DISCUSSION PAPER SERIES

DP14619

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PUBLIC ECONOMICS

ISSN 0265-8003

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Discussion Paper DP14619
Published 16 April 2020
Submitted 15 April 2020

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Abstract

This paper studies how political fragmentation affects government stability. We show that each additional party with representation in Parliament increases the probability that the incumbent government is unseated by 4 percentage points. Governments with more resources at their disposal for bargaining are less likely to be replaced. When they are, new government leaders are younger and better educated, suggesting instability may induce positive selection. We interpret our results in light of a bargaining model of coalition formation featuring government instability. Our findings indicate that the rising fragmentation in parliaments worldwide may have a substantial impact on stability and political selection.

JEL Classification: H1, H7, R50

Keywords: Government stability, fragmentation, No-confidence votes, Bargaining, Alignment effect

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Acknowledgements
We would like to thank Alberto Alesina, Inés Berniell, Germán Bidegain, Jan Bietenbeck, Michael Blanga-Gubbay, Daniel Buquet, Davide Cantoni, Guillermo Caruana, Stefano DellaVigna, Albert Falcó-Gimeno, Olle Folke, Horacio Larreguy, Gianmarco León, Monica Martinez-Bravo, Eva Mörk, Salvatore Nunnari, Henry Overman, Torsten Persson, David Strömberg, Ferenc Szucs, Pilar Sorribas-Navarro, Janne Tukiainen, Stephane Wolton, and seminar participants at UCFS, Universidad de La Plata, SSE-SITE, Uppsala University, Harvard University, Helsinki GSE, LSE, European Commission - JRC (Ispra), Central European University, IEB - Universidad de Barcelona, CEMFI, Stockholm University, Spring Meeting of Young Economists, Instituto de Ciencia Politica - UDELAR, and the 75th Annual Congress of the International Institute of Public Finance for comments and suggestions.

Divided They Fall.
Fragmented Parliaments and Government Stability

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Abstract

This paper studies how political fragmentation affects government stability. We show that each additional party with representation in Parliament increases the probability that the incumbent government is unseated by 4 percentage points. Governments with more resources at their disposal for bargaining are less likely to be replaced. When they are, new government leaders are younger and better educated, suggesting instability may induce positive selection. We interpret our results in light of a bargaining model of coalition formation featuring government instability. Our findings indicate that the rising fragmentation in parliaments worldwide may have a substantial impact on stability and political selection.

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First Version: February 2019

This Version: January 2020

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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.[1] 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 entry of new parties in Congress challenged the established two-party system. 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 government termination for 29 European parliaments in 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.

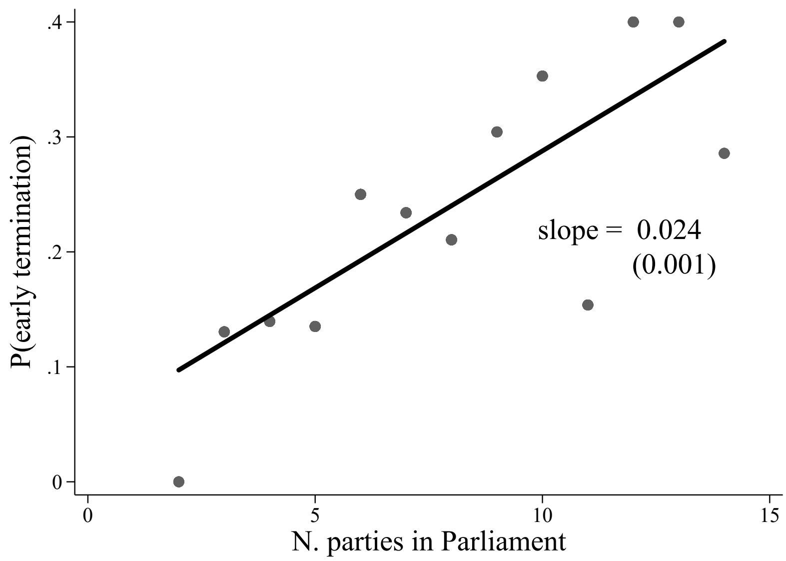
This paper studies the determinants of government stability in parliamentary democracies. Using a regression-discontinuity (RD) design, we start by showing that fragmentation has a sizeable and negative effect on stability. Next, we investigate whether the resources available to the incumbent affect their survival in power. Finally, we explore the trade-off between stability and the possibility of replacing unfit politicians and show that government instability can be beneficial in selecting politicians of higher quality. We interpret our results in light of a two-period model of coalition formation that allows for no-confidence votes and heterogeneity in party quality.

The empirical strategy relies on a dataset covering over 50,000 Spanish municipal governments, spanning all full terms between 1979 and 2014. Using local-level data 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, finding credible sources of exogenous variation in the determinants of stability is typically

[1] Cross-country evidence documenting a positive association between political stability and growth can be found in Barro (1991), Alesina et al. (1996), and, more recently, Arezki and Fetzer (2019). Recent work has also emphasized the effect of policy uncertainty on investment (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). Bernanke (1983) provides an early theoretical model linking policy uncertainty to reduced investment.

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).

hard.[2] We exploit institutional features common to all 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. Our results can be informative about the determinants of stability of national governments because Spanish municipalities share many of the common traits of modern parliamentary democracies. Each has the equivalent of a parliament that appoints the executive, and the possibility of using a no-confidence vote to unseat the incumbent.

To study the effect of fragmentation — measured as the number of parties with representation – we exploit a discontinuity in the probability of a party obtaining a seat in the local council generated by a 5% vote-share admission threshold. Municipalities in which one party obtained a vote-share just above this threshold have, on average, more parties in the council than municipalities in which the party fell just below the threshold. We use this variation in an RD design, and find that the entry of an additional party leads to a 4 percentage-point increase in the probability of the local mayor being voted out of office and replaced by a challenger. This effect is large, amounting to twice the corresponding baseline

[2]Previous work has generally relied on observational methods. 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 nine Western European countries to estimate a structural model of government formation.

probability.

To evaluate whether the amount of bargaining resources at the disposal of the incumbent affects stability, we test whether aligned mayors – that is, those belonging to the same party as the one in power at the regional level – are less likely to be unseated. Aligned municipalities have been shown to receive more transfers from upper tiers of government (studies documenting an alignment effect for Spain include Solé-Ollé and Sorribas-Navarro 2008; Curto-Grau, Solé-Ollé and Sorribas-Navarro 2018). This connection provides parties with additional bargaining resources that can be used during the coalition-formation process. Comparing municipalities that are aligned with those that are not in a close-elections RD design, 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.

Finally, votes of no confidence and other early terminations can affect the selection of politicians in office by removing lower-quality incumbent mayors. 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.[3] 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-differences estimates show that challengers of higher quality replace unseated mayors. Moreover, parties of unseated mayors are heavily punished in the next elections. For example, they are 28 percentage points less likely to be re-elected. Conversely, the parties of challengers who are successful at unseating the incumbent enjoy large electoral rewards, thus reinforcing the notion that the legislature tends to replace low-quality incumbents.

To guide the empirical analysis, we build on Baron and Ferejohn (1989) and Persson and Tabellini (2002) and develop a two-period sequential game of coalition formation in which parties bargain over the allocation of budgetary resources. The probability that the incumbent is unseated by 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. Second, coalition governments elected by more fragmented parliaments are more likely to be unseated, because 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. The mechanisms at the core of our theoretical framework are general and do not rely on specific institutional features of Spanish municipalities. Hence, the model also helps emphasize the potential external validity of our empirical findings.

Our results suggest the existence of a trade-off between government stability and the possibility of replacing low-quality politicians, and provide an immediate policy implication. Designers of electoral rules can use the admission threshold to Parliament as a tool to achieve

[3]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).

more stability, at the cost of hindering the replacement of unfit incumbents.[4] 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 percentage points, one-fourth of the baseline probability. Similarly, lowering the threshold from 5% to 4% would increase the likelihood of replacing the government by 0.6 percentage points.

Our analysis is, in part, motivated by the fact that fragmentation has become a prominent feature of parliaments all over the world. Over the last few 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). As mentioned above, previous empirical work on the determinants of government stability typically relies on strong assumptions for identification.[5] One exception in this regard is the work by Gagliarducci and Paserman (2011), which uses an RD design and focuses specifically on estimating how the gender of the executive head affects government stability. Our contribution to this line of research lies in providing rigorous causal evidence on key drivers and consequences of government stability.

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) present 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.

2. Theoretical Framework

We start by presenting a two-period coalition-formation game that links government instability to the number of parties represented in Parliament. In each period, a party is chosen as the agenda setter or *formateur* with some probability. The agenda setter has the right to propose a transfers allocation to other parties to form a governing coalition. The setting draws on elements 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

[4]High admission thresholds also present the problem of leaving a large part of the electorate without representation in the Parliament. We do not discuss issues of representation in our paper.

[5]For example, Taylor and Herman (1971) and Merlo (1998) provide reduced-form evidence, whereas Merlo (1997) and Diermeier, Eraslan and Merlo (2003) obtain structural estimates of a government-formation model. Baron, Bowen and Nunnari (2017) and related work explore the determinants of coalition stability in the lab.

no-confidence vote. To our knowledge, this is the first formal model relating fragmentation with political instability.

Variation in the number of parties admitted in Parliament affects government stability through two channels: (i) it changes the probability of a single party having 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 three to four 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

We present 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, so that all politicians belonging to a party have the same preferences (Persson and Tabellini, 2002). In each period, the payoff 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. Future payoffs are discounted by $\beta \leq 1$. This framework summarizes the legislative bargaining in a parliamentary democracy in which parties with strong identity seek additional partners to form a majority government.

There are two potential *formateurs*, party 1 and 2, that 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 they are drawn before the start of the game and are known to all players. θ_1 and θ_2 can be interpreted as characteristics of the parties – for example ability or political connections – which affect the total amount of resources available for bargaining. Because transfers are bounded by 1, the assumption that $\omega > 1$ makes preferences lexicographic – the agenda setter will always prefer to be in power, regardless of any feasible transfers they may receive if supporting another party.

The timing of the sequential game is as follows. We assume that, in the first period, party 1 is always selected as agenda-setter and attempts 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 to accept the proposal by party 1.[6] If the proposal is accepted by the majority of Parliament, a coalition is formed and each party receives its payoff. If the proposal does not gather

[6]One can also derive the propositions below under the alternative assumption that the agenda setter is chosen randomly between party 1 and party 2.

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 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 a successful vote of no confidence occurred. 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 $1 - \mu$), period 2 payoffs 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).[7] The assumption that party 2 can only become the new *formateur* with some probability is a simple way of modelling the fact that votes of no confidence are uncommon and may only be feasible after a political shock such as a public scandal, or a swift change in support (see Diermeier 2006).

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 three parties*

We now assume $J = 3$ 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 payoffs 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. Party 2 can gain the support of party 3 by offering at least the continuation value $\overline{g}_3^1$ carried over from period 1. Whether party 2 has enough resources to make this offer depends on whether $\theta_2 \geq \overline{g}_3^1$. 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 their 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 of θ_1 and θ_2 and on the seat shares. Two cases 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 payoff 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

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

proposal that gathers a majority by offering $s_3\theta_1$ to party 3. The problem that party 1 faces when forming an initial coalition can be written as:

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

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

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, three different types of coalitions can arise in equilibrium.

If $\theta_2 < s_3\theta_1$, 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 payoff is the maximum 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) will lead to smaller transfers to party 1. We call this equilibrium a *safe minimum-cost coalition*.

If $\theta_2 \geq \theta_1$, no transfer to party 3 in period 1 can prevent a vote of no confidence in period 2 (i.e., θ_2 is always larger than 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 equilibrium play requires offering $s_3\theta_1$ to party 3.

Finally, for values of θ_2 such that $\theta_2 \in [s_3\theta_1, \theta_1)$, party 1 can form a *safe blocking coalition*.[8] 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 any transfer above 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 $\theta_2 < \theta_1$. Whether they are incentive compatible will depend on the payoff 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.

Expected payoffs for party 1 in each coalition are given by:

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

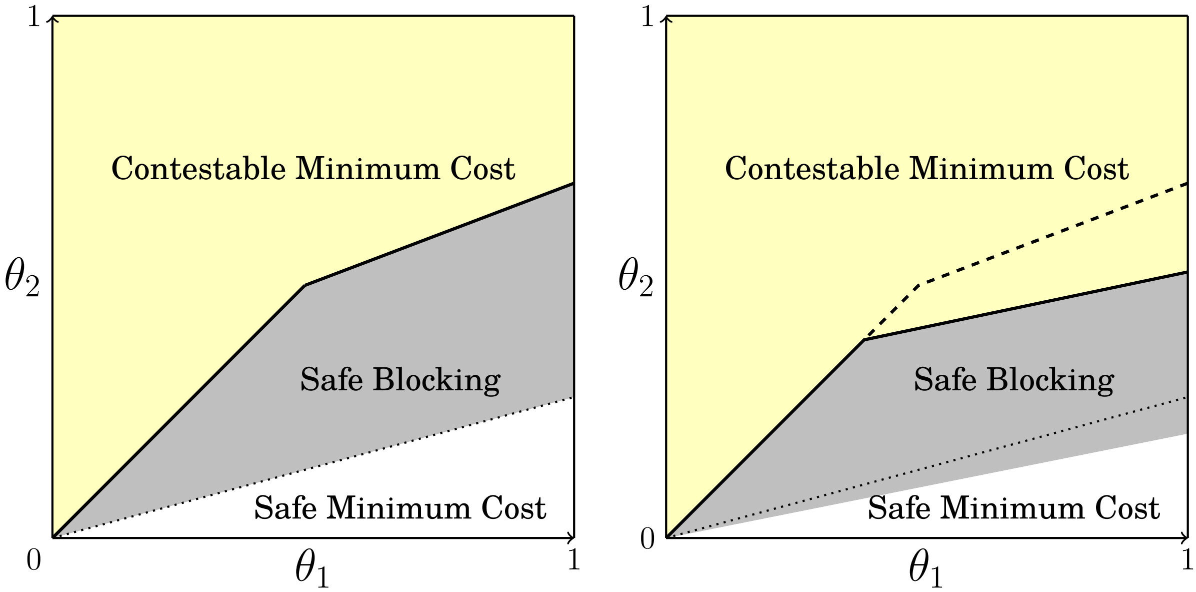
where V_{mc}^{S} is the payoff for safe minimum-cost coalitions, which is feasible when $\theta_2 < s_3\theta_1$. V_{mc}^{C} is the payoff for contestable minimum-cost coalitions, which are always feasible. Finally, V_{block}^{S} is the payoff for safe blocking coalitions, which are feasible when $\theta_2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

[8] 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.

Note 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 region of (θ_1, θ_2) space is represented below in the left-panel of Figure 2 bounded by the dotted line.

FIGURE 2

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



Notes: Equilibrium party 1 coalition strategies in period 1 in the (θ_1, θ_2) space. Case with $s_1 < 0.5$. Solid line represents the boundary between safe and contestable coalitions. **Left panel**: Three-party case. Dotted line represents the boundary of the safe minimum-cost coalition region. **Right panel**: Four-party case. The dashed line represents the boundary of the safe blocking coalition region in the case with three parties. The dotted line is the boundary of the safe minimum-cost coalition region with three parties.

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 condition takes the form of a linear constraint, with a positive intercept and slope increasing in θ_1. Combining both conditions, we can obtain the set of (θ_1, θ_2) pairs such that safe blocking coalitions are played in equilibrium, represented by the gray area between the solid and dotted lines in the left-panel of Figure 2. A kink in the boundary of this region is found in the intersection of constraints 3 and $\theta_1 = \theta_2$.[9]

This completes the list of possible equilibria in the three party case. The solid line in Figure 2 separates safe and contestable coalitions in the case with no single-party majorities.

[9]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.

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. We define $\pi(\mathrm{s})$ as the function that maps seat-share vector s to a probability of a vote of no confidence for a given distribution of bargaining resources $g(\theta_1, \theta_2)$. The expression for $\pi(\mathrm{s})$ in the case with three parties is provided in Appendix A.

2.3. *Equilibrium with four parties*

Consider the case of four 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 four parties, party 1 has two options to form a majority. It can always form a majority with party 3, because necessarily, $s_1 + s_3 \geq 0.5$.[10] 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 three parties. The expected payoffs from forming each type of coalition are the same as in the 3 party 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 $\theta_2 < s_*\theta_1$) and the payoff from contestable coalitions. The payoff from forming a blocking coalition for party 1 is the same as in the three party case, because the transfer required to block party 2 from unseating is unchanged, regardless of the identity and seat share of the party receiving it.[11]

The condition for party 1 to prefer a safe blocking coalition to a contestable minimum cost coalition is now given by $h(\theta_1, s_*)$, where function $h(\cdot)$ is defined as in expression 3. As above, blocking coalitions will only be feasible when $\theta_1 > \theta_2$. Combining both constraints, we can obtain the equivalent of the solid line in the left panel of Figure 2 for the four party case. In the case in which $\theta_2 < s_*\theta_1$, 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 A.1, 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. If it does, it 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 a no-confidence vote in the three- and four-parties cases, we

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

[11]If $s_1 + s_4 < 0.5$, party 3 is offered $g_3^1 > \theta_2$ in period one, as in the three party case. If $s_1 + s_4 > 0.5$, party 1 can split transfers 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 payoff for party 1 or the probability of a vote of no confidence.

obtain the first proposition.

Proposition 1 - Fragmentation and Stability

Assume two seat-share vectors s $= (s_1, s_2, s_3)$ and 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 $\pi(\text{s})$ be the probability of a vote of no confidence as a function of s. For a given joint distribution $g(\theta_1, \theta_2)$ with positive density in the unit square, we have that $\pi(\text{s}') \geq \pi(\text{s})$.

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 s$'$ and 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 three to four 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 payoff 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 case is illustrated in the right panel of Figure 2, where we see the region of stable government in the (θ_1, θ_2) space becomes smaller when the number of parties increases from three to four. It is important to note that this proposition also follows if the initial agenda setter is selected at random between party 1 and party 2 when $s_1 < 0.5$, which is closer to the recognition rule in Baron and Ferejohn (1989).

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 the probability of a vote of no confidence will be largest when either party 1 or party 3 loses seats. This is formalized in the following lemma.

Lemma 1 - Heterogeneity by Party Losing Seats

Starting from a seat distribution in the three party case 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: s$' = (s'_1, s_2, s'_3, s'_4)$ or 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 $(\pi(\text{s}') - \pi(\text{s})) - (\pi(\text{s}'') - \pi(\text{s})) \geq 0$.

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 broadly interpreted as measuring bargaining skills.

We test both propositions by implementing two different RD 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 the 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 RD design to vary exogenously the alignment status of the incumbent party with other levels of government. In doing so, we build on the insights from previous studies documenting that partisan alignment increases the municipal budget through additional fiscal transfers (Curto-Grau, Solé-Ollé and Sorribas-Navarro 2018; Bracco et al. 2015).

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.[12] Municipal expenditures are financed by 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, Spain had 8,098 municipalities, 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

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

taking place every four years.[13] 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, implying 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 parliaments in Europe and elsewhere.[14] We use this threshold in our RD analysis of the effect of legislative fragmentation on stability. In similar fashion, Palguta (2019) uses a 5% threshold in Czech municipal election to induce exogenous variation in local-party representation in municipal councils.

Mayors direct the administration and 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 members, under a majority rule. If one party has the absolute majority of seats in the council, its candidate is, in most cases, directly elected mayor. If no party has a majority, a bargaining process occurs, by which a mayor can be elected with the support of different parties (Fujiwara and Sanz 2019). 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. 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". In the vast majority of cases, council members from a party vote in block, which motivates the choice of parties – rather than councillors – as players in the model above.

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 (with the exception of only Chile, France, Mexico, South Korea, Turkey, and the US which are presidential democracies), and in large non-OECD countries such as India or Pakistan.

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*).[15] Suc-

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

[14]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 figure. Germany used to have a 3% threshold, but it was ruled unconstitutional in 2018. Finally, 11 countries have none.

[15]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*.

cessful *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. Although the initiator of these two types of motions 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 generically refer to successful votes of no-confidence when observing the identity of the mayor in office and her party change during the term, without distinguishing between the two motions. Our dataset identifies 1,066 no-confidence votes taking place between 1979 and 2014, distributed across the country, as shown in Figure 3. Although these events can lead to a change in the local executive, the municipal election schedule is fixed and early elections are not possible.[16]

The political landscape in Spain

In the last several decades, Spanish local politics have been largely dominated by two large national parties, the center-left socialists *PSOE* and the center-right popular party *PP* (which ran as *Alianza Popular* in the 1980s). These two parties alone account for over 65% of all mayors and 59% of all municipal council members in our sample. The third party running in all jurisdictions in this period is *IU*, a left-wing platform including the Spanish communist party. Several regional parties can be important players in their area of influence. For example, the center-right coalition *CiU* ruled over 50% of all municipalities in Catalonia between 1979 and 2014. About 85% of all mayors and 83% of all elected council members come from parties that also participate in elections at the national or regional level.[17] It is not uncommon for smaller, local platforms to run for election in some municipalities, although they tend to have modest electoral results.

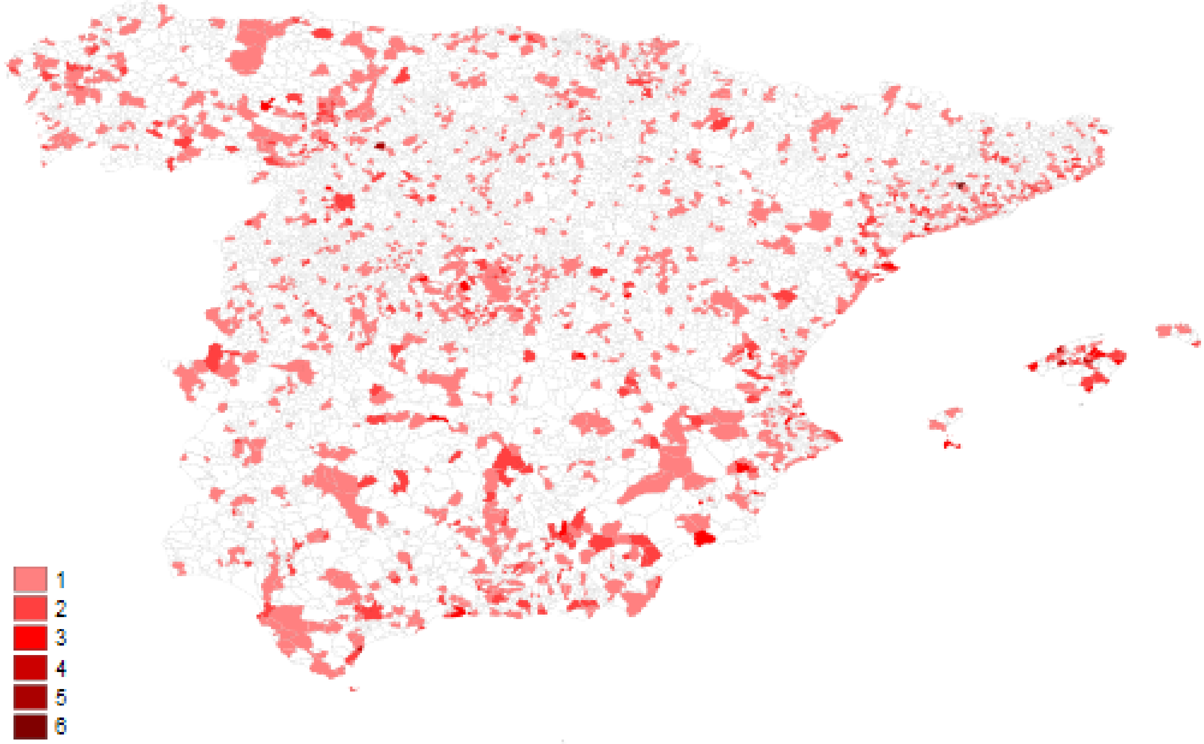
The 5% vote share entry threshold will have a disproportionate effect on the entry of certain parties with moderate to low electoral prospects. These marginal parties can have different political or ideological origins, as well as varying levels of national visibility. Of all parties obtaining a vote share between 4% and 6% in our sample, the left-wing *Izquierda Unida* (IU) is the most common. Other national parties, such as PA, BNG, PP, PSOE, and ERC, are also found relatively often. In almost two-thirds of the cases, however, these marginal parties are civic lists, which are created specifically to run in local elections and often do not

[16]It is worth noting that changes of the party in power are more common around the middle of the term, possibly because parties have an agreement to take turns in power. The results in the following are robust to dropping observations in which the motion happened in a 90-days window around the midpoint of the term, suggesting that our interpretation of party turnover as a consequence of a new round of bargaining is sensible.

[17]These parties are PSOE, PP, IU, UCD, CDS, CIU, ERC, PNV, BNG, PAR and PA.

Figure 3

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 electoral data. Geodata from *Instituto Geográfico Nacional de España (Ministerio de Fomento)*.

have a clear position in the ideological spectrum.

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 the composition of regional and national governments. Electoral outcomes in municipal elections are obtained from the Ministry of Internal Affairs. We complement this dataset 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. For a more detailed description of data sources and sample selections, please refer to Appendix D.

Because of the different electoral system in small towns, we only include municipalities with more than 250 inhabitants, leaving us with up to 9 elections for 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, which usually happens shortly after elections, although occasionally mayors change during the legislature. We identify votes of no confidence as instances in which change occurs both in the identity *and* the party of the mayor.[18]

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. Panel C splits the sample in panel B into councils that approved at least one vote of no confidence during the term (C2), and those that did not (C1).

Panel A of Table 1 provides municipal-level descriptive statistics 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

[18]We have also explored an alternative definition, that excludes cases when the mayor in unseated immediately after taking office, and we obtained analogous results.

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 nine parties with seats.[19] In 54% of municipalities, the elected mayor is aligned with the regional government. Importantly, successful no-confidence votes are passed in 2% of all legislatures. About three-quarters of councils have a single-party majority. Governments in these municipalities tend to be more stable and have been shown to differ from more fragmented ones in the management of the municipal budget (Artés and Jurado, 2018).

The last two panels show characteristics of municipalities that had stable governments throughout the four-year term (C1) and those that experienced a vote of no confidence (C2), respectively. Unsurprisingly, motions of no-confidence are much more common in councils where no party has the majority of seats. The mayor can be replaced in municipalities featuring a single-party majority as a result of the actions of *transfugas*, council members which switch partisan affiliation during the term.[20] It is worth noting that this is extremely rare. Only 0.3% of municipalities with a single-party majority experience a vote of no confidence.

In panels C1 and C2 we can also 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). Although encouraging, extrapolating from these mean comparisons may be problematic. The number of parties in the council, or a town's alignment status, may 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 estimators that rely on observables such as regression or matching are unlikely to be successful in identifying a causal effect. For this reason, in the following, we recur to RD methods, which allow us to exploit exogenous variation in both council fragmentation and political resources. As usual, in interpreting the results, one has to keep in mind that all RD estimates are local, in the sense that they identify local average treatment effects for the sub-population of compliers around the discontinuity (Angrist and Imbens, 1994).

4. Empirical Analysis

In this section, we test whether the predictions laid out in Proposition 1, Lemma 1, and Proposition 2 of the theoretical model are supported by the data. Specifically, we show 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

[19] As Figure E.2 in the appendix shows, the number of parties elected in a municipality council are four or fewer in over 90% of cases. Hence, situations like the ones derived in the model's equilibrium with three and four parties are prominent in our sample.

[20] 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 phenomenon is not pervasive. According to Passarelli et al. (2017), only 5.3% of candidates for the council changed parties between the 2007 and 2011 elections.

voted out of office. In the final part of the analysis, we study the characteristics of unseated governments, the quality of the mayors who replace them, and their electoral performance in the subsequent elections. In doing so, we provide evidence suggesting 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 RD 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 each observation is a party-municipality-election triple, each municipality appears in the sample as many times as the number of parties that ran in the election, for a total of 161,558 observations.[21]

Our baseline specification relates Y_{it} – an indicator equal to 1 if the mayor of municipality i is unseated and replaced by a new mayor during term t – to our measure of fragmentation, N_{it}, the number of parties with seats in the council, as follows:

$$Y_{it} = \alpha_1 + \tau_1 N_{it} + \beta_1 V_{pit} + \beta_2 V_{pit} D_{pit} + \epsilon_{pit}. \tag{4}$$

The number of parties N is instrumented with an indicator D for a party being above the 5% threshold as in the following first stage equation:

$$N_{it} = \alpha_0 + \gamma_1 D_{pit} + \delta_1 V_{pit} + \delta_2 V_{pit} D_{pit} + u_{pit}. \tag{5}$$

The instrument D is constructed for each municipality, election, and party. This 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% and, hence, have $D = 1$. The predictive power of the instrument is especially strong close to the 5% threshold. As an example, imagine the case in which two parties have vote-shares close to 5%. If, by chance, they both get more that 5% – so $D = 1$ for both parties – and the proportional rule assigns both of them a seat in the council, 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, we can reasonably assume parties are unable

[21] 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.

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 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 threshold for a number of pre-election outcomes and municipal characteristics.

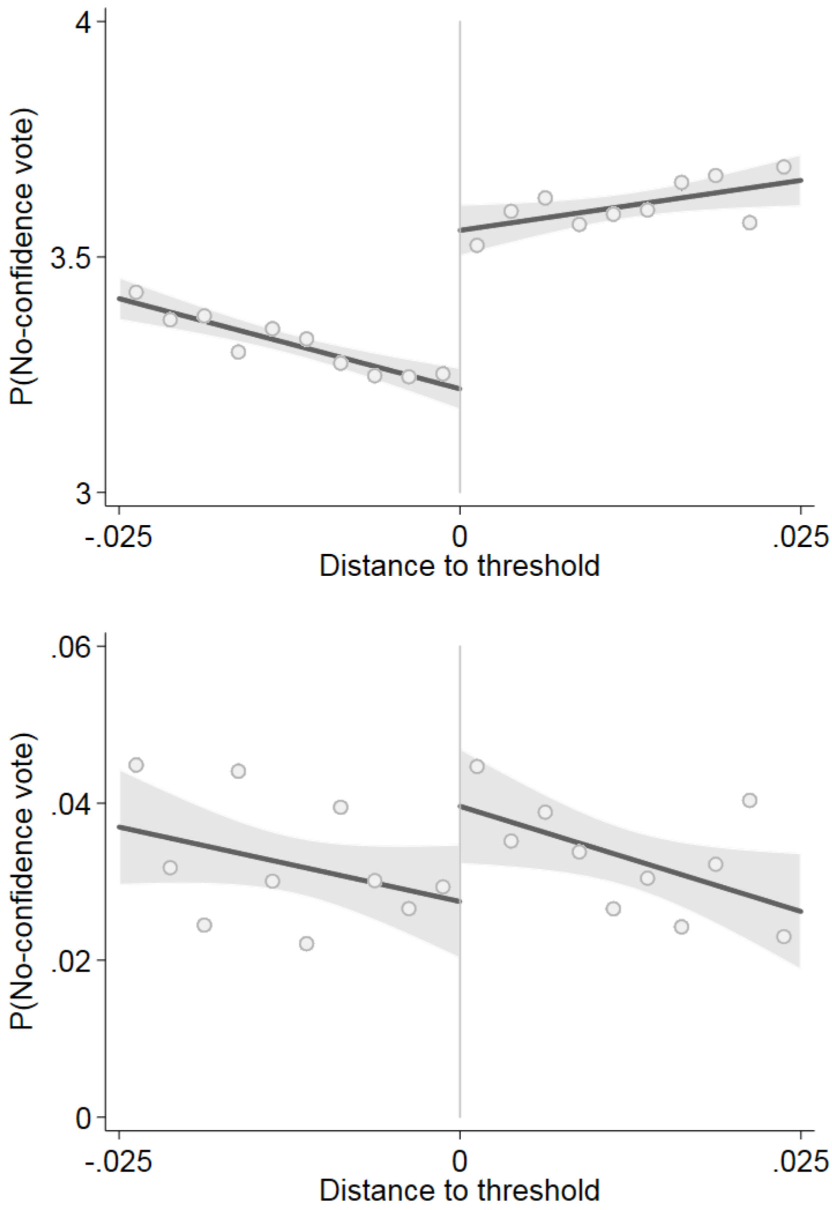
TABLE 2
2SLS ESTIMATES - FRAGMENTATION AND STABILITY

	(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 the number of parties on the probability of unseating the mayor (equation 4). 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. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

The top panel of figure 4 illustrates our first stage by plotting the number of parties with seats in the council against our running variable. 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. 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

FIGURE 4
THE EFFECT OF FRAGMENTATION ON STABILITY - FIRST-STAGE AND REDUCED-FORM



Notes: In both panels, the horizontal axis corresponds to the running variable, defined as the vote-share distance between a party's vote-share and 5%. Hence, in a given election, each municipality appears as many times as the number of parties running. The upper panel illustrates the first stage; hence, the vertical axis measures the number of parties represented in the council. The lower panel plots the reduced-form, which relates the probability of the mayor being unseated to the running variable and the instrument D, an indicator for the running variable being greater than zero. Dots are averages in 0.25 percentage point bins of the running variable, and lines are linear regressions estimated on either side of the threshold separately using the *lfitci* command. Shaded areas are the corresponding 95% confidence intervals.

reason, our design is a *fuzzy* RD design with a continuous treatment.[22] The size of the jump

[22]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

is about 0.3, in line with the regression estimates of the first-stage coefficients reported in Table E.2 in the appendix. The relationship between the running variable and the outcome is upward sloping because the higher is the vote-share of the party, the higher is the probability that it is actually admitted into the council, based on the number of available seats and the D'Hondt allocation rule.

The bottom panel of Figure 4 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 of about 1.2 percentage points.

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 4 and 5 by two-stage least squares using only observations within a bandwidth h from the threshold. We use the optimal bandwidth popularized in Calonico, Cattaneo and Titiunik (2014) to select h in all cases, and show 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 of the mayor being unseated by approximately 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 the 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 is large, showing fragmentation has a substantial effect in harming government stability. To assess the robustness of these estimates, we perform a number of additional checks and tests. For example, we show that estimates obtained for placebo thresholds between the 1% and 10% vote shares lead to statistically insignificant effects. Only the 5% threshold yields a positive and significant discontinuity. Our estimates are also robust to controlling for quadratic and cubic polynomials in the running variable. They also remain stable across a range of bandwidths, and when estimated over sub-samples obtained by removing one election term at a time. These and other tests are detailed in section 5.

The estimated effect of fragmentation on stability operates via two channels, as in the theoretical model above. First, the entry of an additional party decreases the probability of a

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.

single-party majority.[23] Second, the number of parties can also affect stability in cases where no single-party majority exists, 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 majority in office. We find a large effect of fragmentation on stability, with point estimates being over twice as large as the ones reported in panel A of Table 2. This finding is consistent with model predictions – an increase in the number of parties makes coalitions less stable. Importantly, it is robust to taking into account the possible bias due to sample selection induced by dropping single-party majorities. Imposing a monotonicity condition and assuming that the probability of being unseated for municipalities whose single-party majority status varies at the threshold is 30%, we apply the method discussed in Gerber and Green (2012) and obtain a lower bound of 5.6% on our effect of interest for municipalities without a single-party majority.[24]

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 that when 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 counterfactual 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 separately 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

[23]RD estimates showing the entry of an additional party reduces the probability of a single-party majority by 11 percentage points are available in Table E.3 of Appendix E.

[24]Details of this method can be found in chapter 7.4 of Gerber and Green (2012). The monotonicity condition requires that the probability of a single-party majority can never decrease when a party crosses the 5% threshold. This is satisfied in our context, as the entry of a new party in the council can never lead to an increase in the seat share of the most voted party. The probability of being unseated for governments of municipalities whose single-party majority status varies at the threshold is in principle unknown but we can explore the sensitivity of our results to different values of this parameter. A value of 30% is over three times the baseline probability of unseating for municipalities with no single-party majority, and higher than the probability of unseating for any region-term pair in our sample. To obtain a lower bound of zero for our effect of interest, one needs the rather extreme assumption that the probability of unseating the mayor is as high as 70%.

seats. We observe a positive and significant effect of the number of parties on the probability of the government being unseated. The coefficient is similar in magnitude to the baseline effect reported in panel A of Table 2. Estimates in column 2 show that when party 2 is losing seats, the entry of a new party has essentially no effect on the probability of a vote of no confidence. The corresponding coefficient is negative, small, and not statistically significant at conventional levels. In the case of party 3 losing seats, 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 and provide evidence that party entry fuels instability through changes in the size and composition of the ruling coalition.

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

Another potential determinant of government stability is the amount of resources available for negotiation to the agenda setter. These resources can be either 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 one key driver of these political resources on government stability: the effect of partisan alignment with upper tiers of government.

These additional transfers could be used directly to buy support from other parties, for example, by funding specific projects or policies.[25] Alignment may also yield other forms of support from the regional party, for example 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 an RD design with close elections, in which we compare municipalities where the coalition in power at the regional level just won the municipal elections (and elected the mayor) with municipalities where it just lost. Defining A as an indicator for the mayor being aligned, that is, belonging to one of the parties in the coalition ruling at the regional level (the *regional coalition bloc*), the relationship between stability and alignment status is as follows:

$$Y_{it} = \alpha_2 + \tau_2 A_{it} + \beta_3 W_{it} + \beta_4 W_{it} D_{it} + \epsilon_{it}, \tag{6}$$

where W is the running variable, defined as the vote-share distance to the municipal seat majority of the regional coalition bloc in office at the time, and D is an indicator for when

[25] 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.

$W \geq 0$. 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-RD, and the alignment variable is instrumented with D in the following first-stage equation:

$$A_{it} = \alpha_3 + \gamma_2 D_{it} + \delta_3 W_{it} + \delta_4 W_{it} D_{it} + u_{it}. \tag{7}$$

To construct our running variable, we build on recent work that adapted the close-elections RD method to proportional systems (see, e.g., 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 the 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.[26] 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 it 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.

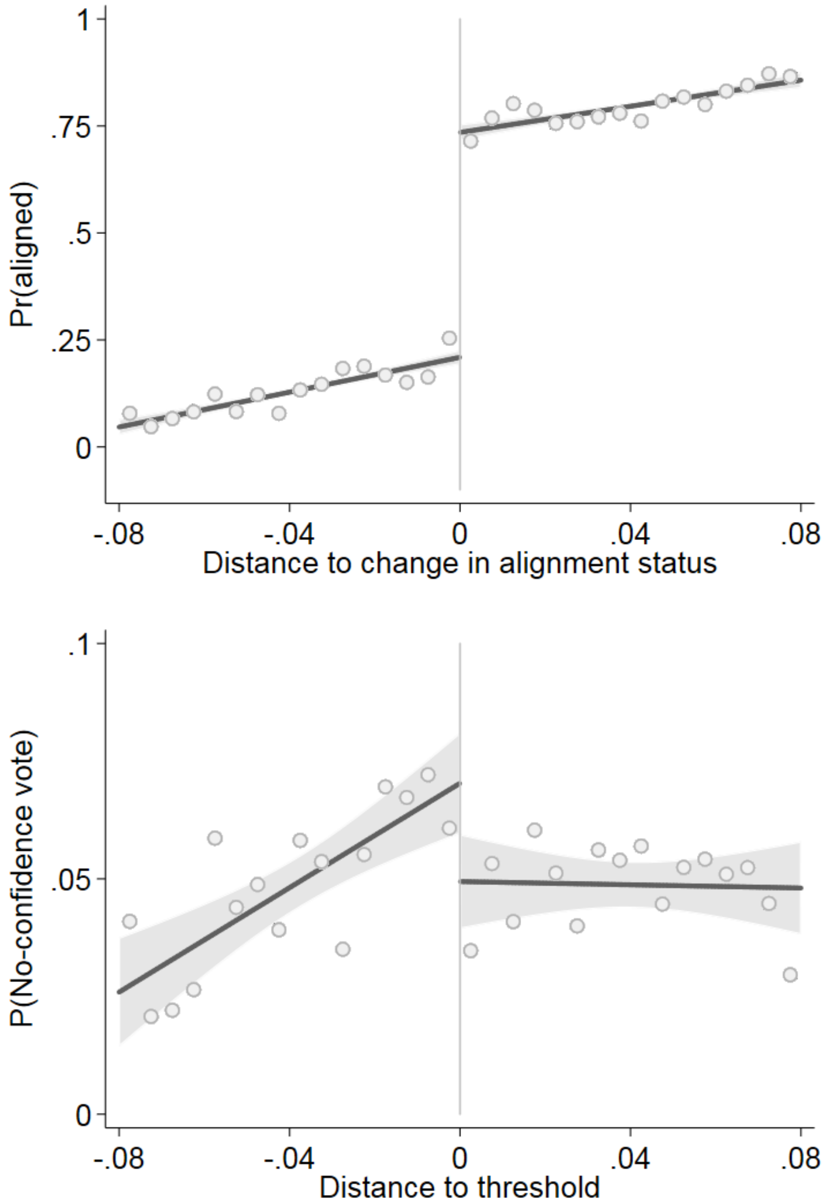
The top panel of Figure 4 illustrates the first-stage. A substantial jump in the probability of being aligned is observed at the threshold. This finding is to be expected, because municipalities where the regional bloc holds more seats than the regional opposition will typically be able to elect the mayor, who will be aligned by construction. The corresponding reduced form is shown in the bottom panel of Figure 4. We observe a clear discontinuity between the fitted lines, indicating municipal governments where the regional bloc has the majority are substantially less likely to be unseated. By rescaling this reduced-form discontinuity by the first-stage, we find that partisan alignment can reduce the probability of a vote of no confidence by roughly 5 percentage points.

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 con-

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

Figure 5

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 the first-stage; hence, the vertical-axis measures the probability of the mayor belonging to the regional bloc. The lower panel plots the reduced-form, which relates the probability that the mayor is unseated to the running variable and the instrument D, an indicator for the running variable being greater than zero. Dots are averages in 0.1 percentage point bins of the running variable, and lines are linear regressions estimated on both sides of the threshold separately using the *lfitci* command. Shaded areas are the corresponding 95% confidence intervals.

trols 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 with the regional government on the probability of unseating the mayor (equation 6). 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. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

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. Being aligned with the regional government results in a 4.8 percentage-points decrease in the probability of the mayor being 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 very large, comparable in magnitude to the impact of the exit of one party from the council estimated above. Insofar as we can think of alignment as providing politicians with additional resources useful for bargaining, this result provides a first piece of direct evidence in favour of Proposition 2 in our model. 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***

Individual traits of incumbent politicians, such as their competence, skill, and connections may affect the probability that they are unseated. Similarly, the competence of representatives of the opposition can also influence their chances of taking over the executive. These traits are captured in the model by θ_j, which can be interpreted more broadly as measuring valence or the ability to offer more transfers with a given budget. In this light, Proposition 2 predicts that incumbents of higher quality than the potential challenger have more resources to offer in the bargaining stage and, therefore, are less likely to be unseated. An implication of this result is that government turnover can induce selection of politicians in power, with relatively less competent politicians being unseated. This trade-off between government fragility and political selection is one of the defining features of democratic rule, and may have consequences for voter welfare.

To test to what extent stability affects the selection of politicians, we use three measures of quality at the politician level.[27] Our dataset includes educational attainment and occupation for all council members – including 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 incumbent mayor (θ_1), we construct an indicator for having college education, an indicator for having a professional occupation (such as being a doctor, engineer, teacher, etc.), and a variable that counts the number of terms a politician has served as a councillor in the past. Measuring the challenger's quality (θ_2) is more difficult because the identity of the potential challenger is revealed only after a successful vote of no-confidence. As a proxy, we use the maximum value of each of these three measures among council members of the largest opposition party. Although 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
STABILITY AND QUALITY DIFFERENCES BETWEEN MAYOR AND CHALLENGER

	(1) Mayor Uns.	(2) Mayor Uns.	(3) Mayor Uns.
College	-0.005***		
	(0.002)		
Professional		-0.003	
		(0.002)	
Experience			-0.013***
			(0.003)
Mean of dep.var.	0.017	0.016	0.024
Obs.	24199	21702	18291

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 quality, we use *College*, an indicator for the mayor having completed college; *Professional*, an indicator for the mayor having a professional job; and *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 for the incumbent mayor and the maximum value among the members of the municipality council belonging to the largest opposition party. Controls and fixed effects included in all columns. Controls: logarithm of surface and population. FE: year-region and first mayor party dummies. Standard errors are clustered at the municipality level. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

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 is available. Results show that, irrespective of the measure used, an increase in the difference between the quality of the incumbent and that of the challenger is positively associated with government stability. For example, a mayor with a college degree confronting a challenger without one is 0.5 percentage points less likely to be removed from office. This effect is sizeable and equal to about one-third of the unconditional probability of a vote of no

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

confidence in this sample (1.5%). A similar but statistically insignificant effect is observed when the mayor reported having worked in a professional or white-collar occupation, and the challenger did not. Finally, we find a large negative effect of differences in previous experience in office on the probability of a vote of no confidence. Experienced mayors facing inexperienced challengers are unlikely to be unseated. These results are in line with the model prediction that incumbents of better quality are less likely to be unseated before the next election.

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

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

where W_{it} is a personal trait of the mayor in power in year t, for example, one of our quality measures, age (measured at the beginning of the term), or an indicator for a female mayor. 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 including surface and population. 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.[28]

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 coefficients reveal that not only are incumbents of lower quality more prone to being unseated, but the challengers who replace them are of better quality. Replacing mayors are roughly 7.8 percentage points more likely to have attended college, 6.6 percentage points more likely to have a high-skill job, and 1.3 years younger than their unseated predecessors. However, we observe no change in terms of past experience or gender.

The lower quality of incumbents that are voted out of office is also reflected in their subsequent electoral performance. In Table 6, we regress different measures of electoral performance of the incumbent and the 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 set of controls and fixed effects, we control for the vote-share of the first and second parties as well as for mayor's party-electoral term interactions.

Columns 1 and 2 of table 6 indicate that unseated parties obtain worse electoral results and are 28% less likely to win the subsequent election. Parties of challengers who success-

[28]While this difference-in-differences specification is useful to investigate mechanisms, it relies on stronger identification assumptions than our baseline RD design. This has to be kept in mind when interpreting the results.

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	-0.062**	-0.081**	-0.165***	-0.795	0.058***
	(0.031)	(0.033)	(0.030)	(0.540)	(0.022)
Post × Unseated	0.078**	0.066*	-0.011	-1.268*	-0.006
	(0.037)	(0.040)	(0.039)	(0.665)	(0.026)
Mean of dep.var.	0.437	0.459	0.800	48.313	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 professional job; *Experience* is a count variable measuring the number of previous terms that the mayor has served in the municipality council; *Age* is the age of the mayor in office, measured at the beginning of the term. *Female* is an indicator variable taking value 1 if the mayor is a woman. Controls and FE are included. Controls: logarithm of surface and population. FE: year-region and first mayor party dummies. Standard errors are clustered at the municipality level. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

Table 6

The effect of a no-confidence vote on electoral performance

	(1) Mayor's share (t+1)	(2) Mayor's party wins (t+1)	(3) Party 2 share (t+1)	(4) Party 2 wins (t+1)
Mayor Uns.	-0.088***	-0.280***	0.048***	0.213***
	(0.005)	(0.017)	(0.006)	(0.025)
Mean of dep. var.	0.513	0.744	0.338	0.544
Obs.	32646	32646	29475	29475
Fixed Effects	Y	Y	Y	Y
Controls	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 1 if the mayor was replaced at some point during the term. Dependent variables are as follows: in column 1, the vote-share of the mayor's party in the next elections; in column 2, an indicator equal to 1 if the party of the incumbent mayor appoints the mayor in the next election; in column 3, the dependent variable is the second-most-voted party's vote-share in the next election. Finally, in column 4, the dependent variable is an indicator equal to 1 if the second-largest party is elected mayor in the next election. To ensure we are measuring the effect of the no-confidence vote on the vote-share of the challenger, in columns 3 and 4, we only include the no-confidence votes proposed by the second-largest party. Controls and FE are included. Controls: surface and population (in logs), vote-shares of most-voted and second most-voted parties. FE: number of available seats, year-region fixed effects, mayor's party-term fixed effects. Standard errors are clustered at the municipality level. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

fully unseat the incumbent, instead, appear to be rewarded. As column 3 of Table 6 shows, the vote-share of the challenger in the following election is 4.8 percentage points higher when this party successfully unseats and replaces the incumbent. In addition, after a successful no-confidence vote, and conditional on running again, the party of the challenger is 21 percentage points more likely to win the next election.

Taken as a whole, these estimates suggest that replacing the mayor has a positive effect on the quality of the government and show evidence of a trade-off between stability and accountability. 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 explore what policy makers can do to move along this trade-off in the following section.

5. Additional Results and Robustness Checks

5.1. Additional Results

Interactive Effects of Alignment and Fragmentation

The results in the previous section show 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 into *aligned* and *unaligned* municipalities 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 estimates using the CCT bandwidth calculated on the sample of aligned (column 2) and unaligned (column 4) municipalities, respectively.

The effect of fragmentation appears to be modest for aligned municipalities, and between two and six times as large for unaligned ones. The destabilizing effect of an additional party in the council is almost completely offset by being aligned, suggesting the challenger may have a chance to unseat and replace the incumbent only when the latter is not aligned. This evidence is consistent with two mechanisms. First, it is harder to overthrow an aligned mayor who has the support of the upper tiers of government and additional resources to distribute. Second, being aligned may help remove obstacles in gathering support for a no-confidence vote among the opposition parties.

Changing Entry Thresholds and Stability

Our results indicate vote-share admission thresholds to Parliament may be used to affect government stability and political selection. To explore this possibility further, we use the estimates reported in Table 2 and the observed vote-share distribution to conduct a simple counterfactual analysis assessing how a change in the entry threshold would affect the probability of an early termination. The exercise amounts to re-computing the number of seats received by each party for different entry threshold values, applying the D'Hondt assignment rule to assign votes to seats.

Results are illustrated in Figure E.8 of Appendix E. Lowering the entry threshold from 5% to 4% and re-calculating the seat-share allocations leads to an effective 0.15 increase in the average number of parties with representation. Correspondingly, the probability of a no-confidence vote increases by 0.6 percentage points. On the contrary, increasing the threshold

TABLE 7
FRAGMENTATION EFFECTS BY ALIGNMENT STATUS

	Aligned		Not Aligned	
	(1) Mayor Uns.	(2) Mayor Uns.	(3) Mayor Uns.	(4) 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 the value 1 if a vote of no confidence was approved 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. Panel A: alignment is defined as the mayor belonging to the same coalition as the one in power at the regional level. Panel B: alignment is defined as the mayor belonging to the same coalition in power at the national level. 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. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

from 5% to 6% would reduce the average number of parties by 0.2 and the probability of a no-confidence vote by 0.8 percentage points. Compared to the 2% in-sample baseline probability of unseating the mayor, these results show that even moderate changes in the entry threshold can have substantial effects on stability.

Naturally, the results of this exercise depend crucially on whether the existence of an entry threshold has an effect on the distribution of vote-shares. Instrumental voters may be discouraged from voting for a party that is not expected to obtain representation. Yet, a glance at the histogram of party vote-shares in Figure E.3 of Appendix E does not suggest any differences in density at or around 5%, and previous work on this topic has not found evidence in this regard.[29] We think the distribution of vote-shares is unlikely to change substantially with the threshold. Admittedly, further research beyond the scope of our paper

[29] Arenas (2016) suggests these types of strategic responses by voters may be small or absent. The author uses an increase in null votes prompted by the ban of a political party in the Basque country to study whether voters respond strategically to the effective vote threshold, and reports no evidence that they do.

would be required to test formally whether voters react to marginal changes to the admission threshold.

Ideology

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 positions, so that certain coalitions that could, on paper, be enough for a majority, are unfeasible.

In Table E.8 in Appendix E, we estimate the reduced form of our model in equations 4 and 5 and include, as additional covariates, different measures of ideological distance between the marginal party, defined as the party that is closest to the threshold, and the largest party (more details are available in appendix D).

The information on ideology is drawn from Polk et al. (2017) and is available since 1999 and only for the parties that ran at the national level, so that the precision of the estimates in this exercise is reduced. Results in Table E.8 show the entry of a party that is ideologically distant from the first has an additional effect on the probability of a 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, although 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 our proposed mechanism operates regardless of ideological differences between parties.

5.2. Robustness Checks

In this section we discuss the robustness of our main empirical results. We start by showing our estimates of the effects of fragmentation and alignment on stability are unaffected by bandwidth choice for a reasonable range of bandwidths. Figure E.7 displays estimates and 95% confidence intervals obtained by estimating our models using different bandwidths around the threshold. Panel A shows fuzzy-RD estimates of the effect of fragmentation (equation 4), whereas panel B shows estimates of the alignment effect (equation 6). The CCT optimal bandwidth is displayed as a vertical dotted line in each case. In both panels, the coefficients are stable across bandwidths, and start to attenuate only when using values of the bandwidth well above the optimal level.

We now turn to a set of robustness checks that are specific to the fragmentation analysis. First, we introduce some changes to our main specification and sample to evaluate their robustness. Then, we discuss the identity of compliers in our RD estimates and how it may affect the estimates of interest.

In Table E.9, we estimate our baseline effect using including polynomial terms in the running variable and using a fixed bandwidth of 5 percentage points on either side of the threshold. In this way, we can capture possible non-linearities in the conditional expectation of our outcome, at the cost of having to rely on more observations far from the threshold. Results from both quadratic and cubic specifications are statistically significant at conventional levels and in line with our baseline results obtained with a local linear regression estimator.

In a separate analysis, we modify the entry threshold value by setting it at each integer value between 1% and 10%. We then estimate the reduced form of our baseline model for each of these values. The purpose of this exercise is to ensure that we can only detect an effect on fragmentation when using the 5% threshold. Figure E.9 in the Appendix shows that there are no observed discontinuities in government stability around these artificial thresholds, with point estimates being very close to zero and statistically insignificant. The only positive and statistically significant effect of fragmentation on stability is found at the 5% threshold, reassuring us that our baseline results are indeed capturing the effect of a party entering council as a result of crossing the entry threshold.

Finally, to ensure that our results do not depend on a specific group of outliers or are driven by a particular election, in Table E.10 in the Appendix we estimate our baseline model removing from the sample observations from each electoral term, one at a time. The effect of fragmentation remains positive and of magnitude similar to the full-sample estimate, suggesting that our results are stable over time and not specific to a particular election.

We now discuss the role of compliers in our analysis, and how their identity may affect our results. As shown in Figure 4, crossing the 5% vote-share threshold leads to an average increase of approximately 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, that have a council large enough that obtaining 5% is usually enough to obtain a seat. Instead, the contribution of small municipalities to the estimation of the parameter of interest is negligible.

To test whether the effect of fragmentation is robust when focusing on the set of compliers, we obtain estimates using a sample restricted 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 Appendix's Table E.11. Column 1 records the first-stage coefficient, which is almost three times as large as the coefficient 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 percentage points is slightly lower than the baseline estimate of 4 percentage points, although the coefficients fall within each other's confidence intervals.

To further 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. This variable is constructed as follows: for each party represented in each council, we start by removing 0.1 percentage points of their vote-share. We redistribute the corresponding votes to all other parties proportionally to their vote-share. In each step, we re-calculate the new seat-share allocation and keep iterating until the party in question loses its last seat in the council. Finally, we record the total removed vote-share as the running variable. In the case of parties that were originally *not* in the council, we instead add votes – reducing other parties' vote-shares correspondingly – until they obtain a seat in the council. The effective threshold is then simply calculated as the difference between the original vote-share and the running variable.

We use this running variable in our baseline model of the effect of fragmentation on stability, and provide results in panel B of Table E.11 in the Appendix.[30] As expected, 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 percentage points. 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 reduced in smaller municipalities. Also note that, although this approach has the advantage of using more information and of giving a stronger first stage, it has some drawbacks. First, the specific choice of how to re-assign votes across parties affects the running variable, potentially inducing measurement error and compromising identification (Davezies and Le Barbanchon, 2017). Secondly, using the 5% threshold has the advantage of allowing us to quantify directly how this particular institutional feature affects fragmentation.

In panel C of Table E.11, we present results obtained when restricting the sample to only one party per municipal-election pair. Specifically, we keep, for each municipality and in each election, only the party with vote-share closest to the 5% entry threshold. This approach restricts the sample substantially relative to the baseline, but the main effect of interest remains very close to the baseline coefficient at 3.6 percentage points. Finally, we provide results using weights equal to the number of parties within the CCT threshold running in a municipality to ensure all municipalities have equal weights in estimation. Results are provided in panel D of Table E.11. 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.11 in the Appendix reassure us that our qualitative findings for the effect of fragmentation on stability are not driven by methodological choices made when producing our baseline estimates.

6. Conclusions

This paper provides theoretical support and rigorous empirical evidence for the hypothesis that the fragmentation of Parliament harms government stability. Additionally, we show that incumbents with more resources – and, hence, bargaining power – are less likely to be

[30] Assuming the votes removed or added iteratively to each party become blank votes instead of reassigning them to the rest of the parties yields very similar results.

removed from office. Finally, politicians replacing unseated incumbents tend to be of higher quality and are rewarded by voters in the next elections, suggesting government instability can also have beneficial effects.

Understanding the determinants and consequences of government stability is important to design electoral rules that balance the need to hold politicians accountable through efforts to limit policy uncertainty. Using a simple simulation exercise, we calculate that increasing the vote-share required to enter Parliament would limit the influence of small parties and foster the creation of more stable coalitions. These results are especially relevant in a context of increasing political fragmentation such as the one currently arising in Europe and elsewhere.

When interpreting our empirical estimates, we often extrapolate results from local elections to national-level politics. These contexts may be different in terms of both the institutional rules governing them and the stakes at play. However, we can reasonably assume the simple theoretical mechanism that we propose to interpret our results holds more generally in comparable bargaining settings, such as the coalition-formation stage in national parliaments. Additionally, the institutional traits of local governments that we use in our analysis present several commonalities with regional and national parliaments, as well as with a number of other countries' assemblies. For these reasons, we believe our results provide new evidence informing the debate on the determinants and consequences of government stability in parliamentary democracies.

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Appendices for Online Publication

A. Theoretical Appendix

Expression for Prob. of Vote of No confidence $\pi(\mathrm{s})$ *- Case with three parties and* $s_1 < 0.5$

In the three party case, the probability of a vote of no confidence when there is no single-party majority $\pi(\mathrm{s})$ is given by:

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

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 (see Figure 2). When $s_1 \geq 0.5$, the probability of a vote of no confidence is 0.

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 A.1 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 the right-panel of figure 2, 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 equation 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 s' and, as a result, $\pi(\mathrm{s}') - \pi(\mathrm{s}'') > 0$.

■

Proof of Proposition 2

Define $\pi_2(\Theta, \mathrm{s})$ as the probability that the government is unseated in period 2 for seat share vector s and 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:

$$\pi_2(\Theta', \mathrm{s}) \equiv \begin{cases} 0 & \text{if} \quad \theta'_2 \leq h(\theta'_1) \text{ and } \quad \theta'_2 < \theta'_1 \\ \mu & \text{if} \quad \theta'_2 > h(\theta'_1) \text{ or } \quad \theta'_2 \geq \theta'_1 \end{cases}$$

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 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:

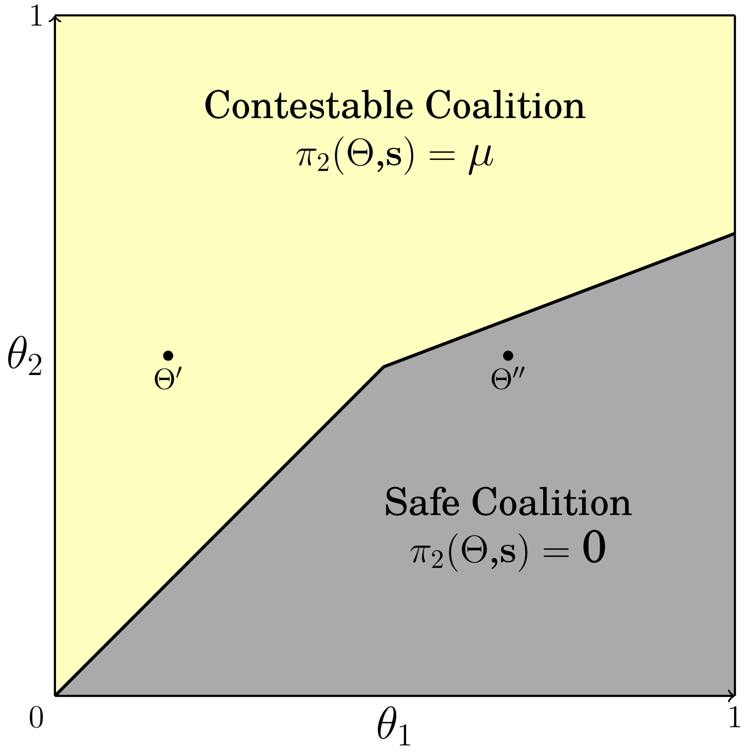
Case	1	2	3
$\pi_2(\Theta', \mathrm{s})$	0	μ	μ
$\pi_2(\Theta'', \mathrm{s})$	0	μ	0
Δ	0	0	μ

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

■

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.

Equilibrium with two 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 five 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 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 $\theta_2 < s_*\theta_1$ with s_* taking the values illustrated in table A.1. The associated pay-off will be $V^S_{mc} = (\omega + \theta_1(1 - s_*))(1 + \beta)$.

When considering blocking coalitions there are two cases that warrant separate attention, $s_1 + s_3 \geq 0.5$ and $s_1 + s_3 < 0.5$. In the first case, party 1 only needs one party to

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 $s_4 + s_5 > s_3$)	$s_3 + s_5$
	$s_1 + s_4 + s_5 \geq 0.5$	$s_4 + s_5$

form a winning coalition, and can therefore offer θ_2 to one party (e.g. party 3) to form a blocking coalition. 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 $\theta_1 > \theta_2$. 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 $\theta_1 > 2\theta_2$.

In both cases we can determine when blocking coalitions are played in (θ_1, θ_2) space by using condition $V^C_{mc} \geq V^S_{block}$ to derive incentive compatibility constraints $\theta_2 \leq h(\theta_1, s_*)$, and the feasibility conditions for a blocking coalition as participation constraints.[31] 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:

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

We can use this expression to prove the equivalent of proposition 1 in the 4 to 5 party case. Assume two seat share vectors $\mathrm{s} = (s_1, s_2, s_3, s_4)$ and $\mathrm{s}' = (s'_1, s'_2, s'_3, s'_4, s'_5)$ 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 $\pi(\mathrm{s}') \geq \pi(\mathrm{s})$. 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

[31] 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.

coalition in the 4 party case, and s'_* corresponds to the same figure in the 5 party case (see table A.1).[32] Because $h(\theta_1, s_*)$ is increasing in s_*, and a blocking coalition needs to satisfy $\theta_2 \geq h(\theta_1, s_*)$, 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 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.[33]

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

[33] 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.

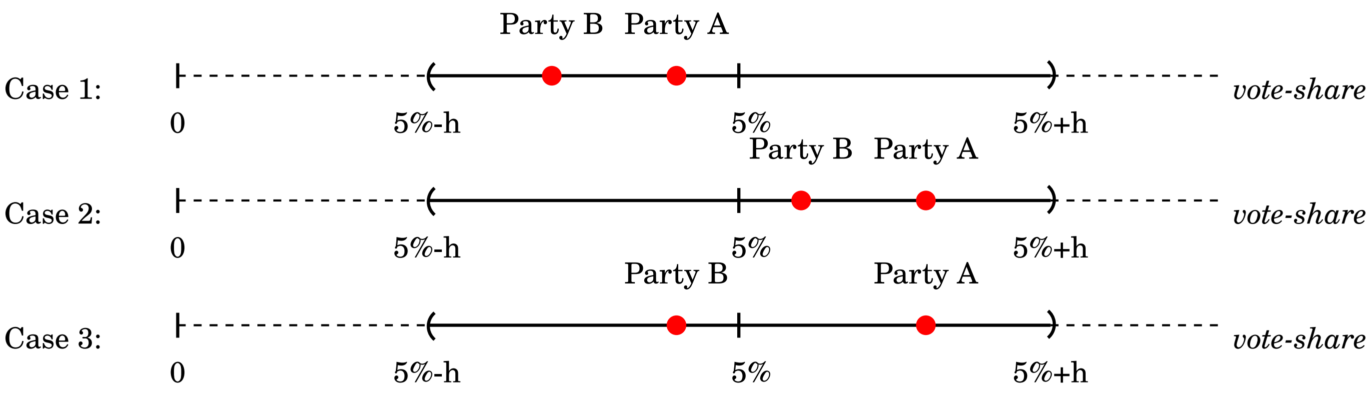
B. Construction of the instrument for fragmentation

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*) in the year when the municipal election takes place. This aggregate share is simply 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 method.

Given that often the regional elections take place at a different date than the municipal ones, i.e., during the municipal term, our running variable correctly identify elections in which the regional coalition bloc just worn (or lost) at the municipal level only until a new regional election takes place. For this reason, in section 4.2 we redefine our indicator for a no-confidence vote and code as zeros (instead of ones) cases of no-confidence votes taking place after the date of the regional election.

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 *Ministerio de Hacienda y Administraciones Públicas* 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). The data were made available upon request by this institution. 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

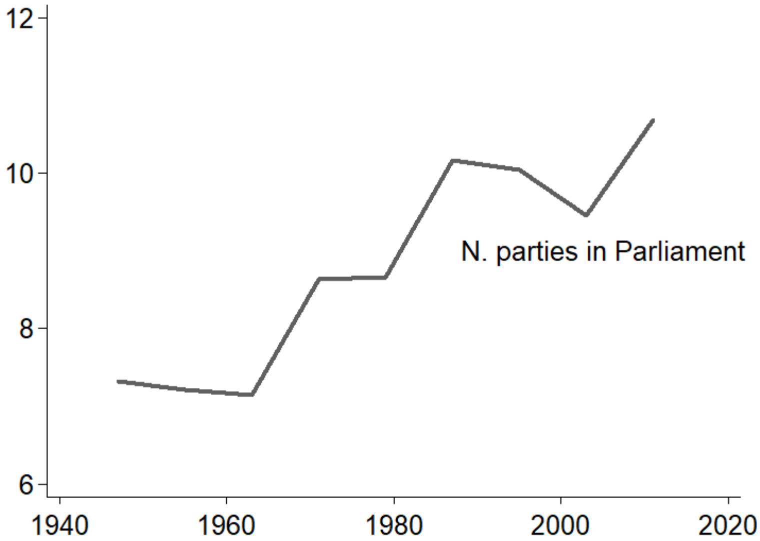
The dataset for the analysis of the effect of alignment on stability is a panel of municipalities, observed for all election years between 1983 and 2011 and containing information from data sources described above. Elections held in 1979 are excluded from the sample since no regional government was already 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 and, hence, can never 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.

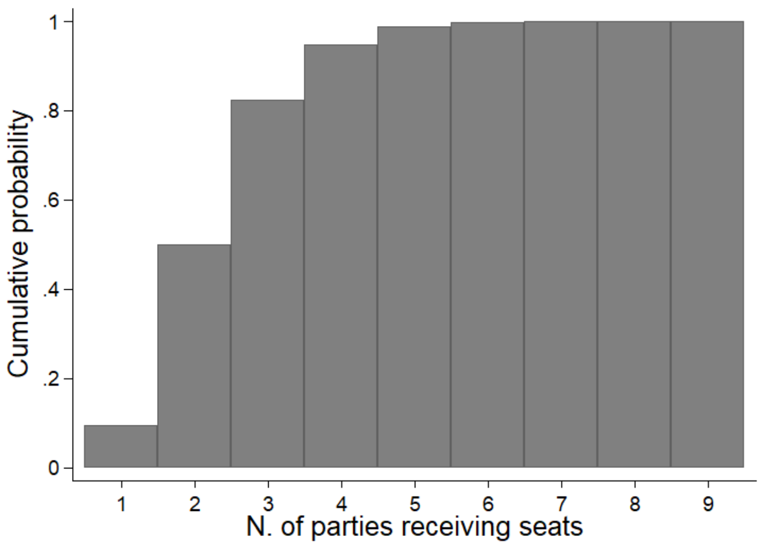
E. Additional empirical results

FIGURE E.1
EVOLUTION OF THE NUMBER OF PARTIES IN PARLIAMENT OVER TIME



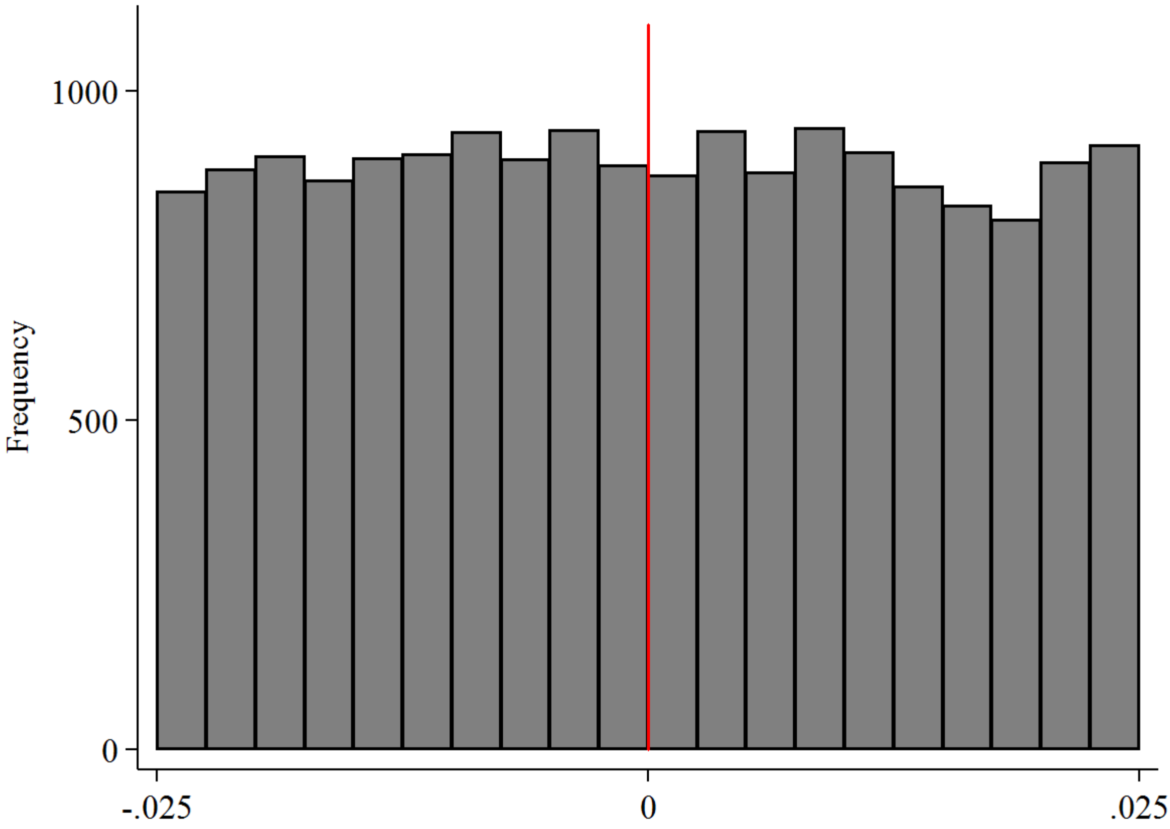
Notes: The graph plots the evolution of the number of parties with representation in parliament over time. The solid line is the average number of parties, for all countries in the sample, calculated in 8-years windows since 1947 to 2019. Source: authors' elaboration based on the *parlgov* dataset (experimental 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



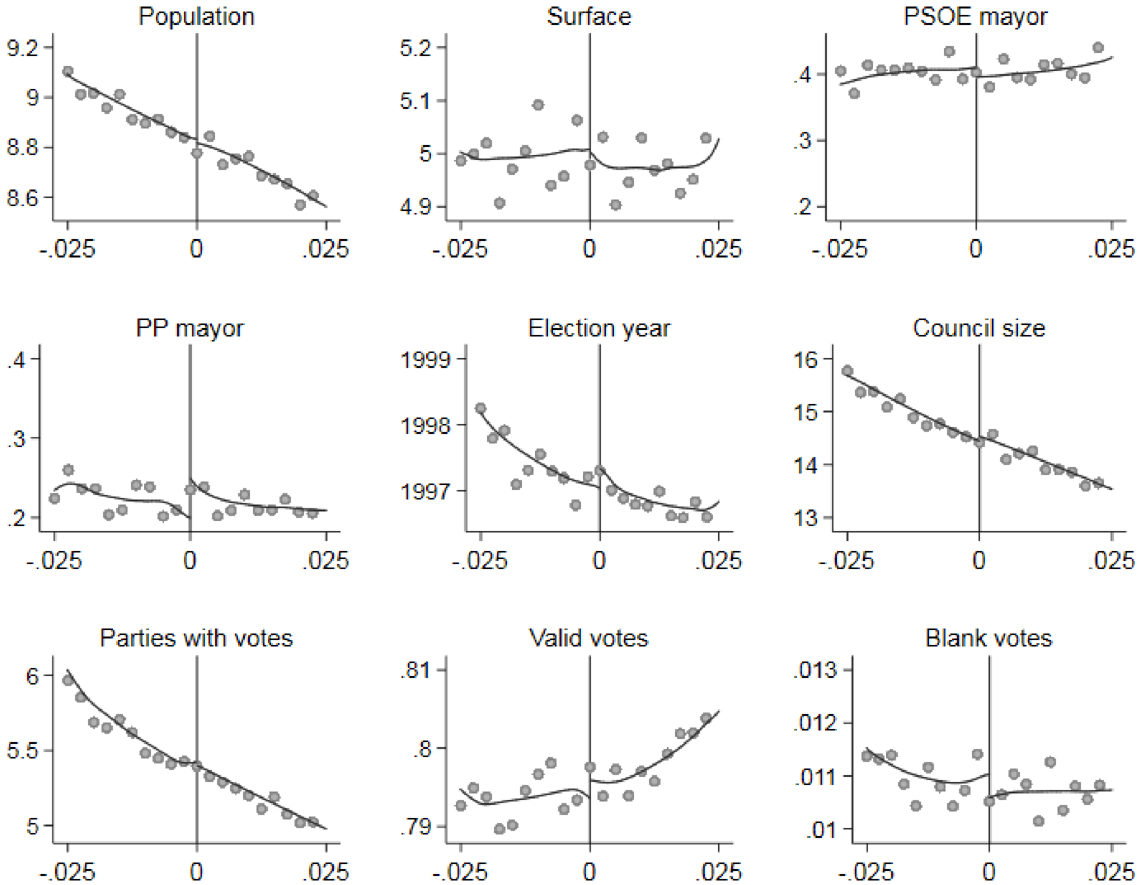
Notes: Cumulative distribution of the number of parties represented in Spanish municipal councils between 1979 and 2014.

Figure E.3
Density of the fragmentation running variable around the threshold



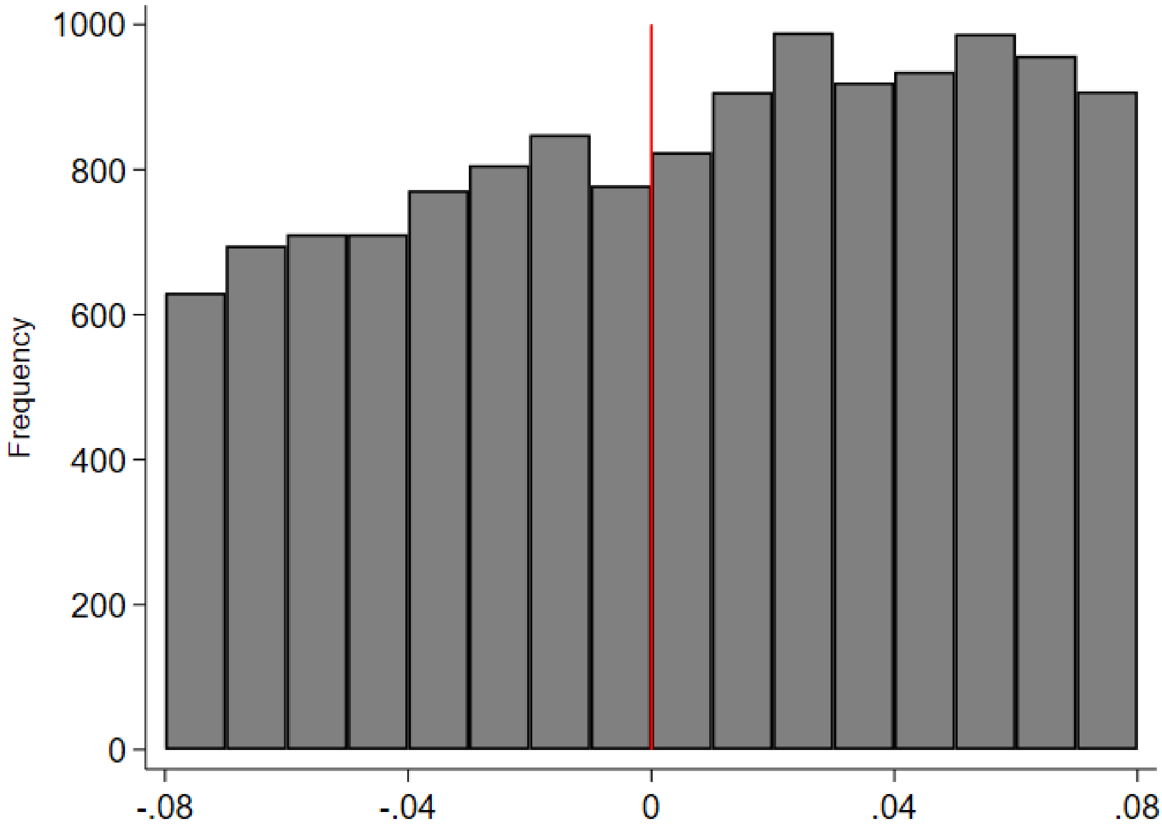
Notes: Frequency histogram of the running variable used in the RDD on the effect of fragmentation on stability, in bins of size 0.025%. A McCrary (2008) test of the null hypothesis of no discontinuous jump in the density at the threshold fails to reject the null with a p-value of 0.96. A Cattaneo, Jansson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

FIGURE E.4
COVARIATE BALANCING PLOTS - FRAGMENTATION



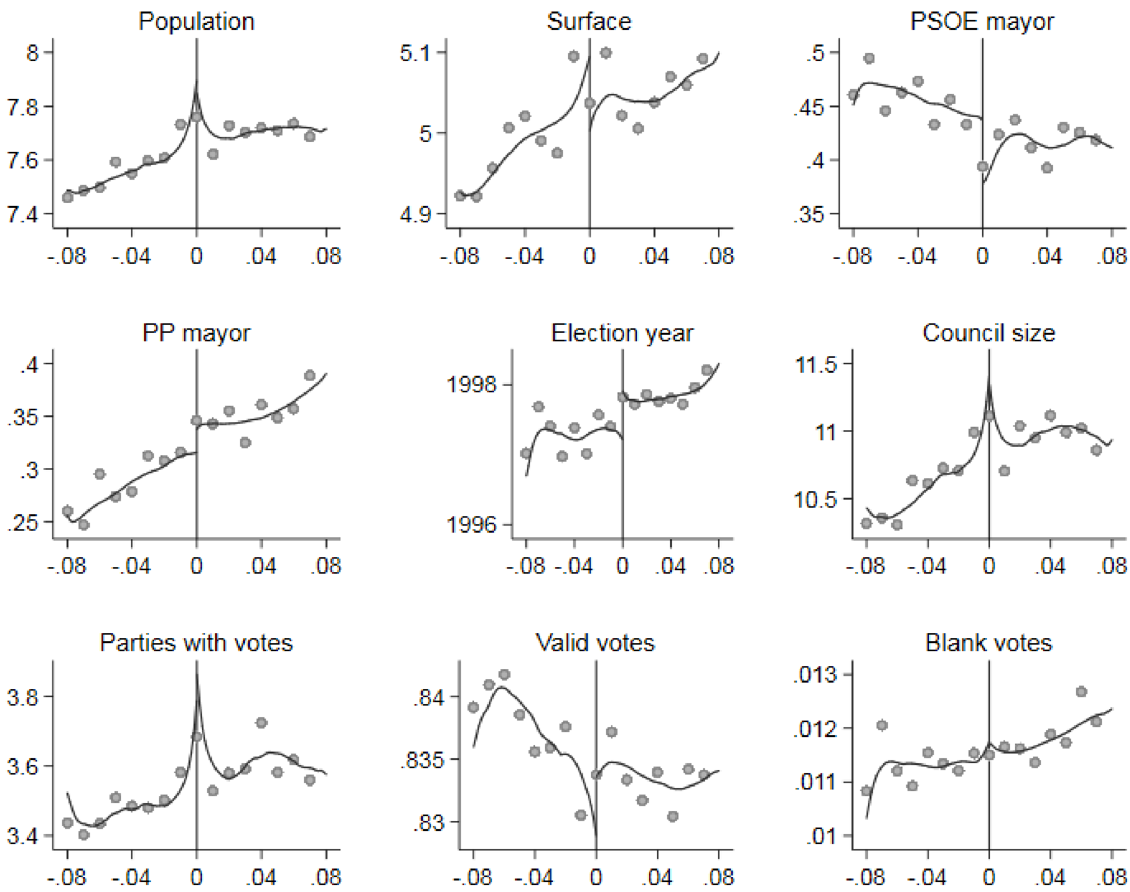
Notes: Averages of different municipal characteristics near the threshold. Population and surface are in logarithms. Capital is an indicator for being a regional capital. PSOE mayor is an indicator for the mayor belonging to the socialist party PSOE and, similarly, PP mayor is an indicator for a mayor from the Popular Party. 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 valid votes cast (including blanks) divided the total number of votes. Blank votes is the share of blank votes cast. Dots are averages in 0.25% 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: Frequency histogram of the running variable used in the RDD on the effect of alignment status on stability, in bins of size 0.25%. 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.

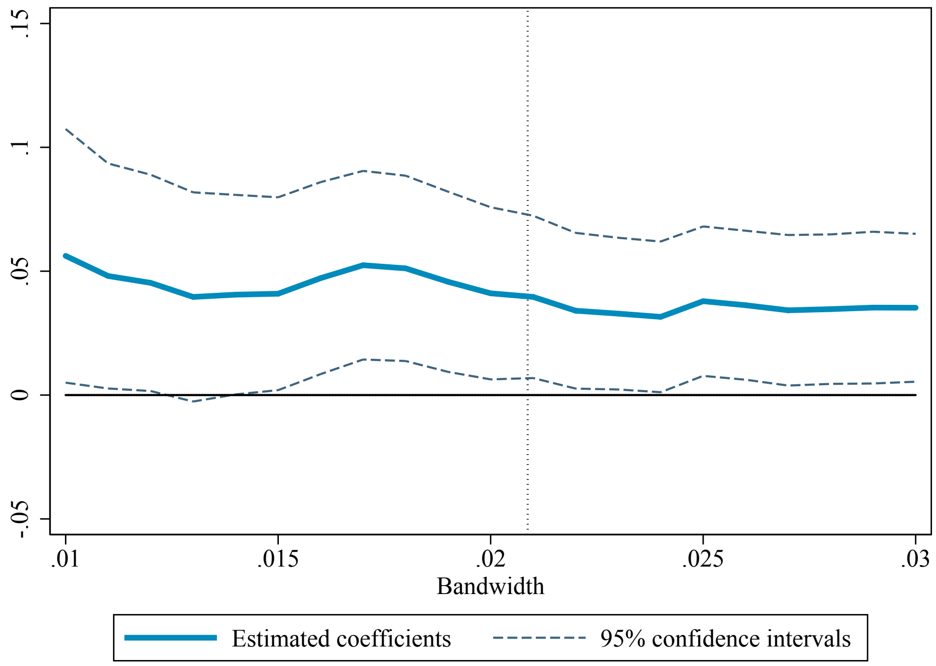
FIGURE E.6
COVARIATES BALANCING PLOTS - ALIGNMENT



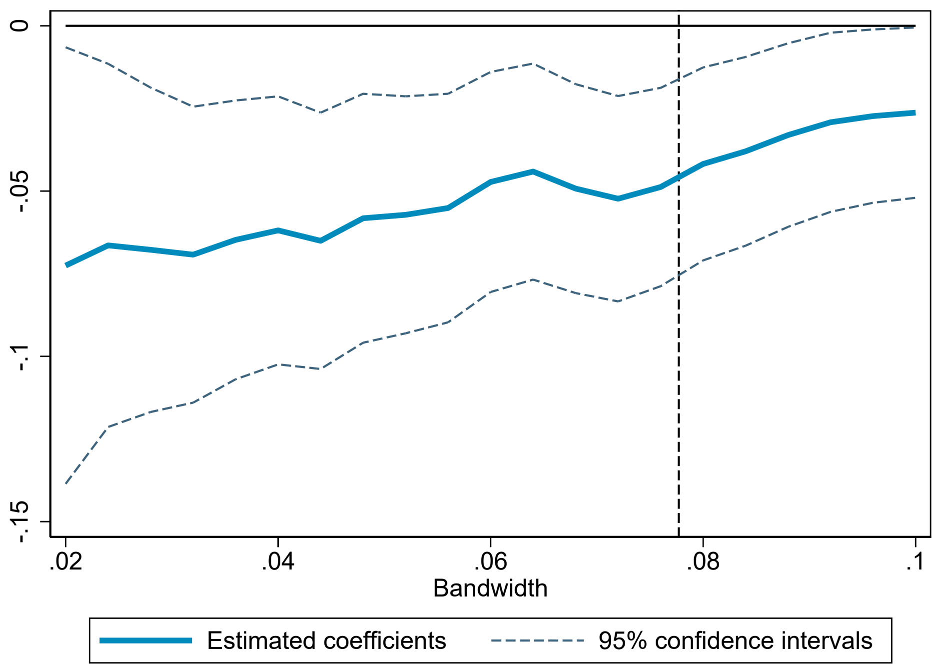
Notes: Averages of different municipal characteristics near the threshold. Population and surface are in logarithms. PSOE mayor is an indicator for the mayor belonging to the socialist party PSOE and, similarly, PP mayor is an indicator for a mayor from the Popular Party. Council size is the number of 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 valid votes cast (including blanks) divided the total number of votes. Blank votes is the share of blank votes cast. 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

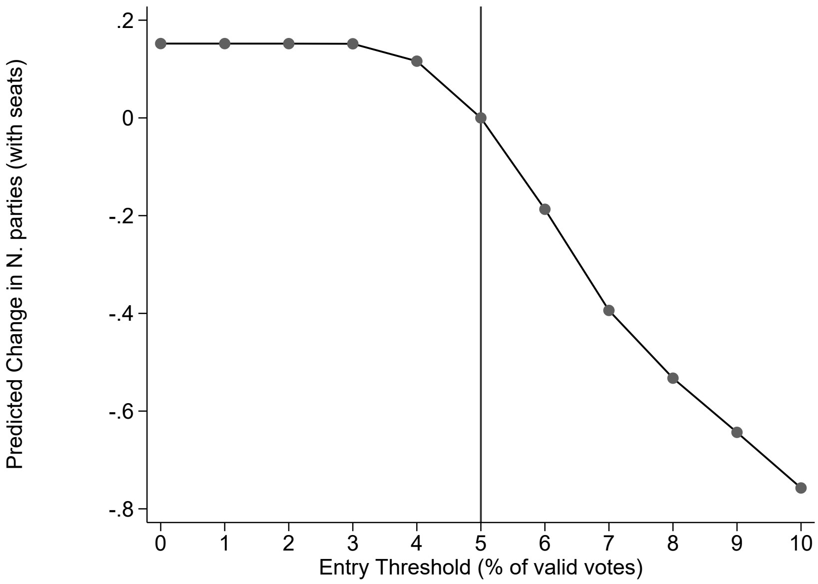


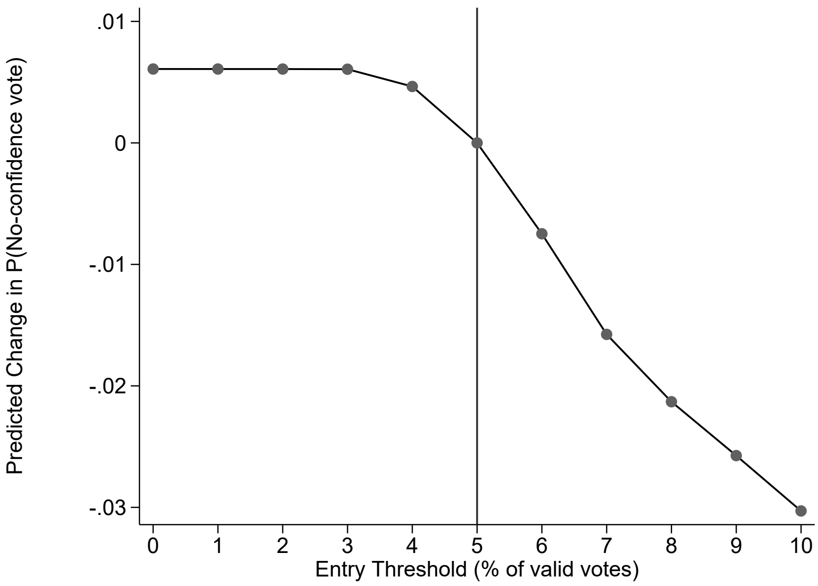
B) Alignment

Notes: Panel A shows estimates of of the effect of fragmentation on the probability of a no-confidence vote for different bandwidth choices (eq. 4). Panel B shows estimates of the effect of alignment on the probability of a no-confidence vote for different bandwidths (eq. 6). 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

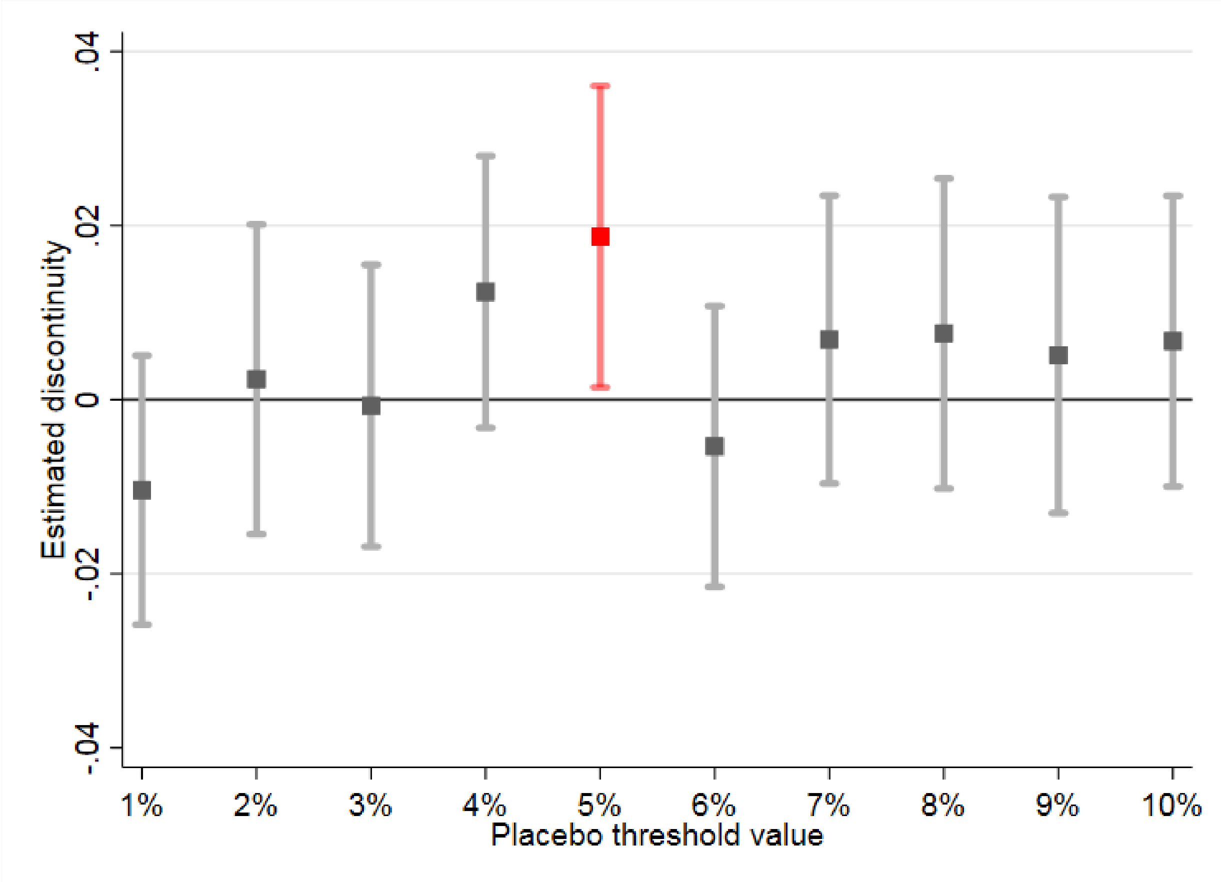




Notes: This figure reports the predicted number of parties as well as the predicted probability of a vote of no-confidence as a function of entry thresholds, holding constant voters' preferences. We retrieve the number of parties for any variation in the admission threshold between 0% (no admission threshold) 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.

FIGURE E.9

REDUCED FORM ESTIMATES FOR DIFFERENT PLACEBO VALUES OF THE THRESHOLD



Notes: Reduced form estimates of crossing the admission threshold on the probability of unseating the mayor for different placebo values of the entry threshold. The dependent variable is always an indicator taking value 1 if the mayor was unseated by a vote of no confidence during the legislature. Each point in the horizontal axis represent different values of the admission threshold, from 1 to 10%. For instance, the first point shows point estimates and 95% confidence intervals of the discontinuity present at the 1% vote-share threshold. The bandwidth is 1% at either side of the threshold in all specifications. Standard errors clustered at the municipality level. The result for the real vote-share admission threshold (5%) is highlighted.

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.	0.22	1997.09	14.54
Bandwidth	0.021	0.021	0.021
Obs.	14882	14882	14882
	Parties w. votes	Valid votes	Blank votes
Above threshold	0.05	-0.00	-0.00
	(0.066)	(0.004)	(0.000)
Mean of dep.var.	5.395	0.795	0.011
Bandwidth	0.021	0.021	0.021
Obs.	14879	14879	14879

Notes: Covariate balancing regressions for the fragmentation RDD model (eq. 4 and 5). Population and surface are in logarithms. PSOE mayor is an indicator for the mayor belonging to the socialist party PSOE and, similarly, PP mayor is an indicator for a mayor from the Popular Party. 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 share of votes cast (including blanks). Blank votes is the share of blank ballots. 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. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

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 5). 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. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

Table E.3
2SLS 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 has 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. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

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	0.002	0.000
	(0.064)	(0.003)	(0.000)
Mean of dep.var	3.552	0.835	0.012
Bandwidth	0.078	0.078	0.078
Obs.	13054	13053	13053

Notes: Covariate balancing regressions for the alignment RDD model (eq. 6 and 7). Population and surface are in logarithms. PSOE mayor is an indicator for the mayor belonging to the socialist party PSOE and, similarly, PP mayor is an indicator for a mayor from the Popular Party. 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 share of votes cast (including blanks). Blank votes is the share of blank ballots. 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. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

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 7). 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. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

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 as an instrument for alignment status. 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. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

TABLE E.8

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. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

TABLE E.9
ROBUSTNESS CHECKS I - QUADRATIC AND CUBIC SPECIFICATIONS

	(1) Mayor uns.	(2) Mayor uns.	(3) Mayor uns.	(4) Mayor uns.
A. Quadratic polynomial				
N. Parties	0.051***	0.041***	0.049***	0.049***
	(0.020)	(0.014)	(0.017)	(0.017)
Mean of dep.var.	0.033	0.033	0.033	0.033
Bandwidth	0.050	0.050	0.050	0.050
Obs.	36371	36371	36371	36371
B. Cubic polynomial				
N. Parties	0.043**	0.052*	0.045**	0.045**
	(0.021)	(0.028)	(0.021)	(0.022)
Mean of dep.var.	0.033	0.033	0.033	0.033
Bandwidth	0.050	0.050	0.050	0.050
Obs.	36371	36371	36371	36371
Fixed Effects	N	N	Y	Y
Controls	N	Y	N	Y

Notes: 2SLS estimates of the effect of the number of parties on the probability of unseating the mayor, controlling for a quadratic (Panel A) or cubic (Panel B) polynomial in the running variable. The dependent variable is an indicator taking value 1 if the mayor was unseated by a vote of no confidence during the legislature, full sample. 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 bandwidth is fixed at 5% in all specifications. Standard errors are clustered at the municipality level. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

TABLE E.10
ROBUSTNESS CHECKS II - REMOVING ONE ELECTION AT A TIME

	1979	1983	1987	1991	1995
N. Parties	0.042**	0.040**	0.035*	0.043**	0.027*
	(0.018)	(0.019)	(0.019)	(0.018)	(0.016)
Mean of dep.var.	0.034	0.034	0.034	0.031	0.032
Bandwidth	0.021	0.021	0.021	0.021	0.021
Obs.	13966	13749	13209	13029	13266
	1999	2003	2007	2011	
N. Parties	0.035**	0.040**	0.033*	0.049**	
	(0.017)	(0.018)	(0.019)	(0.020)	
Mean of dep.var.	0.032	0.033	0.029	0.034	
Bandwidth	0.021	0.021	0.021	0.021	
Obs.	13149	13129	12864	12695	

Notes: In each column, we report 2SLS estimate of the effect of fragmentation on stability obtained from estimating equation 4 excluding one full election term at a time, as specified by the column header. The CCT bandwidth is kept constant at the full sample value of 2.1 percentage points. No controls or fixed effects are included. Standard errors clustered at the municipality level. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.

Table E.11

Robustness Checks III - Fragmentation and Stability

	(1)	(2)
A. Large Councils Only (#seats ≥ 17)		
	First-Stage	2SLS Estimate (N. Parties)
	.873***	.032**
	(.060)	(.014)
Bandwidth	.015	
Obs.	4289	
B. Effective Threshold		
	First-Stage	2SLS Estimate (N. Parties)
	.922***	.012**
	(.026)	(.005)
Bandwidth	.026	
Obs.	17770	
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 shows the first-stage estimate of our instrument when estimating equation 5. Column 2 reports associated 2SLS estimate of the effect of fragmentation on stability obtained from estimating equation 4. 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. *, **, and *** represent 10%, 5%, and 1% significance levels, respectively.