majority *and* the two different versions of s′ (when $s'_1 + s'_4 = s_1$ and $s'_3 = s_3$, or $s'_3 + s'_4 = s_3$ and $s'_1 = s_1$). There are four cases in total:

In the case with $s_1 \geq 0.5$ and $s'_1 + s'_4 = s_1$, then we will have that $\pi(\mathrm{s}'') = 0$, as vector s″ will continue to have $s_1 > 0.5$. However, $\pi(\mathrm{s}') \geq 0$ as it is possible that $s'_1 < 0.5$. If the entry of party 4 removes seats from party 1 and results in it losing its majority, this will result in an increase in the probability of a vote of no confidence. So $\pi(\mathrm{s}') - \pi(\mathrm{s}'') > 0$. In the case with $s_1 \geq 0.5$ and $s'_1 = s_1$, then we will have that $\pi(\mathrm{s}'') = 0$ and $\pi(\mathrm{s}') = 0$ as both vectors will continue to lead to a single-party majority.

In the case with $s_1 < 0.5$ and $s'_1 + s'_4 = s_1$, then we will have that $\pi(\mathrm{s}') - \pi(\mathrm{s}'') = 0$. To see this, note that combining both conditions for this case, we know $s'_1 + s'_4 < 0.5$ for both vectors. Therefore, in this case the composition and cost of the minimum cost coalition are the same for s′ and s″: a coalition with party 3 is formed, and a transfer of $\theta_1 s_3$ is paid by party 1 to that effect. As a result, the probabilities of a vote of no confidence are identical under both vectors.

Finally, with $s_1 < 0.5$ and $s'_3 + s'_4 = s_3$, then we will have that $\pi(\mathrm{s}') - \pi(\mathrm{s}'') \geq 0$. If the entry of the fourth party allows party 1 to form an minimum cost majority with it ($s_1 + s_4 > 0.5$ and $s_1 + s_4 < s_1 + s_3$) then both probabilities will be identical. However, if this is not the case and the minimum cost coalition involves party 3, then we will have that $s'_3 < s_3$ by

assumption. This means the cost of a minimum cost coalition is lower under $\mathbf{s}'$ and, as a result, $\pi(\mathbf{s}') - \pi(\mathbf{s}'') > 0$.

■

Proof of Proposition 2

Define $\pi_2(\Theta, \mathbf{s})$ as the probability that the government is unseated in period 2 for seat share vector $\mathbf{s}$ and a quality-pair $\Theta \equiv (\theta_1, \theta_2)$. In the first place, consider the case in which $s_1 \geq 0.5$. In that case, party 1 forms a single-party majority so that $\pi_2(\Theta, s) = 0 \ \forall \Theta$, and $\pi_2(\Theta', s) = \pi_2(\Theta'', s) = 0$.

In the case in which $s_1 < 0.5$, then we can define:

$$\pi_2(\Theta', \mathbf{s}) \equiv \begin{cases} 0 & \text{if} \quad \theta_2' \leq h(\theta_1') \text{ and} \quad \theta_2' \leq \theta_1' \\ \mu & \text{if} \quad \theta_2' > h(\theta_1') \text{ or} \quad \theta_2' > \theta_1' \end{cases}$$

This definition formalizes the regions separated by the solid line in figure A.1. Safe coalitions have 0 probability of suffering a vote of no confidence. For contestable coalitions, this probability is μ. For any pair Θ' and Θ'' in the unit square that satisfy the assumptions, Θ'' is to the right of Θ'. We can provide a proof with the aid of figure A.1. Given that Θ'' is to the right of Θ', there are only three possible cases. Either:

Case	1	2	3
$\pi_2(\Theta', \mathbf{s})$	0	μ	μ
$\pi_2(\Theta'', \mathbf{s})$	0	μ	0
Δ	0	0	μ

So $\pi_2(\Theta', \mathbf{s}) \geq \pi_2(\Theta'', \mathbf{s})$. For example, this inequality is strict for the two points we can see labelled in figure A.1.

■

Equilibrium with 2 Parties

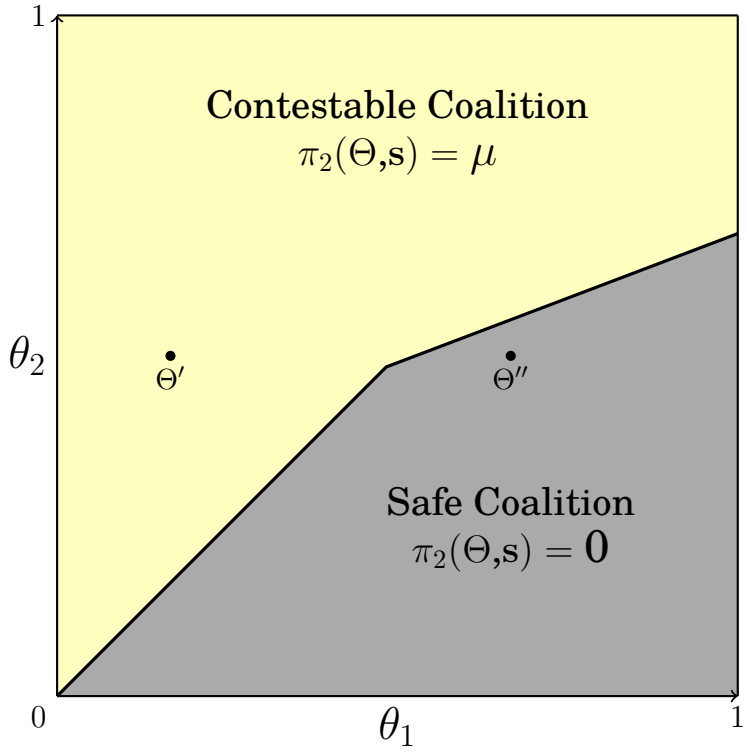
The case with 2 parties is very straightforward as, necessarily, party 1 is always able to form a single-party majority in period 1 by approving a transfer of θ_1 to itself. Because no alternative majority can be formed, the probability of a vote of no confidence is 0 regardless of shares s_1 and s_2 or the values of (θ_1, θ_2).

An increase in the number of parties from 2 to 3 can result in an increase in the probability of a vote of no confidence if and only if $s_1 < 0.5$ in the 3 party case.

Equilibrium with 5 Parties

We now discuss the equilibrium when with 5 parties. If $s_1 \geq 0.5$, then party 1 forms a single-party majority, approves paying itself θ_1, and the probability of a vote of no confidence in period 2 is 0. When $s_1 < 0.5$, the contestable minimum cost coalition will result in an

FIGURE A.1
COALITIONS IN (θ_1,θ_2) SPACE



Notes: Optimal party 1 coalition strategies in period 1 on (θ_1, θ_2) space. Case with $s_1 < 0.5$. The solid line represents the boundary of the safe coalition region. Points Θ' and Θ'' are examples that satisfy the conditions of proposition 2.

expected pay-off of $V^C_{mc} = (\omega + (1-s_*)\theta_1)(1+\beta(1-\mu))$, with s_* corresponding to the combined seat share of the additional parties that party 1 needs to form a minimum winning coalition. This number will depend on the vector of seat shares, as detailed in table A.1.

The safe minimum cost coalition will be available to party 1 if and only if $\theta_2 \leq s_*\theta_1$ with s_* taking the values illustrated in table A.1. The associated pay-off will be $V^S_{mc} = (\omega + \theta_1(1 - s_*))(1+\beta)$.

TABLE A.1
VALUES OF s_* - 5 PARTY CASE ($s_1 < 0.5$)

	Case	s_*
Panel A		
$s_1 + s_3 \geq 0.5$	$s_1 + s_5 \geq 0.5$	s_5
	$s_1 + s_4 \geq 0.5$ & $s_1 + s_5 < 0.5$	s_4
	$s_1 + s_4 + s_5 \geq 0.5$ & $s_4 + s_5 < s_3$ & $s_1 + s_4 < 0.5$	$s_4 + s_5$
	$s_1 + s_4 < 0.5$ & $s_4 + s_5 \geq s_3$	s_3
Panel B		
$s_1 + s_3 < 0.5$	$s_1 + s_3 + s_5 \geq 0.5$ & ($s_1 + s_4 + s_5 < 0.5$ or $s_4 + s_5 > s_3$)	$s_3 + s_5$
	$s_1 + s_4 + s_5 \geq 0.5$	$s_4 + s_5$

When considering blocking coalitions there are two cases that warrant separate atten-

tion, $s_1 + s_3 \geq 0.5$ and $s_1 + s_3 < 0.5$. In the first case, party 1 only needs one party to form a winning coalition, and can therefore offer θ_2 to one party (e.g. party 3) to form a blocking coalition, as long as $\theta_1 > \theta_2$. This is analogous to the case with 3 or 4 parties and yields a pay-off of $V^S_{block} = (\omega + (\theta_1 - \theta_2))(1 + \beta)$, which is feasible if $\theta_1 \geq \theta_2$. When $s_1 + s_3 < 0.5$, party 1 needs two parties to form a coalition, and hence will have to pay θ_2 to *both* for that coalition to be blocking. In this case, the pay-off from forming a blocking coalition is $V^S_{block} = (\omega + (\theta_1 - 2\theta_2))(1 + \beta)$, and is only feasible if $\theta_1 \geq 2\theta_2$.

In both cases we can determine when blocking coalitions are played in (θ_1, θ_2) space by using condition $V^C_{mc} > V^S_{block}$ to derive incentive compatibility constraints $\theta_2 \leq h(\theta_1, s_*)$, and the feasibility conditions for a blocking coalition as participation constraints.[32] The incentive compatibility constraints will be given by:

$$h(\theta_1, s) = \begin{cases} \dfrac{\mu\omega\beta}{1+\beta} + \dfrac{s_*(1+\beta-\mu\beta)+\mu\beta}{1+\beta}\theta_1 \text{ if } s_1 + s_3 \geq 0.5 \\ \dfrac{\mu\omega\beta}{2(1+\beta)} + \dfrac{s_*(1+\beta-\mu\beta)+\mu\beta}{2(1+\beta)}\theta_1 \text{ if } s_1 + s_3 < 0.5 \end{cases}$$

We can use these to write the probability of a vote of no confidence in the case with 5 parties as:

$$\pi_2(\Theta, \mathbf{s}) \equiv \begin{cases} 0 \quad \text{if} \quad \begin{cases} s_1 + s_3 \geq 0.5 \text{ and } \theta_2 \leq h(\theta_1, s_*) \text{ and } \theta_2 \geq \theta_1 \\ \text{or} \\ s_1 + s_3 < 0.5 \text{ and } \theta_2 \leq h(\theta_1, s_*) \text{ and } \theta_2 < \theta_1/2 \end{cases} \\ \mu \quad \text{Otherwise} \end{cases}$$

We can use this expression to prove the equivalent of proposition 1 in the 4 to 5 party case. Assume two seat share vectors $\mathbf{s} = (s_1, s_2, s_3, s_4)$ and $\mathbf{s}' = (s'_1, s'_2, s'_3, s'_4, s'_5)$ such that $s_j \geq s'_j \quad \forall j = \{1, 2, 3, 4\}$ and $s'_5 > 0$. For a given joint distribution $g(\theta_1, \theta_2)$ with positive density in the unit square, we have that $\pi(\mathbf{s}') \geq \pi(\mathbf{s})$. To prove this, it suffices to show that $s'_* \leq s_*$, where s_* is the seat share of the ally party 1 needs when building a minimum cost coalition in the 4 party case, and s'_* corresponds to the same figure in the 5 party case (see table A.1).[33] Because $h(\theta_1, s_*)$ is increasing in s_*, and a blocking coalition needs to satisfy $\theta_2 < h(\theta_1, s_*)$, a decrease in s_* will reduce the size of the region in (θ_1, θ_2) space for which this condition is satisfied. For a fixed $g(\theta_1, \theta_2)$ with positive support in the unit square, the will translate in a higher probability of a vote of no confidence. To show $s_* \geq s'_*$ it suffices to go over table A.1, compare them to expression $s_* = s_3 + (s_4 - s_3)\mathbb{1}\{s_1 + s_4 \geq 0.5\}$ for the four party case, and note that $s_j \geq s'_j \ \forall j = \{1, 2, 3, 4\}$, by assumption.

In this sense, going from 4 to 5 parties appears to be no different to going from 3 to 4 parties. However, adding a fifth party introduces an additional mechanism. Not only can

[32] Because s'_* and s_* are both smaller than 0.5, we can guarantee that safe minimum cost coalitions will never be feasible if blocking coalitions are not feasible.

[33] If the minimum winning coalition requires two parties (e.g. 3 and 5), then this figure will be the combined share of both parties.

the cost of a minimum cost coalition fall when adding a fifth party ($s_* \geq s'_*$), but also the cost of forming a blocking coalition can increase. This occurs because in the 5 party case we might have that $s_1 + s_3 < 0.5$ which implies party 1 needs *two* other parties to form a minimum coalition. To make this a blocking coalition, party 1 needs to pay θ_2 to each party. This doubles the cost of forming a blocking coalition, affecting both its feasibility and desirability.[34]

[34] It is also possible to show that an adapted version of the lemma in section 2 is satisfied in the five party case. Proof available upon request.

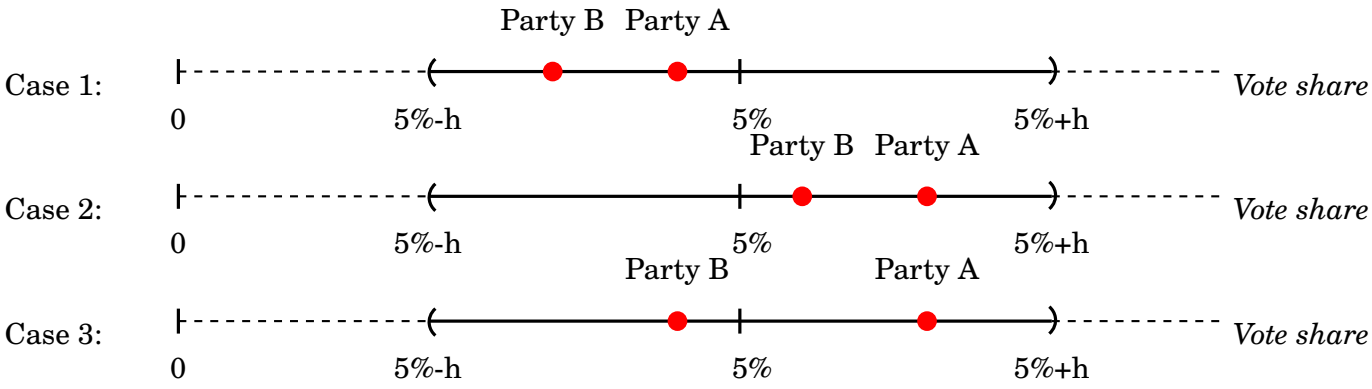
B. Construction of the instrument for fragmentation

To instrument for the number of parties in the council, we use an indicator D equal to one if, in a given election, a given party in a municipality obtained a vote share above the 5% threshold. Given that the electoral rules exclude parties with less than 5% from the allocation of seats, parties above the threshold have a positive probability of being in the council, whereas parties below the threshold never receive a seat. Thus, the number of parties with seats in the council in a given municipality will be related to how many parties were able to cross this threshold. Our fuzzy-RD design is based on this intuition. It uses variation in the number of parties that crossed the 5% threshold to instrument for the number of parties in council, focusing on observations within a small bandwidth h from 5%.

The instrument is defined for each election, municipality and party. As an illustration, consider an example in which, after an election, vote shares are determined in a way that there are only two parties that obtained vote shares sufficiently close to the 5% threshold to be within the bandwidth h.

There are three possible cases, depicted in the figure below: both parties receive less than 5% (case 1), both receive more (case 2), or parties locate at either side of the 5% threshold (case 3). In case 1, our instrument D takes value 0 for both parties A and B. Similarly, in case 2 it is 1 for both parties, while in case 3 it equals 1 for party A and 0 for party B.

It is clear that the number of parties that enter the council is partially determined by the number of parties that manage to get at least 5% of the votes and are, hence, eligible to obtain a seat. In case 2, for example, if the vote shares of party A and B are sufficiently high, the D'Hondt method will allocate both parties a seat, so that the council will have two additional parties. On the contrary, in situations like case 1, there will be two parties less in the council.



C. Calculation of the running variable for alignment

This section clarifies how we calculate the running variable for alignment. We follow Folke (2014) and Fiva, Folke and Sørensen (2018)'s recommendation that, when applying the close-elections approach to proportional representation systems, the running variable should take into account the overall votes distribution across all parties.

First, for each municipality, we calculate the aggregate vote share of the coalition in power at the regional level (the *regional coalition bloc*) as the sum of all vote shares of parties belonging to the bloc. We proceed similarly by aggregating over the *regional opposition bloc*, defined as the group of all other parties with representation in the regional council. We define an indicator D equal to 1 if the regional coalition bloc has the majority of seats in the municipality, and zero otherwise.

We then apply an iterative method in which we add votes to the regional coalition bloc (if it does not have the majority of seats in council) or subtract them (if it does) until a majority change is achieved. If the regional coalition bloc has the majority of seats in the local council, start by subtracting votes to the regional bloc in a small increment of .5 percent of the total votes cast. These votes are allocated to the parties in council belonging to the opposition block proportionally to their seat shares. Then, re-calculate the seats allocation. If, with this new allocation of votes, the alignment indicator does not change, subtract an additional .5 percent until there is a majority change, defined as a change in which bloc has the most seats or, in case of a tie in seats, the most votes.

When we observe a majority change, in order to gain precision, we iterate further by subtracting .1% of votes until the majority changes again. Then, we repeat the operation in finer increments of .01% and, finally, .001%. The final running variable, therefore, is approximated to jumps in vote share of .001%.

When we re-allocate votes taken from the regional government and assigned to the opposition, or vice-versa, we assume that the probability that each party belonging to the bloc loses (gains) a vote is proportional to the vote share of the party itself relative to the total vote share of the bloc to which the party belongs.

We calculate the original seat distribution, as well as the simulated seat distributions using the STATA user-written command *v2seats*, to which we input the details of the Spanish municipalities electoral system in terms of admission threshold and the D'Hondt allocation rule.

D. Data Appendix

D.1. List of Data Sources

Towns Panel

We create a list of municipalities-by-year unique identifiers, gathering information on the official naming of municipalities, as well as municipality, province and region codifications. For years after 1999, we use the official list from the *Instituto Nacional de Estadistica*. This information is not available in earlier years, for which we use the election results as a basis for our towns panel instead. This town panel is used as a basis for all subsequent merges with the other datasets used in the paper.

Elections

We use municipal election data from the *Ministerio del Interior* (the Spanish Ministry of Internal Affairs), relative to all election years between 1979 and 2011. This source contains information about all parties running for office, as well as information on votes received by each party, number of citizens with the right to vote, voters, turnout, number of blank ballots, number of non-valid ballots. In the original data sources (http://www.infoelectoral.mir.es/infoelectoral/min/), around 400 elections are missing in 1979 and 1983.

Seats

We access data on the seat distribution across parties in all municipality councils from the *Ministerio del Interior*, relative to all election years between 1979 and 2014. The data contain information on the number of seats that each party received, as well as the total number of seats in the municipality council.

We address the quality of this data source by calculating with the help of the Stata user-written command *v2seats* the number of seats assigned to each party according to election results, the 5% vote share admission threshold, and the D'Hondt allocation rule. We detect that in only 414 cases the two approaches do not yield the same seat distribution.

Mayors

We use yearly information on mayors in all municipalities from the *Ministerio del Interior* between 1979 and 2014. The data contain information about the party affiliation of the mayor, as well as the date in which the mayor entered in office.

We aggregate the data at the election level. In the case in which the identity of the mayor changes within a term, we keep the information relative to all mayors who have served. Our main dependent variable, *Mayor Unseated*, is an indicator equal to one if, at some point during the term, the identity of the mayor changes and her party affiliation is different from the one of her predecessor. In the original data sources, information on the mayor's identity is missing in 39 cases (mainly in Navarre, 1999).

Alignment

We access the outcomes of the votes held within the council of each region (*Comunidad Autonoma*) to gather information about the *regional coalition bloc*, that is, the coalition of parties that have voted in favor of the elected President. We consider all parties who voted in support of the incumbent regional President prior to the current municipality election as part of the regional governing majority. Following Curto-Grau, Solé-Ollé and Sorribas-Navarro (2018), we construct the shares of the regional coalition and opposition blocs at the municipal level by aggregating the vote shares of all parties belonging to the regional coalition and the opposition blocs, respectively. A municipality is defined as aligned if the mayor belongs to one of the parties of regional coalition bloc, and not aligned otherwise.

At the national level, single-party majorities (or coalition governments between one very large party and other small or local parties) have been observed most of the times. Hence, we consider that a mayor is aligned with the national government if and only if she belongs to the party of the Prime Minister's, and that she is not aligned otherwise.

Capital Transfers

We use ex-post budget information of all municipalities from *Ministerio de Hacienda* (the Spanish Ministry of Finance), relative to the years 2002-2014. From this source, we obtain the capital transfers that each municipality received from upper-tier levels of government in the last year before a new municipality election. Link: `http://serviciostelematicosext.minhap.gob.es/sgcal/entidadeslocales/`.

As a robustness check of both our measure of capital transfers and our approach to compute the running variable and the treatment groups for the alignment analysis, we use the variable *tk* (capital transfer per capita) from Curto-Grau, Solé-Ollé and Sorribas-Navarro (2018).

Personal Characteristics of Politicians

We have information from ... on gender, age, education and profession of all members of municipality councils and mayors elected in the 2007 and 2011 elections, as well as the number of previous terms that the individual has served in the council (only for the 2007 election). We proxy for $\theta_1 - \theta_2$ in the theoretical model by comparing the observable characteristics of elected mayors and the average characteristics of members of the municipality council belonging to the party with the second largest seat share.

Ideology

We obtain information on ideology by merging our dataset to the 1999-2014 Chapel Hill Expert Survey (CHES) trend file. This dataset was constructed by Polk et al. (2017) and contains ideology measures of parties represented in the national Parliament between 1999 and 2014. These parties are *PP, BNG, CC, CHA, CiU, EA, EH, ERC, IU, PA, PAR, PNV, PSOE, and UV.*

To define our measures of ideological distance, we use the variable *lrgen* in the CHES dataset, which measures the general ideology of each party on a scale from 1 (far left) to 10

(far right), after standardizing it and taking the absolute value. In addition to using the continuous variable, we also generate an indicator *far* equal to 1 if the distance between the largest party and the *marginal party*, defined as the party closest to the 5% entry threshold, is above the 75^{th} percentile of the distance distribution. Similarly, we define *close* if the distance is below the 25^{th} percentile. *Same*, instead, is an indicator for these two parties being both on the left or both on the right of the mean ideology among all parties represented in the Spanish Parliament between 1999 and 2014.

D.2. Sample selection

Fragmentation and stability

The dataset for the analysis of the effect of fragmentation on stability is a party-level panel of municipalities, observed for all election years between 1983 and 2011 and containing all information from data sources described above. We restrict the sample to municipalities with population above 250 since the ones below the are subject to a different voting rule, based on individual candidates rather than on party lists. We drop 414 elections in which the allocation of seats across parties observed in the official sources is not consistent with the election results, according to the 5% admission threshold and the D'Hondt allocation rule.

We also drop a total of 864 elections, in which either i) we are unable to match electoral results and mayors, or ii) the party of the mayor is not recognized among the ones participating in the elections, or iii) cases in which electoral results are inconsistent (e.g. if none of the parties received votes, or the number of voters is larger than the number of individuals with right to vote).

The final sample consists of 161,558 party-municipality observations from 50,154 unique municipal elections.

Alignment and stability

The dataset for the analysis of the effect of alignment on stability is a panel of municipalities, observed for all election years between 1983 and 2011 and containing information from data sources described above. Elections held in 1979 are excluded from the sample since no regional government was already incumbent at the time of the municipality elections. Again, we restrict the sample to municipalities with more than 250 residents, and we drop 414 elections in which the allocation of seats across parties observed in the official sources is not consistent with the election results.

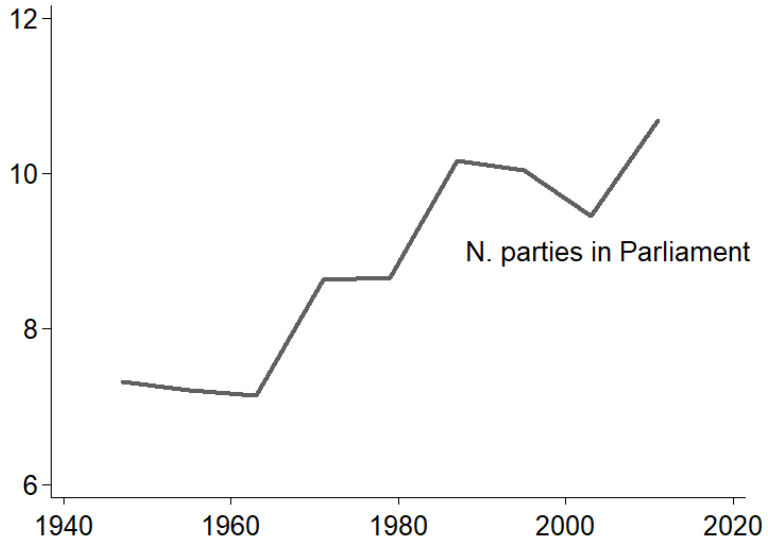
We also drop a total of 6,212 elections, in which either i) we are unable to match electoral results and mayors, or ii) the party of the mayor is not recognized among the ones participating in the elections or iii) the party of the mayor belongs to local lists by construction impossible to be aligned to the regional government, or iv) cases in which electoral results are inconsistent (e.g. if none of the parties received votes, or the number of voters is larger than the number of individuals with right to vote).

The final sample consists of 44,806 observations, each of which representing a unique municipality-election pair.

E. Additional empirical results

FIGURE E.1

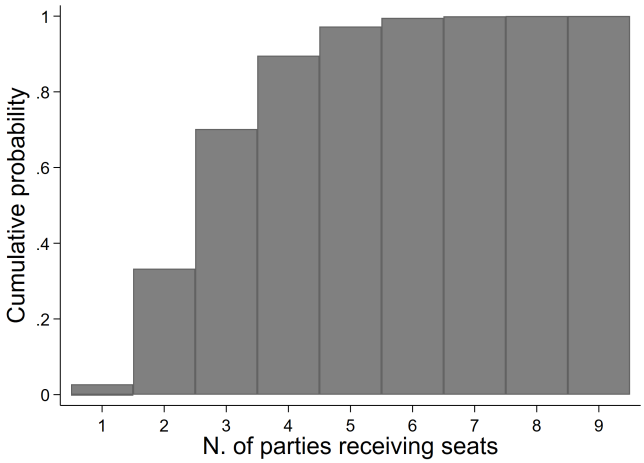
EVOLUTION OF THE NUMBER OF PARTIES IN PARLIAMENT OVER TIME



Notes: The graph plots the evolution of the number of parties with representation in the Parliament over time. The solid line is the average number of parties, for all countries in the sample, calculated in 8-years windows since 1947 to 2019. Source: authors' elaboration based on the *parlgov* dataset (experimental version) by Döring and Manow (2019). The dataset contains information on national election results for 39 countries, including all EU and most OECD countries until 2019.

FIGURE E.2

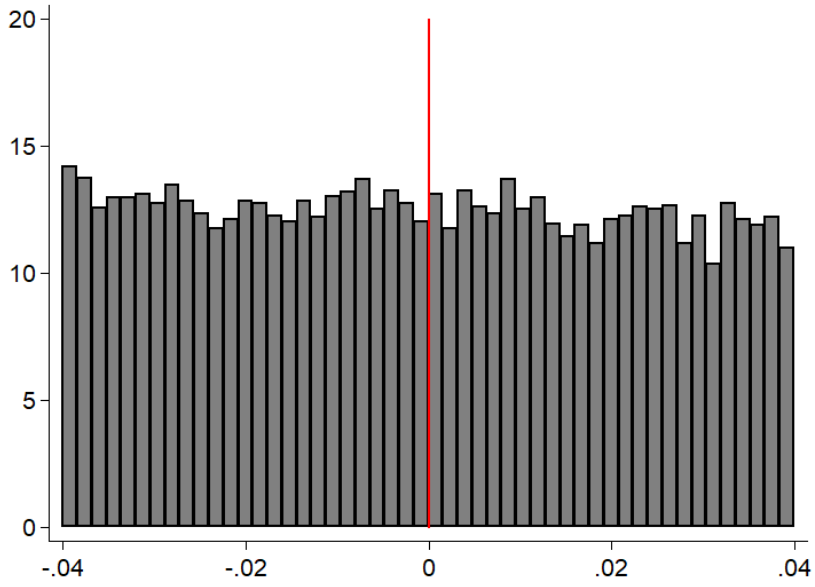
NUMBER OF PARTIES IN MUNICIPAL COUNCILS



Notes: Cumulative distribution of the number of parties represented in municipality councils between 1979 and 2014.

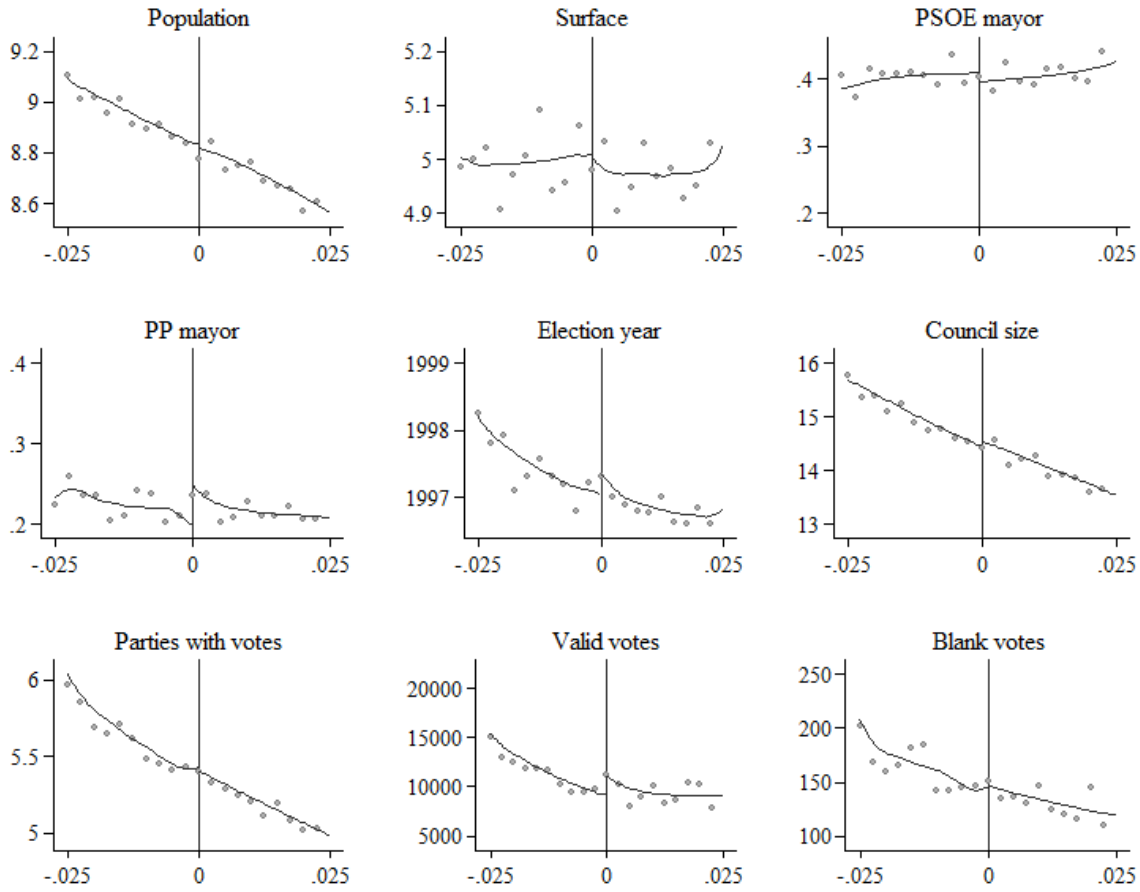
Figure E.3

Density of the fragmentation running variable around the threshold



Notes: Density histogram of the running variable used in the RDD on the effect of fragmentation on stability, in bins of size 0.025%. A McCrary (2008) test of the null hypothesis of no discontinuous jump in the density at the threshold fails to reject the null with a p-value of 0.96. A Cattaneo, Jansson and Ma (2017) test, instead, yields a p-value of 0.72.

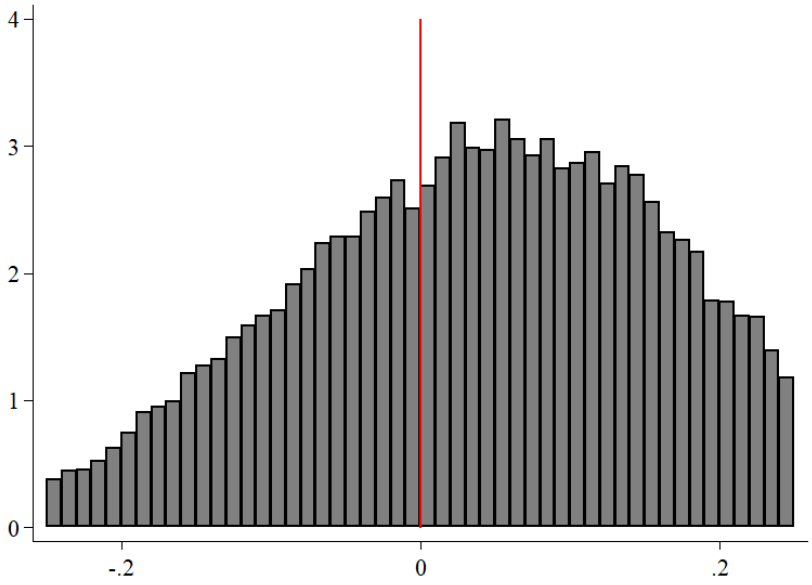
Figure E.4
Covariate Balancing Plots - Fragmentation



Notes: Averages of different municipal characteristics near the threshold. Population and surface are in logarithms. Capital is an indicator for being a regional capital. PSOE mayor is an indicator for the mayor belonging to the socialist party PSOE. Council size is the number of available seat in the municipality. Parties with votes measures the number of parties that ran and obtained votes in the municipal election. Valid votes is the total number of votes cast (including blanks). Dots are averages in 0.1% bins of the running variable and lines are nonparametric local linear regressions estimates.

Figure E.5

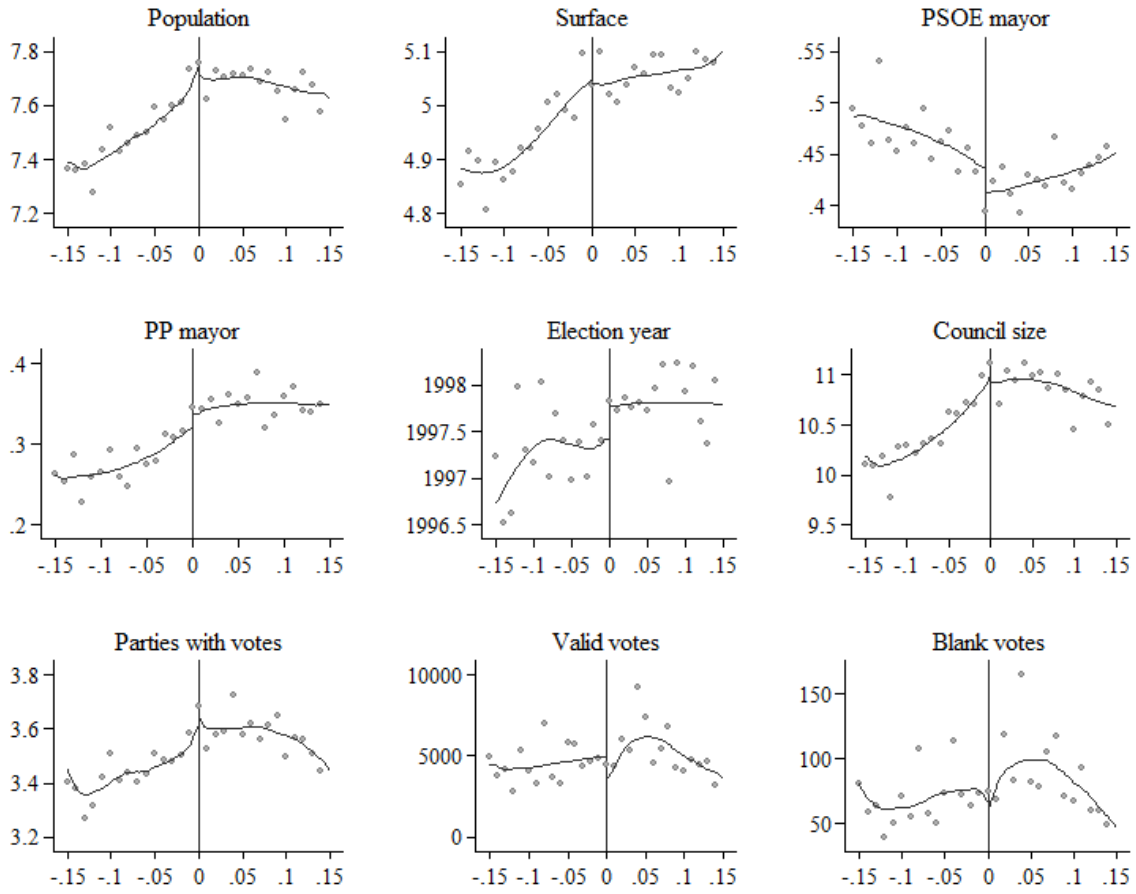
Density of the alignment running variable around the threshold



Notes: Density histogram of the running variable used in the RDD on the effect of alignment status on stability, in bins of size 0.1%. A McCrary (2008) test of the null hypothesis of no discontinuous jump in the density at the threshold fails to reject the null with a p-value of 0.24. A Cattaneo, Jansson and Ma (2017) test, instead, yields a p-value of 0.93.

Figure E.6

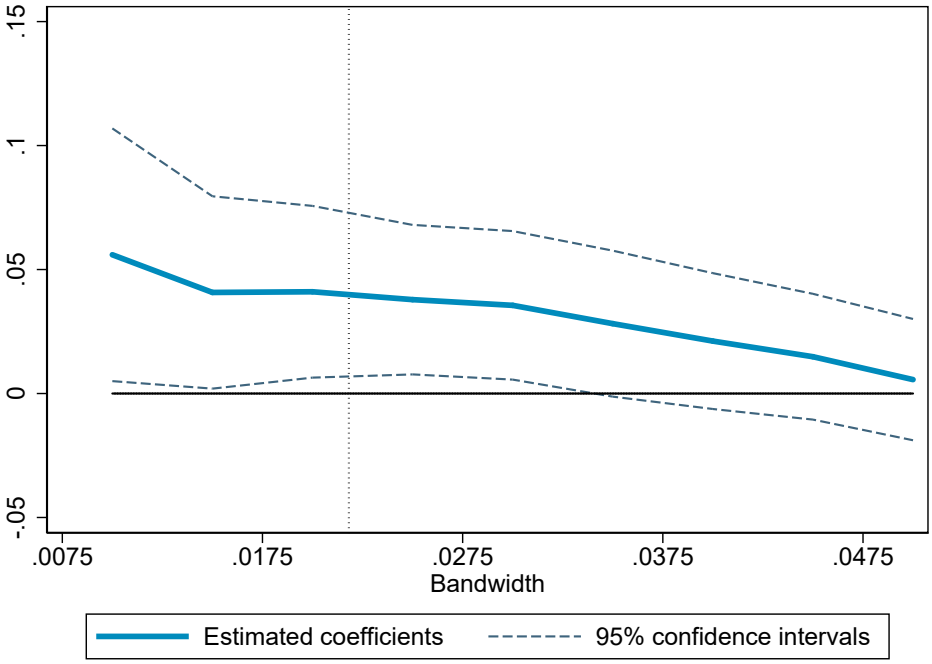
Covariates balancing plots - Alignment



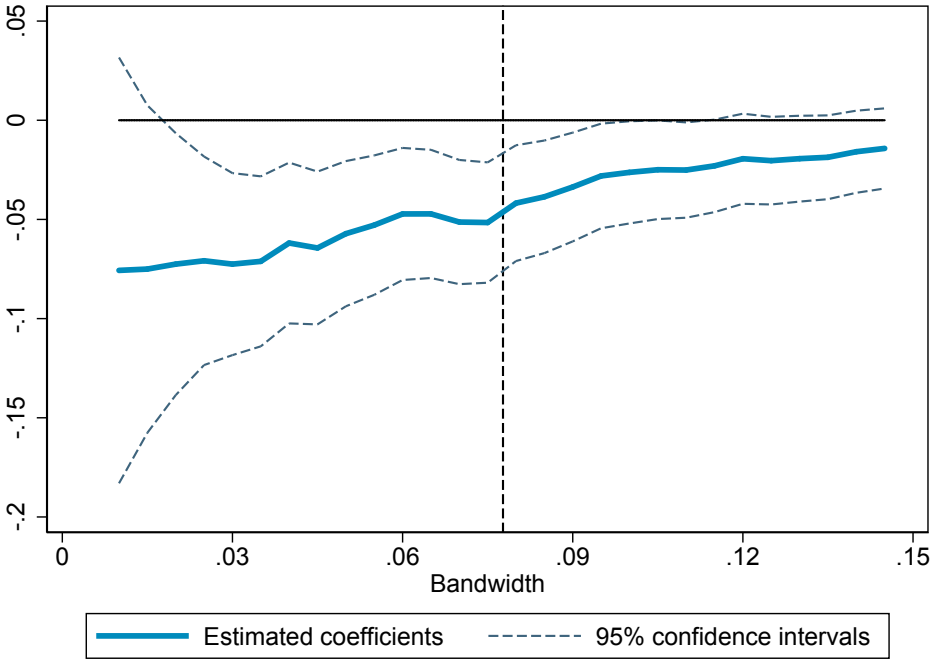
Notes: Averages of different municipal characteristics near the threshold. Population and surface are in logarithms. PSOE mayor is an indicator for the mayor belonging to the socialist party PSOE. Council size is the number of available seat in the municipality. Parties with votes measures the number of parties that ran and obtained votes in the municipal election. Valid votes is the total number of votes cast (including blanks). Dots are averages in 1% bins of the running variable and lines are nonparametric local linear regressions estimates

Figure E.7

Bandwidth Robustness - Fragmentation and Alignment estimates



A) Fragmentation

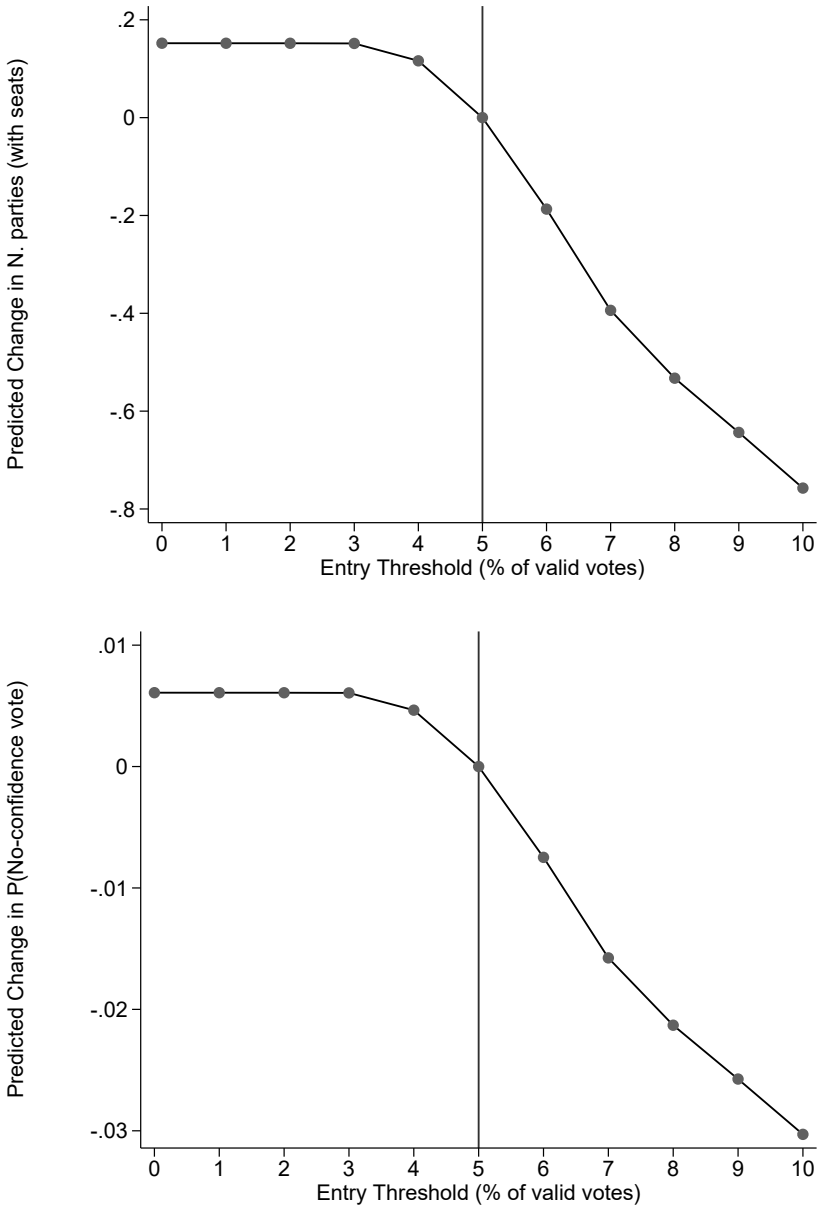


B) Alignment

Notes: Panel A shows estimates of of the effect of fragmentation on the probability of a no-confidence vote for different bandwidth choices (eq. 5). Panel B shows estimates of the effect of alignment on the probability of a no-confidence vote for different bandwidths (eq. 7). Horizontal axes represent the relevant running variable in each case. Solid lines represent coefficient values, while dashed lines are 95% confidence intervals. Controls: surface and population (in logs). FE: number of available seats and year-region fixed effects. Standard errors are clustered at the municipality level.

Figure E.8

Predicted changes in stability as a function of the Entry Threshold



Notes: This figure reports the predicted number of parties as well as the predicted probability of a vote of no-confidence as a function of entry thresholds, holding constant voters' preferences. We retrieve the number of parties for any variation in the admission threshold between 0% (no admission threshold) and 10% of valid votes, by applying the D'Hondt rule on observed election results in our sample. Then, we apply the coefficient estimated in Table 2 to retrieve, for each potential admission threshold, the change in probability of no-confidence vote compared to the case of a 5% entry threshold, observed in the data.

TABLE E.1
COVARIATE BALANCING - FRAGMENTATION

	(1) Popul.	(2) Surface	(3) PSOE Mayor
Above threshold	0.001	-0.020	-0.010
	(0.046)	(0.041)	(0.016)
Mean of dep.var.	8.831	4.984	0.403
Bandwidth	0.021	0.021	0.021
Obs.	14882	14882	14882
	PP Mayor	Election year	Council size
Above threshold	0.021	0.161	0.107
	(0.013)	(0.324)	(0.178)
Mean of dep.var.	0.222	1997.091	14.536
Bandwidth	0.021	0.021	0.021
Obs.	14882	14882	14882
	Parties w. votes	Valid votes	Blank votes
Above threshold	0.046	1249.352	6.843
	(0.066)	(1426.476)	(18.433)
Mean of dep.var.	5.395	10168.438	144.004
Bandwidth	0.021	0.021	0.021
Obs.	14879	14879	14879

Notes: Covariate balancing regressions for the fragmentation RDD model (eq. 5 and 6). Population and surface are in logarithms. Capital is an indicator for being a regional capital. PSOE Mayor and PP Mayor are indicators taking value one if the mayor is from the socialist or popular parties, respectively. Council size is the number of available seat in the municipality. Parties with votes measures the number of parties that ran and obtained votes in the municipal election. Valid votes is the total number of votes cast (including blanks). Estimation by local linear regression using a fixed bandwidth equal to the CCT optimal bandwidth used in table 2. No controls or FE are included. Standard errors are clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.

Table E.2

First-Stage - Fragmentation

	(1) N. Parties	(2) N. Parties	(3) N. Parties	(4) N. Parties
Above threshold	0.316***	0.312***	0.313***	0.311***
	(0.037)	(0.032)	(0.029)	(0.029)
F-stat.	74.01	94.85	119.09	118.17
Mean of dep.var.	3.471	3.471	3.471	3.471
Bandwidth	0.027	0.027	0.027	0.027
Obs.	19420	19420	19420	19420
Fixed Effects	N	N	Y	Y
Controls	N	Y	Y	Y

Notes: OLS estimates of the first-stage for fragmentation (equation 6). The optimal bandwidth is calculated using the CCT criterion. Controls and FE are included as specified in each column. Controls: surface and population (in logs). FE: number of available seats and year-region fixed effects. Standard errors are clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.

Table E.3

IV Estimates - Fragmentation and Single-Party Majorities

	(1) P(Majority)	(2) P(Majority)	(3) P(Majority)	(4) P(Majority)
N. Parties	-0.101**	-0.103**	-0.106**	-0.106**
	(0.043)	(0.042)	(0.042)	(0.041)
Mean of dep.var	0.625	0.625	0.625	0.625
Bandwidth	0.021	0.021	0.021	0.021
Obs.	13623	13623	13623	13623
Fixed Effects	N	N	Y	Y
Controls	N	Y	N	Y

Notes: 2SLS estimates of the effect of number of parties on the probability that the largest party receives the absolute majority of seats. The dependent variable is an indicator taking value 1 if one party has strictly more than half of the seats in the municipality council. Controls and FE are included as indicated in each column. Controls: surface and population (in logs). FE: number of available seats and year-region fixed effects. The optimal bandwidth is calculated using the CCT criterion. Standard errors are clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.

Table E.4

Reduced-form - Fragmentation and Stability by party losing a seat

	(1) Mayor Uns.	(2) Mayor Uns.	(3) Mayor Uns.
N. Parties	0.041**	-0.008	0.038
	(0.017)	(0.026)	(0.037)
Party Losing Seats	1	2	3
Mean of Dep.var.	0.037	0.045	0.059
Bandwidth	0.021	0.021	0.021
Obs.	1769	1063	444

Notes: 2SLS estimates of the effect of the number of parties on the probability of unseating the mayor. The dependent variable is an indicator taking value 1 if the mayor was unseated by a vote of no confidence during the legislature. Column 1 is estimated with the sub-sample of municipalities for which the entry (exit) of the party closest to the 5% threshold would lead to a reduction (increase) of seats for party 1 only. Columns 2 and 3 are estimated with the sub-sample of municipalities where the second and third parties would lose (win) seats, respectively. All columns include controls (log population and log surface area) as well as region-year effects and total number of seats effects. Bandwidth chosen to be consistent with the optimal bandwidth in table 2.

Table E.5

Covariate Balancing - Alignment

	(1) Popul.	(2) Surface	(3) PSOE Mayor
Above threshold	0.002	-0.019	-0.020
	(0.052)	(0.040)	(0.018)
Mean of dep.var	7.648	5.024	0.435
Bandwidth	0.078	0.078	0.078
Obs.	13054	13052	13054
	PP Mayor	Election year	Council size
Above threshold	0.005	0.386	0.009
	(0.017)	(0.316)	(0.172)
Mean of dep.var	0.324	1997.602	10.810
Bandwidth	0.078	0.078	0.078
Obs.	13054	13054	13054
	Parties w. votes	Valid votes	Blank votes
Above threshold	0.045	435.356	13.768
	(0.064)	(889.592)	(21.804)
Mean of dep.var	3.552	5399.305	86.523
Bandwidth	0.078	0.078	0.078
Obs.	13054	13054	13054

Notes: Covariate balancing regressions for the alignment RDD model (eq. 7 and 8). Population and surface are in logarithms. PSOE Mayor and PP Mayor are indicators taking value one if the mayor is from the socialist or popular parties, respectively. Council size is the number of available seat in the municipality. Parties with votes measures the number of parties that ran and obtained votes in the municipal election. Valid votes is the total number of votes cast (including blanks). Estimation by local linear regression using a fixed bandwidth equal to the CCT optimal bandwidth used in table 3. No controls or FE are included. Standard errors are clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.

Table E.6

First-Stage - Alignment

	(1) Aligned	(2) Aligned	(3) Aligned	(4) Aligned
Above threshold	0.523***	0.524***	0.527***	0.527***
	(0.014)	(0.014)	(0.014)	(0.014)
F-stat.	1307.59	1310.99	1425.19	1422.88
Mean of dep.var.	0.500	0.500	0.500	0.500
Bandwidth	0.078	0.078	0.078	0.078
Obs.	13054	13052	13054	13052
Fixed Effects	N	N	Y	Y
Controls	N	Y	Y	Y

Notes: OLS estimates of the first-stage for alignment (equation 8). Bandwidth is calculated using the CCT criterion. Controls and FE are included as specified in each column. Controls: surface and population (in logs). FE: number of available seats and year-region fixed effects. Standard errors clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.

Table E.7

2SLS Estimates - Alignment and Capital Transfers from region

	(1) Transfers	(2) Transfers	(3) Transfers	(4) Transfers
Aligned Mayor (Block)	0.245**	0.319***	0.216***	0.226***
	(0.105)	(0.096)	(0.078)	(0.078)
Mean of dep.var.	4.718	4.718	4.718	4.718
Bandwidth	0.067	0.067	0.067	0.067
Obs.	5003	5003	5003	5003
Fixed Effects	N	N	Y	Y
Controls	N	Y	N	Y

Notes: 2SLS estimates of the effect of alignment on capital transfers, using D_{it} as an instrument. The dependent variable is the logarithm of the average capital transfers received by the municipality over the full four-year term. Bandwidth is calculated using the CCT criterion. Controls and FE are included. Controls: surface and population (in logs). FE: number of available seats and year-region fixed effects. Standard errors clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.

TABLE E.8

2SLS ESTIMATES FRAGMENTATION AND STABILITY - EQUAL WEIGHTS

	(1) Mayor Uns.	(2) Mayor Uns.	(3) Mayor Uns.	(4) Mayor Uns.
A. Full Sample				
N. Parties	0.047**	0.046**	0.042**	0.042**
	(0.024)	(0.023)	(0.021)	(0.021)
Bandwidth	0.022	0.022	0.022	0.022
Obs.	15540	15540	15540	15540
B. No Single-Party Majorities				
N. Parties	0.113**	0.130**	0.107**	0.108**
	(0.049)	(0.055)	(0.049)	(0.049)
Bandwidth	0.017	0.017	0.017	0.017
Obs.	4229	4229	4229	4229
Fixed Effects	N	N	Y	Y
Controls	N	Y	N	Y

Notes: Weighted 2SLS estimates of the effect of number of parties on the probability of unseating the mayor (equation 5). The dependent variable is an indicator taking value 1 if the mayor was unseated by a vote of no confidence during the legislature. Weights are the inverse of the number of parties running for election. Panel A uses the full sample while panel B only uses municipalities with no single-party majorities. Controls and FE are included as indicated in each column. Controls: surface and population (in logs). FE: number of available seats and year-region fixed effects. The optimal bandwidth is calculated using the CCT criterion. Standard errors are clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.

TABLE E.9

REDUCED-FORM ESTIMATES OF THE ENTRY OF A MARGINAL PARTY, BY IDEOLOGY

	(1) Mayor uns.	(2) Mayor uns.	(3) Mayor uns.	(4) Mayor uns.	(5) Mayor uns.
D	0.004	-0.004	-0.001	0.006	0.008
	(0.009)	(0.012)	(0.010)	(0.010)	(0.010)
$D \times distance$		0.011			
		(0.010)			
$D \times 1(far)$			0.025**		
			(0.013)		
$D \times 1(close)$				-0.003	
				(0.011)	
$D \times 1(same)$					-0.008
					(0.011)
Mean of Dep.var.	0.027	0.027	0.027	0.027	0.027
Bandwidth	0.024	0.024	0.024	0.024	0.024
Obs.	4148	4148	4148	4148	4148
Fixed Effects	Y	Y	Y	Y	Y
Controls	Y	Y	Y	Y	Y

Notes: Reduced-form estimates of the effect of crossing the entry threshold on the probability of unseating the mayor. The dependent variable is an indicator taking value 1 if the mayor was unseated by a vote of no confidence during the legislature. In column 2 we include, in addition to the indicator D for crossing the threshold, an interaction with a continuous measure of ideological distance between the largest party and the *marginal party* (defined as the party closest to the 5% threshold). In column 3 and 4 we include interactions with indicators for this distance being above the 75^{th} percentile or below the 25^{th} percentile of the distance's distribution, respectively. In column 5 we include an interaction with an indicator for these two parties being on the same size of the ideological spectrum (i.e. both to the left or both to the right of the mean ideology). The bandwidth is calculated using the CCT criterion. Controls and FE are included as indicated in each column. Controls: surface and population (in logs). FE: number of available seats and year-region fixed effects. Standard errors clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.

TABLE E.10

ROBUSTNESS CHECKS - FRAGMENTATION AND STABILITY

	(1)	(2)
A. Large Councils Only (#seats $\geq$ 17)		
	First-Stage	2SLS Estimate (N. Parties)
	.873***	.032**
	(.060)	(.014)
Bandwidth		.015
Obs.		4289
B. Effective Threshold (Turnout Method)		
	First-Stage	2SLS Estimate (N. Parties)
	.924***	.013**
	(.027)	(.006)
Bandwidth		.025
Obs.		16629
C. Party 5% Only		
	First-Stage	2SLS Estimate (N. Parties)
	.332***	.036**
	(.032)	(.018)
Bandwidth		.021
Obs.		11022
D. Equal Weights		
	First-Stage	2SLS Estimate (N. Parties)
	.281***	.059***
	(.032)	(.022)
Bandwidth		.018
Obs.		12576

Notes: Column 1 displays the first-stage estimate of our instrument when estimating equation 6. Column 2 reports associated 2SLS estimate of the effect of fragmentation on stability obtained from estimating equation 5. Each panel corresponds to a different robustness check as follows: A) estimates obtained restricting the sample to municipalities with 17 or more seats in the council; B) estimates obtained using an alternative definition of the running variable incorporating the effective entry threshold for different municipalities; C) estimates obtained restricting the sample to one observation per municipality, corresponding to the party with the vote share closest to 5%; D) estimates obtained using weights equal to the inverse of the number of parties running in each election, ensuring all municipal-election pairs have equal weights. Standard errors clustered at the municipality level. *, **, *** represent 10%, 5% and 1% significance levels.