Pre-Electoral Coalitions:

Insights into the Creation of Political Parties *

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Abstract

We evaluate the causes and consequences of pre-electoral coalitions (PECs). In Finland, local elections use a proportional representation system with open lists, and parties may form joint lists. We document that PECs are more common between parties of equal size and similar ideology, and when elections are more disproportional or involve more parties. Using both difference-in-differences and density discontinuity designs we document that voters punish coalescing parties, especially if they are ideologically diverse, and also respond to PECs by targeting personal votes strategically within the PECs. Moreover, small parties become more likely to acquire political leadership positions. Finally, PECs seem to be formed also with the particular purpose of influencing the overall distribution of political power: they lead to more dispersed seat distributions and prevent absolute majorities in close elections. Thus, voter ideology and electoral rules create natural boundaries for the parties, but the party formateurs also consider wider impacts.

Keywords: bargaining power, local elections, multi-party systems, open-list PR system, pre-electoral coalitions, strategic voting

Word count: 11,825

Why do parties exist? What is their function and what determines their scope? Political parties are essential in the running of democratic countries yet American voters today increasingly identify as being independent (Gallup 2020). At the same time, animosity between individuals that identify with one or other party has never been greater (Iyengar and Westwood 2015).

It is difficult to imagine the creation of a new party in the US with its majoritarian party system (Duverger 1972). However, elsewhere in Europe, we have seen a burst of new parties after the Great Recession of 2007/09. These new parties have not stayed on the fringe of politics and are now part of national governments. En Marche was created in 2016 and obtained a landslide victory on the French National Assembly elections in 2017; the Five Star Movement was created in 2009 and in the 2013 general election obtained the most votes of all parties for the Italian Chamber of Deputies; finally, Podemos was created in 2014 and after the 2019 Spanish general election entered a coalition government with the traditional socialist party, PSOE. Given the importance of political parties as mediators between governments and citizens, there has been much scholarly interest in analysing their role and function but we are still lacking a full understanding of their boundaries and the conditions that lead to their creation, merger, and extinction.

A parallel could be drawn with the literature on the boundaries of the firm that tries to understand why much economic activity occurs informally within organisations rather than through the market. In the 1930s, Coase argued that transaction costs and asymmetric information could be the reason for the prevalence of firms (and the incompleteness of contracts could not ameliorate this—see Williamson 1971 and a formalisation in Grossman and Hart 1986). Surely the boundaries of political parties are also affected by asymmetric information given that party labels allow for better communication of political platforms, reduce campaigning costs and help politicians attract funds to reach undecided voters. Informal agreements within parties allow coalitions of alike individuals to implement a political platform that would otherwise not gather enough support. Parties become the custodians of the policies announced during the election and put in place mechanisms to control elected officials' decisions (Cox and McCubbins 1993, 2005 and Levy 2004).

Political parties have also been seen as coalitions of intense policy demanders that control nomination processes to select candidates faithful to the groups' policy priorities (see Cohen et al. 2008 and Bawn et al. 2012; for an interesting critical overview, see McCarty and Schickler 2018). There are returns to scale to

bigger parties, however the bigger the political party, the less homogeneous it becomes and members might need to compromise too much concerning policy and rents.[1]

Rather than disentangling the validity of each of the previous theories, we want to analyse the conditions under which different parties appear, merge or disappear. Our emphasis is on understanding the causes of the party system's configuration and the circumstances under which changes in the *party system* occurs.[2] Such changes are indeed rare and it is extremely difficult to isolate their causes. The electoral system, voters' preferences or the pre-existing distribution of political parties in the ideological spectrum surely play a role in changes in the *party system*, yet the ideal experiment to identify its causes is not normally available. It is for this reason that in the current paper we look at an interesting feature of Finnish local municipalities to understand the conditions under which various political factions decide to run together in a particular election. In so doing, we hope to help our understanding of what determines the size and number of political parties in a particular region at any given time.

Finnish parties can form pre-electoral coalitions (PECs) by running joint lists without committing to a joint policy manifesto after the election. These small *barriers to entry* to forming coalitions make such agreements frequent and yields rich data for our study. Whilst forming a PEC is a less demanding agreement than forming an actual party, it is likely that there are similar strategic considerations and effects (e.g. voter responses) in both cases.

The literature on coalition formation has mainly focused on post-electoral bargaining in proportional electoral systems (Müller and Strøm 2000). However, parties across the world are increasingly seen to join forces before elections (Golder 2005, 2006b; Powell 2000). Most recently in Spain, the two main right-wing parties formed an electoral coalition ahead of the 2020 regional Basque Country elections. Their intention was to prevent the division of the right-wing vote and avoid an overall majority of the Socialist Party. Even

[1]See Hortala-Vallve and Mueller (2015) on how these tensions can be placated by calling a primary election and committing to choose the policy preferred by a plurality of members. An excellent survey of the literature can be found in Dhillon (2003). Primaries have also been seen as a mechanism that incentivises candidates to act on the voters' behalf (Caillaud and Tirole 2002).

[2]The comparative literature uses the term *party system*, to portray countries in terms of the effective number of parties that run for office. Examples include 'a dominant party system', 'a two-party system', or 'a multi-party system' (see Sartori 1976).

in the UK with a first-past-the-post system, there have been recent calls for a united front to defeat the Tories: "to defeat a common enemy, parties should set aside differences and cooperate."[3] Intuitively there are two big advantages of pre-electoral coalitions vis-à-vis post electoral ones: they reduce uncertainty on the likely coalition after the election and result in a less disproportional allocation of seats.

We construct a new data set of parties and their coalitional ties in Finnish local elections to study various aspects of PECs. The seminal work on PECs by Sona Golder looks at the correlates of such coalitions and we show the robustness of some of her findings to the Finnish case. Additionally, our study shows that a key driver for such coalitions is preventing the victory of a rival larger party. The case of the Alavieska municipality in Northern Finland in the 2012 election is a good illustration of our point. Four ideologically diverse parties as depicted in Figure 1 below (the National Coalition Party, the Left Alliance, the Christian Democrats, and the Finns Party) formed an electoral alliance to prevent the Center Party from obtaining an absolute majority of the seats. The municipality had been dominated by the Center Party for years and the spokesman for the Left Alliance, Timo Takkunen, stated that they "wanted to make sure that the policies reflect the opinions of all inhabitants and not only the those of the Center Party supporters."[4] In the end, the coalition did not obtain its objective, possibly due to the lack of ideological cohesion.

Another interesting example occurred in the municipality of Karvia. In the 2012 election, two ideologically proximate parties, the Social Democratic Party and the Left Alliance, formed a PEC that ensured the Center Party did not get a majority of the seats. The last elected candidate was from the Social Democratic Party, and the first non-elected candidate was from the Center Party. Had the PEC not formed, the Center Party would have obtained one more seat and reached an absolute majority of the local council seats.

In what follows, we divide our results into an initial descriptive analysis with the correlates of PECs at the municipality level. The findings from this investigation speak to some of the most prominent hypotheses

[3]See an editorial "The Guardian view on a progressive alliance: divided they fall" in *The Guardian* (December 13, 2020), available online at `https://www.theguardian.com/commentisfree/2020/dec/13/the-guardian-view-on-a-progressive-alliance-divided-they-fall` (accessed January 20, 2021).

[4]See an article in *Helsingin Sanomat* available at `https://www.hs.fi/kotimaa/art-2000002575242.html` (accessed March 11, 2020).

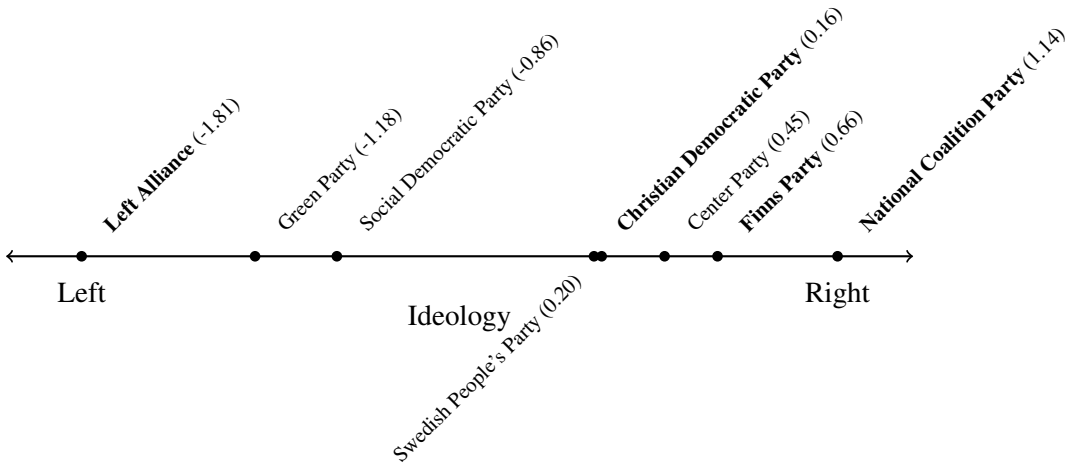

Figure 1. Ideological positions of Finnish main political parties

Notes: The ideological positions are drawn according to survey data on electoral candidates' economic policy preferences from the Finnish Broadcasting Company YLE (see Appendix B for further information). The parties that formed a PEC in Alavieska to undermine the chances of the Center Party obtaining a majority of the seats are indicated in bold.

in the PEC formation literature: PECs are more likely when more parties are present (possibly indicating the incentive for political leaders to signal the likely coalitions after the election), and when the electoral system at the local level is very disproportional. We also assess how ideological polarisation affects the likelihood of coalitions.

Our novel empirical contribution is to analyse the various effects of PECs. An advantage of considering Finnish municipal elections is that there is an open-list proportional system in place. Hence, we observe the party each citizen votes for, even when the party is part of a PEC. Looking at individual party-level data on both coalition formation and electoral outcomes we look at the effect of coalition formation on electoral support. Our difference-in-differences analysis suggest that vote and seat shares are affected negatively by coalescing. This contradicts the motivation behind larger parties to save electoral costs (Dhillon 2003; Montero 2016; Osborne and Tourky 2008). Voter punishment of coalitions is targeted particularly to coalitions with large ideological heterogeneity. We also find that PECs encourage intra-list strategic voting as voters from smaller coalition partners pool their votes into fewer candidates—hence increasing their electoral chances against candidates from larger coalition partners. Strategic voting seems to benefit the small partner within the coalition which might explain why asymmetric coalitions are harder to form. We find that some parties are willing to form PECs and give away important leadership positions to their

smaller partners in order to prevent the absolute majority of their rival party——which would follow the logic of Gamson's law (Gamson 1961).

As mentioned earlier, our work highlights a novel bargaining power hypothesis where parties form coalitions to influence the overall distribution of seats—specially influencing the probability any party obtains and absolute majority of seats and gains full political control of the municipality. There are a few examples of parties with very different ideologies from the political left and right joining their political forces. Such electoral coalitions are often called "technical alliances" suggesting that they are merely formed to exploit the electoral economies of scale rather than making the most of ideological similarities.

In order to causally identify the role of PECs on the likely government composition we provide evidence in the spirit of a regression (or density) discontinuity design that suggests that PECs are an efficient tool for preventing absolute majorities when the largest party is close to obtaining more than half of the seats. This same rationale to coalesce is at the core of the study by Frey, Gabriel, and Montero (2020). They document that in Mexican mayoral elections, parties are willing to compromise ideology and form an electoral alliance to remove an entrenched incumbent party from office. In all, we uncover interesting effects which might apply to the analysis of the formation of political parties. Most importantly, we see that the incentive for politicians to run under a same platform surely depends on their relative electoral support and ideological differences. But crucially, it depends on the electoral support of their rivals and the characteristics of the electoral system.

In the next section, we lay out our central theoretical considerations and empirically testable hypotheses. After introducing the institutional context of our study and our data, we present our empirical findings on the correlates of PEC formation and the effects of electoral alliances on coalescing parties. Prior to our final concluding section, we show the robustness of our findings in considering dyadic data with all possible two party combinations.

Hypotheses

We group our hypotheses into causes and consequences of PECs and discuss how these can be used to understand the creation and destruction of political parties.

Causes of Pre-Electoral Coalitions: Signalling, Proportionality, and Similarity

Taking cues from the seminal work by Sona Golder on pre-electoral coalitions, we analyse the local election level circumstances that might encourage parties to run jointly for election.

In proportional electoral systems, voters often face high uncertainty about the identity of future governments, which might discourage them from voting. The more political parties there are, the more difficulties voters have in anticipating the likely coalitions after the election. Under these circumstances, politicians might want to improve the information voters have by signalling the likely partners after the election. Tillman (2015) argues that this reduction of uncertainty about future governments might also boost turnout. Following Golder (2005), we label this effect the signalling hypothesis.[5]

Hypothesis 1 ***(Signalling)*** *PECs are more likely when there is a large number of parties.*

There is a mechanical benefit of forming coalitions as bigger parties benefit from the apportioning of votes to seats. The key driver of this effect is the degree of disproportionality in each district which depends on the particular distribution of vote shares in the municipality. Smaller parties in municipalities with particularly disproportional representation should have the incentive to form a PEC (see Blais and Indridason 2007 and Parigi and Bearman 2008).

Hypothesis 2 ***(Disproportionality)*** *PECs are more likely when the electoral system is more disproportional.*

Naturally, whether two parties decide to join their forces will also depend on the characteristics of each party and not just the electoral context. A factor that might encourage two parties to form an alliance is a

[5]See also Gschwend and Hooghe (2008) and Eichorst (2014) for examples of studies arguing that PECs provide cues to the voters with regards to the future government composition. Moreover, Gschwend, Meffert, and Stoetzer (2017) use a survey experiment to show that providing voters with coalition signals increases the importance of coalition considerations and decreases the importance of party considerations in voters' decision-making.

shared ideology (Allern and Aylott 2009; Debus 2009; Golder 2006b; Ibenskas 2015). For example, Golder (2006b) argues that coalitions amongst ideologically close parties should be more acceptable to voters of these parties, and should result in smaller expected policy costs for the parties.[6] In other words, voters might punish parties that join ideologically heterogeneous coalitions.

The similarity between coalition partners might not only concern their ideology but also their expected vote share. Asymmetry within coalitions should negatively affect the likelihood of forming an alliance as there might be more difficulties in agreeing a joint platform when bargaining between unequal partners. Bigger parties might feel smaller parties' ideology is over-represented in the coalition and smaller parties might feel their wishes are silenced by the bigger partner in the coalition—similar arguments should apply when analysing two factions willing to form a single party.[7]

Hypothesis 3 ***(Equal partners)*** *PECs are more likely between parties that are ideologically close and that have similar electoral support.*

Consequences of Pre-Electoral Coalitions: Votes, Seats, and Leadership Positions

Our second group of hypotheses is related to the consequences of PECs. PECs might help political parties reduce campaigning and candidate selection costs (Dhillon 2003; Montero 2016; Osborne and Tourky 2008). This should result in PECs having more resources to target voters, thus encouraging coalition formation in order to attract votes. However, the connection between a PEC and vote shares is not so straightforward: joining a PEC may also hurt a political party as voters that are attached to a party label might dislike seeing the party identity diluted within a coalition.

In Finland voters cast a vote for one of the candidates (open-list PR), hence we can keep track of party receiving the vote. This information allows us to identify which parties win and which ones lose when forming a PEC.

Another aspect we can analyse within the Finnish case is whether voters are sophisticated (Downs 1957; Duverger 1954) in the way they cast their preferential vote: PECs create incentives for voters of small

[6]For empirical evidence backing up this argument, see for instance Gschwend and Hooghe (2008) and Fortunato (2017).

[7]Supporting the *equal partners hypothesis*, Ibenskas (2015) mentions the possibility that two small parties form an alliance to make sure that at least one of them is able to gain representation.

coalition partners to pool their votes to few candidates who can then compete with the candidates from larger coalition partners on the list. Precisely because strategic voting might shift seats from a larger coalition partner to a smaller coalition partner, unequal partners might be unwilling to form a PECs as highlighted in Hypothesis 3 above.

Votes are simply the means to seats and leadership positions. What is the effect of PECs on seats? An answer to this question surely involves the votes obtained by each party but also the apportionment rules and the level of disproportionality of the municipality. Note that even when joining a PEC could harm parties' vote shares, it is possible that the mathematics of apportionment improves the party's seat allocation. This comes back to Hypothesis 2 above and the fact that the D'Hondt seat allocation rule (as implemented in Finland) favours larger lists.

There might also be post-electoral returns to joining a PEC. One should expect that parties forming coalitions get a share of portfolios proportional to the seats they contribute to the coalition (Gamson 1961). This means that small parties within a PEC could sometimes get important nominations that would usually be reserved for larger parties. It is thus possible that small parties can improve their position in post-electoral bargaining by forming a coalition with a larger party.[8]

Finally, our novel key proposition is that PECs can be used as a way to prevent other parties obtaining an absolute majority rather than solely increasing their own support—as highlighted with the Alavieska municipality example in the introduction. These coalitions are often called "technical alliances" suggesting that they are merely formed to exploit the electoral economies of scale and to prevent a third party gaining an absolute majority of the seats in the municipality. Obtaining an absolute majority in Finnish municipalities is critical as councils make decisions based on simple majority vote. Moreover, absolute majority typically allows the winner to appoint both the *board chairman* (equivalent to the mayor of the municipality) and the *council chairman* (equivalent to the speaker of the local council). Avoiding this concentration of power might be driving many parties to coalesce.

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[8]Carroll and Cox (2007) propose a link between PECs and post-electoral bargaining outcomes. Similarly, Bandyopadhyay, Chatterjee, and Sjöström (2011) presents a formal model of PECs where parties can commit to seat-sharing agreements. They show that even ideologically distant parties may coalesce if there are potential post-electoral benefits of forming an electoral coalition. Christiansen, Nielsen, and Pedersen (2014), Debus (2009), and Eichorst (2014) also study the role of PECs in post-election bargaining.

Coalescing might also allow parties to reach an absolute majority of seats. A party that is just below such an important threshold might have an incentive to coalesce with another (possibly much smaller) party to ensure the coalition obtains an absolute majority of the seats. The large party in the coalition might, under these circumstances, be ready to offer a big reward to the smaller party in the coalition in exchange for the pivotal role it plays. This last motivation could also explain why being part of a PEC might greatly improve the chances of smaller parties obtaining leadership positions.

Hypothesis 4 ***(Absolute majority)*** *PECs decrease the probability of a single party obtaining an absolute majority. And, PECs increase the probability coalescing parties obtain an absolute majority of the seats.*

Institutional Context and Data

We test the empirical predictions in the context of Finnish local politics. This section describes the Finnish political and institutional environment as well as the data we use in our empirical analysis.

Local Politics in Finland

Decision-making in Finnish municipalities is led by local councils which are responsible for their operation and economy.[9] Decisions are taken by a simple majority of the council members giving parties with absolute majority full control of municipal activities.

Councils are elected using an open-list at-large proportional representation election system. Municipal elections take place every four years, on the fourth Sunday of October. A voter votes for a single individual candidate and not directly for a party. Seats in the municipal council are distributed using the D'Hondt method: the number of seats for a political party depends on the total number of votes received by its candidates, and the seat allocation within the electoral list depends on the number of votes received by each

[9]Municipalities have a very important role in the Finnish system. In our 1996-2012 data, they spend about 5,500 euro per capita annually, on average (in 2012 prices). The majority of this expenditure is used to take care of statutory responsibilities, including social care, health care and primary education. To cover these expenditures, Finnish municipalities are allowed to collect income taxes, property taxes and out-of-pocket payments from users of municipal services. In addition, municipalities receive a share of corporate taxes and fiscal grants from the central government.

candidate. The number of seats in each municipal council is a deterministic step function of the population in the municipality, and it varies between 13 and 85 with a median of 27.

Finland has a multi-party system. Municipal elections held between 1996 and 2008 were dominated by three large parties from the political left, center, and right: the Social Democratic Party, the Center Party, and the National Coalition Party, respectively. In 2012, the populist party True Finns became the fourth largest party. Other parties that hold seats in both municipal councils and national parliament include the Left Alliance, the Green Party, the Swedish People's Party and the Christian Democrats. Many municipalities have local, often independent or one-agenda political groups, that are not registered parties but hold seats in local councils—these groups cannot form pre-electoral coalitions and are not part of our analysis. About one third of the municipalities are governed by single-party absolute majorities despite the proportional representation system (Meriläinen 2019). The Center Party is usually the party that holds the absolute majority in smaller rural municipalities; while the Swedish People's Party holds an absolute majority of seats in many coastal regions, where the majority of the Swedish speakers live.

Parties are allowed to form PECs in local elections. In the Finnish context, forming a PEC simply means that the parties set a joint list of candidates. A PEC between two or more parties is treated as a single party list when assigning votes to seats. Coalescing parties appear as separate parties on the candidate list provided to the voters at the polling booths, but the list clearly indicates the pre-electoral alliances that are in place. For an illustrative example, see Figure 2 that shows the candidate list in the Evijärvi local government election of 2017 where the Social Democrats and the Left Alliance as well as the Center Party and the Christian Democrats formed PECs.[10]

After the election, the newly elected council appoints a municipal executive board where parties are represented according to their seat shares in the council. The council elects by majority rule the *chairman of the municipal board*, which is considered to be the most important local political office (a "local prime minister"), and the *chairman of the council*, which is considered to be the second most important

[10]The order of parties (or PECs) on the candidate list is determined by lottery. Similarly, the order of parties within a PEC is randomised. The norm is that candidates are presented alphabetically within party lists—parties are allowed to move away from alphabetical order but this rarely happens.

position.[11] The council can also set up committees to deal with different functions of the local government. No official ruling coalition government is formed after the election, though sometimes parties may form informal coalitions. Councils vote on an issue by issue case, and post-electoral voting coalitions may change from one vote to another.

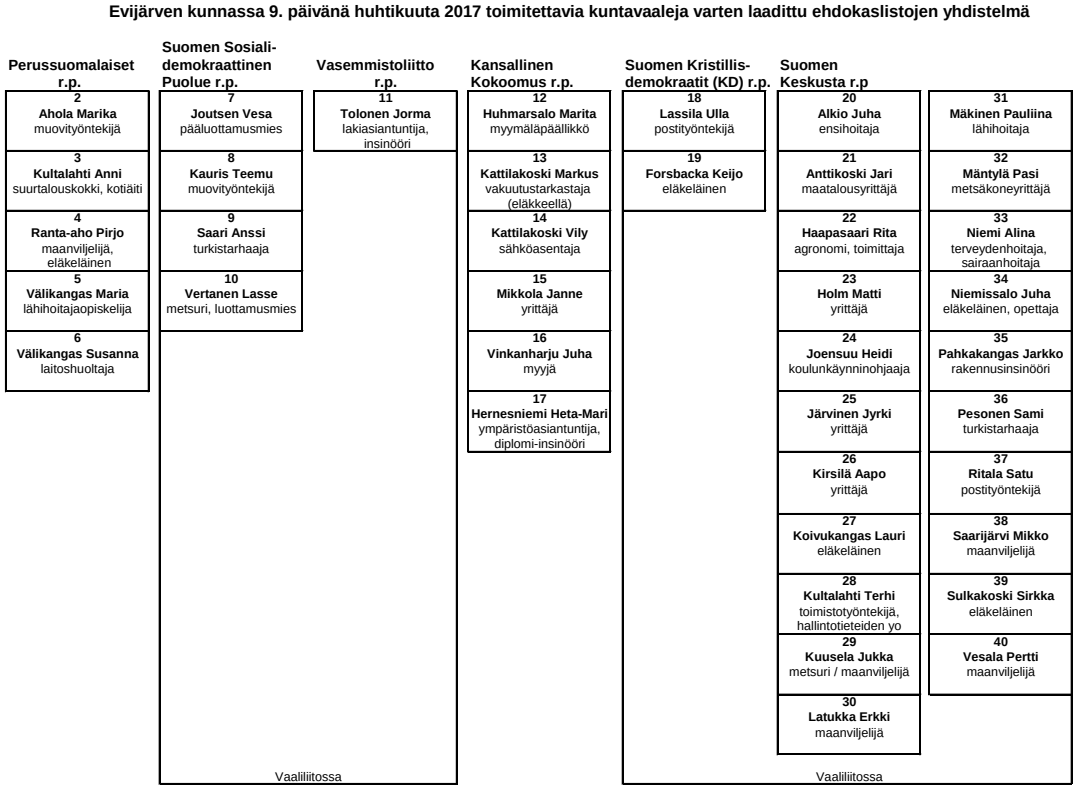

Figure 2. Candidate list in Evijärvi local government election of 2017.

Notes: Parties from left to right are the Finns Party, the Social Democratic Party, the Left Alliance, the National Coalition Party, the Christian Democrats, and the Center Party. Lines connecting the parties indicate PECs that have been formed by the Social Democrats and the Left Alliance, and the Christian Democrats and the Center Party. Candidate numbers, names, and occupations are shown in boxes.

[11] See Meriläinen and Tukiainen (2021) for more information on the selection of the executive board, and Meriläinen and Tukiainen (2018) on the selection of political leaders in Finnish local politics.

Data and Variables

The main body of our data consists of election results for all Finnish local elections held between 1996 and 2012, obtained from the Ministry of Justice. We report the detailed summary statistics on our data in Appendix Table A1. We restrict our attention to registered political parties and rule out all independent (local) groups which are not allowed to form PECs. We examined the votes and seats of all parties and obtain $11,063$ observations of the party-election year. Around 16% of all parties are part of an electoral coalition.

We complement the election results with information from two data sources. First, we obtained data on the party of local political leaders (council and board chairmen) for the years 2000-2012 from the Finnish Association of Local Authorities (Kuntaliitto 2013). Second, we measured party ideology with the *voting aid application* from the public broadcasting company YLE. Voting aid applications are interactive online surveys that election candidates can fill in before the election. Voters can then answer the survey and find the candidate who best matches their policy preferences. These surveys are well-incentivised expert surveys on candidates—the use of such tools is widespread. For instance, a survey found that 40% of Finnish voters used a voting aid application prior to the 2007 parliamentary election (Wagner and Ruusuvirta 2012). Our voting aid application data come from the 2012 municipal election. These data contain a number of questions related to the local public sector and answers to these questions from roughly half of the electoral candidates. Using this data, we compute a measure of parties' economic ideology, which is arguably the most important area of policy-making in Finnish local politics.[12]

For some of our analysis, we collapse our electoral results to the municipality level. After doing so, we are left with $1,914$ municipality-year observations. In 692 cases, we see various parties forming PECs.

The municipality-level data serve us to test both the causes and consequences of PECs. When looking at the conditions under which PECs are more likely to form, our *signalling hypothesis* is easily tested with the *number of parties* in the municipality. In order to test our *disproportionality hypothesis*, we could use the usual 'district magnitude' variable which in our case would correspond to the number of seats in the

[12]In order to compress the data into a one-dimensional measure of ideology, we follow a standard practice in the literature and use a principal component analysis (Ansolabehere, Snyder, and Stewart 2001; Heckman and Snyder 1997). The first principal component captures the economic ideology of candidates. The higher the score, the more the party leans to the right. For further details, we refer to Appendix B.

municipal council. However, this variable fails to capture the disproportionality that might be present in a particular municipality due to the exact distribution of votes. Instead, we use a more accurate measure of disproportionality for each of our observations, namely, the modified Gallagher index (see Koppel and Diskin 2009).[13] This measure captures the difference between the percentage of votes and the percentage of seats that each party receives. The larger the number, the more disproportional the representation in a particular municipality.

We are also interested in political polarisation at the local level and how this might help or damage the likelihood of coalitions. We measure ideological dispersion in municipalities at a point in time as follows: $Polarisation_{mt} = \sum_p v_{pmt} |x_{pmt} - \hat{x}_{mt}|$, were, v_{pmt} and x_{pmt} are the vote share and ideological position (resp.) of party p in municipality m at time t; $\hat{x}_{mt}$ is the vote-share weighted average of policy positions.

We are also interested in understanding the electoral consequences of PECs in terms of the distribution of political power. From the electoral data we observe the number of parties with elected representatives and the distribution of seats. Descriptive statistics in Appendix Table A1 suggest that elected councils look different in places that have PECs versus those that did not have any. For instance, more parties are

[13]The Gallagher index is attractive because of its intuitive meaning and of ease of calculation, but Taagepera and Grofman (2003) argued that it fails to satisfy some relevant axiomatic properties that other indices achieve (e.g. Dalton's principles of transfers, scale invariance, orthogonality). Therefore, we use the modified Gallagher index in our empirical analysis. Formally, this index is defined as

$$Disproportionality_{mt} = \sqrt{\frac{1}{2} \times \sum_p \left(\frac{s_{pmt}}{\sqrt{\sum s_{pmt}^2}} - \frac{v_{pmt}}{\sqrt{\sum v_{pmt}^2}} \right)^2},$$

where s_p is the vote share of party p in municipality m at time t, and v_p is its vote share. Koppel and Diskin (2009) formalised the analysis by Taagepera and Grofman (2003) and actually showed that the modified version of the Gallagher index satisfies all the relevant properties. In the appendix, we show our analysis is not robust to considering the effective electoral threshold as a measure of disproportionality following Golder (2006b).

represented in the local council, parties' seat shares are less concentrated as measured by the *Herfindahl index*[14], the largest party is smaller, and it is less likely that there is an absolute majority.

Causes of Pre-Electoral Coalition Formation

We start by evaluating how the characteristics of the political environment within the municipality shape coalition formation. This part of our empirical investigation complements and supports Golder's seminal work on PEC formation (Golder 2005, 2006b). Because we are using municipality-level variables, our analysis deviates from that of Golder (2005, 2006b) who uses dyadic data to test for these hypotheses.[15] In our specification, we collapse the data to the municipality level and use OLS to estimate the connection between the presence of PECs and different variables characterizing the electoral conditions.

Consider first our *signalling hypothesis* that suggests that an increase in the number of parties should be associated with an increased likelihood of having electoral coalitions. This should happen no matter how disproportional the electoral system is and despite the level of polarisation. The coefficient of *Number of parties* is systematically positive and statistically significant, suggesting that having one more party is associated with a 8 to 14% increase in the probability that a municipality has a PEC. The correlations are in line with our *signalling hypothesis* (Hypothesis 1). We also find support for our *disproportionality hypothesis* (Hypothesis 2): political parties are more prone to form an alliance when the electoral system is more disproportional. [16]

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[14]The Herfindahl index is computed as the sum of squared seat shares divided by 100, thus varying between 0 and 100. A larger value reflects more concentrated political power.

[15]Given that the theoretical predictions concern the political context instead of the characteristics of potential coalition partners, aggregated data is better-suited than dyadic data to this study. However, dyadic data can be helpful in reconciling the aggregate-level findings. We return to this in the last part of our analysis.

[16]In the appendix, we present results from a specification with municipality and year fixed effects which allow us to hold all time-invariant municipality-level characteristics and time-specific common shocks constant (Appendix Table C2). Given that many features of the local political context are rather persistent, including municipality fixed effects leaves us with considerably less identifying variation. Indeed, while we

Previous work has argued that polarisation should be related to the likelihood of coalescing (Golder 2006a,b)—when there are large ideological differences, the incentives to coalesce and increase seat shares are maximised. However, we do not find a significant positive correlation between the level of polarisation and the propensity to coalesce. Contrary to what Golder (2005) labels as the conditional disproportionality hypothesis, we do not observe that a disproportional electoral system should increasingly affect the likelihood of PECs when there are many parties in the municipality (column 2) nor when the municipality is very polarised (column 4). The latter is motivated by the idea that political power is more valuable when the competing parties would implement very different policies. We observe the opposite to be true: polarisation only affects the likelihood of PECs when the apportionment of seats in the municipality is *very* proportional (see the negative and significant coefficient in column 4 together with the positive coefficient on the polarisation variable). For completeness we also look at the last two-way interaction for which we had no precise prediction. We find no interaction effect between the number of parties and polarisation.

Table 1. Testing disproportionality and signalling hypotheses.

	(1)	(2)	(3)	(4)
Number of parties	7.605***	9.543**	7.711***	7.798***
	[0.757]	[4.809]	[0.946]	[0.756]
Disproportionality	38.997***	48.185**	38.524***	52.364***
	[8.384]	[20.080]	[9.274]	[9.448]
Polarisation	-2.003	-1.908	-1.344	36.450*
	[1.670]	[1.676]	[4.794]	[19.958]
Number of parties × Disproportionality		-2.104		
		[5.026]		
Number of parties × Polarisation			-0.089	
			[0.564]	
Disproportionality × Polarisation				-40.635*
				[20.826]
N	1884	1884	1884	1884
R^2	0.11	0.11	0.11	0.11

Notes: The dependent variable is an indicator for at least two parties forming a PEC, multiplied by 100. Standard errors clustered at the municipality level are reported in brackets. The estimation sample only includes municipalities that have at least three political parties. *, ** and *** denote statistical significance at 10%, 5% and 1%, respectively.

still find a strong relationship between the presence of PECs and the number of political parties, the result we have for disproportionality vanishes.

Consequences of Pre-Electoral Coalition Formation

The hypotheses on PEC formation are in many cases based on speculation concerning their effects. Therefore, our results regarding PEC formation are at best indirectly informative about the effects of PECs. Moreover, they are not based on quasi-experimental identification strategies. We will next zoom in and ask what are the actual effects of joining a PEC at the party level. By doing so, we are able to study whether the underlying assumptions of the hypotheses we tested in the previous section are correct, and test for further theoretical predictions. In particular, this section examines how coalitions benefit or hurt political parties, and under what conditions.

In order to identify the effects of PECs on political outcomes at the local party level, we estimate a generalised differences-in-differences specification that takes the form

$$y_{mpt} = \beta PEC_{mpt} + \gamma Seat\ share_{mp,t-1} + \alpha_{mp} + \alpha_t + \varepsilon_{mpt}. \quad (1)$$

Here PEC_{mpt} is a dummy for party label p belonging to a PEC in election t in municipality m, α_{mp} is a local party label fixed effect (that is, municipality times party fixed effect), α_t is an election year fixed effect and ε_{mpt} is the error term. The estimate of our central interest is $\hat{\beta}$. It tells us the effect of forming a PEC on the outcome y_{mpt}.

The standard identifying assumption in a difference-in-differences strategy is that the outcomes in the coalescing parties would have evolved in the same way as before, had they not formed a coalition. If this assumption does not hold (e.g., there are unobservable time-varying factors driving the coalition formation that also affect our outcomes of interest), the estimates ought to be treated just as conditional correlations.[17] A crucial time-variant factor that may shape both the outcome and propensity to join a coalition is party size: parties become less likely to coalesce the larger they are, but larger parties also tend to fare better in elections and the subsequent bargaining process. Thus, all our regressions control for party size, which we measure as the seat share the party obtained in the previous local election, $Seat\ share_{mp,t-1}$.

[17] In Appendix C, we provide a validity test in which we rerun our difference-in-differences analyses controlling for party- or municipality-specific linear time trends. This does not alter any of our causal findings. Moreover, we run regressions including a lead and a lag of the treatment variable to test for common pre-treatment trends.

Table 2. Effects of forming a PEC.

	Vote share		Seat share		Vote concentration	Board chair	Council chair
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PEC	-1.008***	-0.432	-0.491**	0.033	8.241***	0.008	-0.010
	[0.180]	[0.304]	[0.211]	[0.344]	[1.212]	[0.009]	[0.010]
Seat share (t-1)	0.152***	0.153***	0.119***	0.119***	-0.356***	0.002*	0.002
	[0.019]	[0.019]	[0.019]	[0.020]	[0.041]	[0.001]	[0.001]
PEC × Ideological range		-0.728**		-0.660**			
		[0.294]		[0.328]			
PEC × Seat share (t-1)					-0.233***	-0.002**	0.003**
					[0.037]	[0.001]	[0.001]
N	8081	8072	8081	8072	8081	8081	8081
Adjusted R^2	0.96	0.96	0.95	0.95	0.76	0.67	0.63
Mean of dependent variable	17.31	17.32	17.40	17.42	23.81	0.17	0.18

Notes: Vote and seat shares are measured in percentages. Chairmanship is an indicator variable that gets the value one if the party holds either board or council chairmanship (or both). The dependent variable in column (6) is Herfindahl index of within-party vote share concentration. Regressions control for the number of candidates relative to the council size, and year and party group fixed effects. Standard errors clustered at the local party level are reported in brackets. *, ** and *** denote statistical significance at 1%, 5% and 10%, respectively.

In order to analyze heterogeneous effects of electoral coalitions, we interact PEC_{mpt} with ideological differences within the coalition and the party p's seat share in the previous election. The former variable is simply computed as the distance between party p's ideological position and the position of the party within the coalition that is most ideologically distant.

We report the party-level difference-in-differences results in Table 2. Perhaps a somewhat surprising notion is that voters seem to punish parties for forming coalitions (column 1). This is at odds with the hypothesis that coalitions are formed for cost-sharing purposes which, in turn, should lead to an increase in coalescing parties' vote shares as resources should be more efficiently used to target voters (Dhillon 2003; Montero 2016; Osborne and Tourky 2008). Furthermore, this suggests that farsighted parties are not seeking votes when forming coalitions.

Our evidence also points towards ideological voting: on average, voters do not appear to punish coalescing parties that are ideologically similar yet punish parties that coalesce with ideologically distant parties (column 2). The latter provides support for *equal partners hypothesis* (Hypothesis 3): parties do not have any incentive to coalesce with ideologically distant parties when voters are punishing this behaviour.

Forming a coalition has a negative statistically significant effect on seat shares (column 3)—though the effect is half the size the one on vote share. This suggests that the mechanical electoral economies of scale overcome to some degree the punishment that parties receive in terms of votes. Once again we see that the

negative effect is concentrated on coalescing parties that are ideologically distant from each other (column 4).

Both results on votes and seats suggest that some parties have a poor judgement when forming coalitions as they do not seem to anticipate the negative consequences of such coalitions. Alternatively, parties might have alternative motivations to form coalitions, which we aim to uncover in the next section.

We are also interested in investigating whether we can see any traces of strategic voting amongst voters of coalescing parties. In column (5), we report that joining a PEC leads to a less dispersed within-party vote distribution. We measure this with a Herfindahl index of the within-party vote shares. The interaction between joining a PEC and party size has a negative effect on vote concentration, indicating that smaller parties within coalitions are the ones attracting more concentrated votes. Concentrating votes is easier in smaller parties with typically shorter candidate lists. Moreover, smaller parties have stronger incentives to coordinate as this might guarantee the election of an extra candidate from their list within the assignment of seats to the coalition (see Saarimaa and Tukiainen (2016) for a similar argument and results).

Finally, we analyse the impact of forming a PEC in the assignment of leadership roles at the municipal level. Column (6) in Table 2 shows that coalescing large parties are less likely to obtain the top position in local government: the board chairmanship. This might be a sign of the agreements that happen prior to the election to agree on forming a coalition. Finally, column (7) shows instead that coalescing large parties are more likely to obtain the council chairmanship.

Note that the difference-in-differences analysis only includes parties that participate in at least two elections to facilitate the estimation with local party fixed effects. We confirm that our results are robust to only including political parties that are (or have been at some point) part of an electoral coalition in Appendix Table C3. This robustness check ensures control and treatment groups are as comparable as possible.

Consequences of PECs on the Distribution of Power

We do not seem to find evidence that being part of a PEC brings major benefits to any party. However, there might be effects that are not observed at the party level. We conclude our empirical analysis by asking what are the effects of PECs at the government level. By doing so, we tackle our *absolute majority hypothesis* (Hypothesis 4) from multiple angles.

We again estimate a difference-in-differences specification to understand the role PECs play in the distribution of political power in local governments. We aggregate our data to the municipality-term level. The regression central to our interest takes the following form:

$$y_{mt} = \gamma PEC_{mt} + \delta_m + \delta_t + \mu_{mt}. \quad (2)$$

where PEC_{mt} is now defined as a dummy that is equal to one if there is a PEC in municipality m in election t. δ_m and δ_t are municipality and time fixed effects, respectively, and μ_{mt} is the error term. Our estimation sample covers all municipalities that are observed at least twice.

Our aim is analysing the overall distribution of seat shares when a PEC is present. Do PECs alter the number of parties that obtain representation in the municipality (*Parties*)? Do they affect the concentration of the seat distribution in the municipality as captured by the Herfindhal index (*Seat concentration*)? Do they influence the seat share of the biggest party in the municipality (*Max. seat share*)? Or do they change whether a party obtains an absolute majority of seats (*Absolute majority*)? All of these questions help us understand the overall distribution of power in the municipality and whether PECs have an effect on it.

Table 3 presents our results. When parties form PECs, the number of political parties represented in the local council increases by about 0.3 parties (column 1); political power becomes less concentrated (column 2); and, the largest party's seat share decreases thus reducing the concentration of power on the most voted list (column 3). This last effect is rather small, about 0.8 percentage points, but recall that a small decrease could be crucial for some margins—in particular, the absolute majority threshold. However, we do not find any significant evidence that PECs would make absolute majorities any less likely even if the coefficient is negative (column 4).

Detailed Analysis of Close Elections

While the reduction in the maximum seat share is quite small, it could be critical for the largest party to obtain an absolute majority. We want to explore further regarding the possibility of parties coalescing in order to avoid the absolute majority of a rival party. We start with a graphical illustration of our argument.

We plot the distribution of the largest party's seat share in three different scenarios in Figure 3. First, Panel A shows the distribution of the seat share in municipal elections with no coalitions. We see that there is no major jump in the density close to the 50% threshold. Second, in Panel B, we show the distribution

Table 3. Effects of PECs at the local government level.

	Parties	Seat concentration	Max. seat share	Absolute majority
	(1)	(2)	(3)	(4)
PEC	0.312***	-136***	-0.785**	-0.007
	[0.051]	[36.6]	[0.361]	[0.020]
N	1907	1907	1907	1907
Adjusted R^2	0.20	0.13	0.16	0.04
Mean of dependent variable	4.87	3455	48.17	0.40

Notes: Coalition is an indicator variable that gets the value 1 if there is at least one PEC in a municipality, an 0 otherwise. Herfindahl refers to a Herfindahl index of the seat shares of the parties that are represented in the local council. All regressions include year and municipality fixed effects. Standard errors clustered at the municipality level are reported in brackets. *, ** and *** denote statistical significance at 1%, 5% and 10%, respectively.

for municipalities that have PECs: it exhibits a slightly different shape. There is a downward jump in the density at the cut-off for the largest party obtaining an absolute majority. The graphical evidence strongly points towards PECs sometimes being successfully used to prevent absolute majorities. Third, as a placebo check in Panel C, we consider the municipalities plotted in Panel B and reallocate the seats based on the parties' votes as if there had been no PEC. We then plot the distribution of the largest party seat share and observe no change in the density when we pass the 50% seat share threshold suggesting that around the 50% threshold, PECs have an impact on whether the party that receives the most votes obtains an absolute majority of seats or not.

We address the possibility that PECs can act as an efficient tool in preventing absolute majorities in close elections formally using a density discontinuity test. We follow an approach typically used in regression discontinuity design settings to test for potential manipulation of the running variable. To operationalise this test, we adapt the testing strategy proposed by Cattaneo, Jansson, and Ma (2019) by implementing a robust bias-corrected density test. This means that we find a local polynomial fit for the density curve on both sides of the threshold and then calculate the jump in density at the cutoff point.

The density test results can be found in Table 4 which reports the density test statistics, associated *p*-values, as well as a test for a difference in estimated discontinuities. A negative test statistic implies a jump

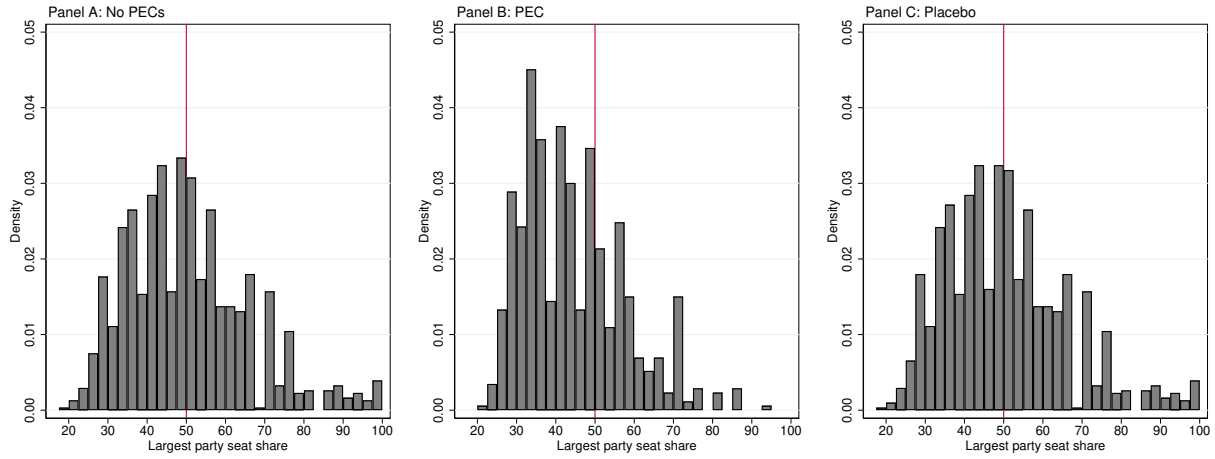

Figure 3. Distribution of largest party's seat share.

Notes: The figures show histograms of the largest party's seat share. The placebo seat shares in Panel C are calculated by reassigning the seats according the D'Hondt method, assuming that there were no PECs in municipalities where there actually are PECs.

downwards at the cut-off.[18] We conduct the test using different degrees of polynomials, and we also vary the window around the cutoff point.[19] Echoing the graphical illustration in Figure 3 we find that there is a downward jump in the density of maximum seat share at the 50% cut-off when there are PECs. While these jumps are not always statistically significant, they systematically have a negative sign. Most of the density test results in the case of no alliances suggest no statistically significant jump at the threshold. Moreover, the density discontinuity test statistic is usually positive, unlike in the PEC sample. We also report the differences in discontinuities and test whether they are statistically significant. While the differences always have an expected (negative) sign, they are significant only for two of the specifications.

[18]Formally, the test statistic is given by

$$T = \frac{\hat{f}_+(\bar{x}) - \hat{f}_-(\bar{x})}{\sqrt{\hat{\sigma}_+^2 + \hat{\sigma}_-^2}},$$

where $\hat{f}_+(\bar{x})$ and $\hat{f}_-(\bar{x})$ are estimates of the density at the boundary point $\bar{x}$ and $\hat{\sigma}_+^2$ and $\hat{\sigma}_-^2$ are the standard errors of these estimates. Under certain conditions, the finite sample distribution of T can be approximated by the standard normal distribution.

[19]We optimise the bandwidths in two alternative ways. We either use either MSE-optimal bandwidths that vary on different sides of the cutoff, or restrict the bandwidth to be the same on both sides.

We then construct a placebo distribution of the largest party seat shares. We do so by taking municipalities that had PECs but distribute the seats according to the D'Hondt rule as if there were no alliances. The placebo distribution shows no hints of discontinuities close to the absolute majority threshold, as we verify more formally in Appendix C. This suggests that these PECs were able to prevent absolute majorities. As a further validity check, we explore covariate smoothness at the 50% seat share cutoff. We report and discuss these results in detail in Appendix C (see Table C9).

We summarise the key conclusion from the density discontinuity test graphically in Figure 4. The graph shows a non-parametric density fit under three scenarios: when there are no PECs (Panel A), when at least one PEC has been formed (Panel B), and a placebo test where we take data from the municipalities with PECs but redistribute the seats assuming that there were no alliances (Panel C). There is no jump at the cutoff when there are no PECs or when we look at the placebo distribution, but the density has a downward jump at the 50% seat share cutoff in municipalities that do have PECs.

Table 4. Density discontinuity test results.

Panel A: Separate bandwidths for each side

	PEC				No PEC				Difference in	
	$\hat{h}_-$ (N_-)	$\hat{h}_+$ (N_+)	T	p	$\hat{h}_-$ (N_-)	$\hat{h}_+$ (N_+)	T	p	discontinuities	p
$T_2(\hat{h}_1)$	3.660 (70)	2.603 (37)	-1.308	0.191	4.381 (150)	3.460 (129)	-2.251	0.024	-0.012	0.832
$T_3(\hat{h}_2)$	6.947 (107)	9.017 (112)	-3.331	0.001	9.761 (325)	7.739 (228)	1.892	0.059	-0.146	0.000
$T_4(\hat{h}_3)$	12.442 (225)	14.116 (142)	-2.612	0.009	10.378 (336)	11.278 (280)	0.266	0.791	-0.082	0.049

Panel B: Same bandwidth for both sides

	PEC				No PEC				Difference in	
	$\hat{h}_-$ (N_-)	$\hat{h}_+$ (N_+)	T	p	$\hat{h}_-$ (N_-)	$\hat{h}_+$ (N_+)	T	p	discontinuities	p
$T_2(\hat{h}_1)$	7.330 (135)	7.330 (99)	-1.442	0.149	4.381 (150)	4.381 (147)	0.2641	0.792	-0.020	0.351
$T_3(\hat{h}_2)$	6.879 (107)	6.879 (74)	-0.981	0.327	7.739 (249)	7.739 (228)	0.1912	0.848	-0.043	0.350
$T_4(\hat{h}_3)$	14.116 (277)	14.116 (142)	-1.165	0.244	10.378 (336)	10.378 (278)	0.2402	0.810	-0.038	0.347

Notes: The density test is conducted using `rddensity` package in Stata. $T_p(h)$ denotes the manipulation test statistic using pth order density estimators with bandwidth choice $h = (h_-, h_+)$. We employ uniform weighting (rectangular kernels) and vary the degree of local polynomials used. Moreover, we use two alternative ways to compute the optimal bandwidths $\hat{h}_p$. In Panel A, we use different bandwidths on different sides of the cut-off (bandwidth selection procedure `comb`), and the same bandwidth on both sides of the cut-off in Panel B (bandwidth selection procedure `sum`). N_- (N_+) is the effective number of observations on the left-hand (right-hand) side of the cut-off.

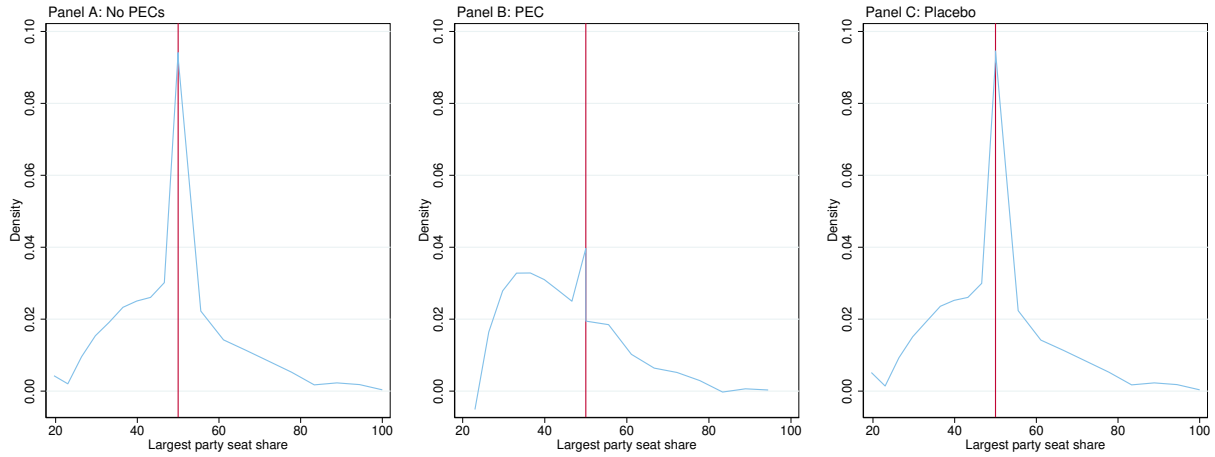

Figure 4. Graphical illustration of the density discontinuity test.

Notes: The figures show fitted distributions of the largest party's seat share following the approach proposed by Cattaneo, Jansson, and Ma (2019). The placebo seat shares in Panel C are calculated assuming that there were no PECs in municipalities where there actually are.

Reality Check: Lessons from Dyadic Data

A different way to look at our data is by assessing which party characteristics are most conducive to PECs. This analysis serves as an important sanity check. The results thus far suggest that an important goal of PECs is to exploit "electoral returns to scale" and prevent the largest party from obtaining an absolute majority. We have also shown that PECs lead to a more concentrated within-party vote distribution. However, we could still learn more about the characteristics of coalescing partners. We examine this below.

Dyadic Data and Variables

Using the party-level data, we construct all possible two-party combinations to study what kind of parties are more likely to coalesce with each other. Overall, there are almost 30,000 potential coalition pairs, and only around 1,100 become actual PECs. Focusing on two-party cases seems reasonable, as PECs are usually small, measured by the number of parties involved. Out of 794 PECs in our data set, 672 involve two parties, 96 three parties and 22 four or more parties. The largest electoral coalition we observe is formed by six parties.[20] Most typical alliances are formed between the Center Party and the Christian Democratic Party (235 instances), the National Coalition Party and the Christian Democratic Party (104 instances), and the Social Democrats and the Left Alliance (85 instances).

For the purposes of our empirical analysis below, for each pair of parties we define *Coalition size* as the sum of parties' lagged seat shares. If a party did not run in $t-1$, its size is coded as zero. Variable *Asymmetry* captures the asymmetry amongst coalition partners, i.e. the absolute value of the difference in party sizes divided by the sum of party sizes. We code this variable as zero if both parties had zero seats in the previous election. The resulting metric varies between zero and one, a higher value reflecting a more asymmetric coalition.

We also construct a dummy variable *Majority* that is equal to one if both parties would expect to obtain an absolute majority based on their past seat shares. This allows us to test the hypothesis that asymmetric coalitions may form if they are likely to obtain an absolute majority and a full control over policy-making (Ibenskas 2015). In order to capture the relevance of the critical 50% threshold, we also define a variable capturing how far the coalition is from such a threshold: *Distance from majority* is defined as

[20]Parties that form coalitions with more than two parties are accounted for multiple times in our data.

$|50\% - \textit{Coalition size}|$. This measure captures whether coalitions are close to achieving an absolute majority. Interacting it with *Majority* results in a piecewise linear fit that allows us to evaluate whether the propensity to coalesce peaks when the coalition is likely to reach an absolute majority of seats (while it does not need to overshoot that threshold).

Finally, we measure the ideological (in)compatibility of two potential coalition partners by the difference in their ideologies.[21] We call this variable *Ideological range*.

Estimation Results

We start by asking whether expecting to reach a majority or seats (or being close to it) is associated with the probability of two parties forming an alliance. Column (1) of Table 5 regresses an indicator variable for two parties forming a PEC on the *Distance from majority* variable, an indicator for the coalition reaching an absolute majority of seats and an interaction of these two terms. The coefficient for reaching a majority of the seats (based on the previous election's seat shares) is positive but not statistically significant. The positive and significant coefficient for *Distance from majority* and the negative and significant coefficient for it's interaction with *Majority* shows that the propensity to coalesce peaks when the dyad can *just about* form a majority. This is natural as when the distance is large, it is likely that one party could reach an absolute majority of seats on its own—and thus would not need to coalesce with anyone. This specification demonstrates coalitions not wanting to maximise seat share but instead maximise the probability of obtaining an absolute majority of seats.

Consider then the results reported in column (2) where we examine the role of size of the expected coalitions, size asymmetry, and their interaction. Given the negative coefficient of *Coalition size*, we can conclude that PECs are less likely to form between large parties. Similarly, as predicted by our *equal partners hypothesis*, similarly sized parties are more likely to coalesce. The interaction term tells us that only when the coalition size is large enough can we expect asymmetric coalitions (i.e. a large party coalescing

[21] Comparing realised and non-realised coalitions reveals that coalitions are more common among ideologically close parties (see Appendix Table A1 for summary statistics). However, it seems that their expected size is smaller than the size of potential two-party coalitions that did not form. There appear to be no differences in terms of asymmetry. We will return to these comparisons below in a more sophisticated regression framework.

with a small one). In column (3), we replace coalition size with the dummy variable indicating whether the two parties together can reach an absolute majority of the seats. Once again, size asymmetry is negatively correlated with the probability of two parties forming a PEC, two parties of a similar size are also less likely to coalesce if they expect to get a majority of the seats together, but this negative association is diluted by size asymmetry. In other words, two parties that expect to get an absolute majority of the council seats become more likely to join forces the more different their electoral support is.

Last, we investigate the role of ideology in PEC formation. We find strong support for the prediction that ideologically proximate parties are more likely to coalesce in column (4) where we regress an indicator for two parties belonging to the same PEC on their ideological distance. As suggested by our *equal partners hypothesis*, the larger the ideological distance between two parties, the less likely they are to become a PEC.

Table 5. Dyad-level determinants of PEC formation.

	(1)	(2)	(3)	(4)
Distance from majority	0.036***			
	[0.011]			
Majority	0.314		-5.243***	
	[0.479]		[0.464]	
Distance from majority × Majority	-0.118***			
	[0.019]			
Coalition size		-0.129***		
		[0.011]		
Asymmetry		-3.686***	-1.209**	
		[0.669]	[0.474]	
Asymmetry × Coalition size		0.147***		
		[0.016]		
Asymmetry × Majority			5.523***	
			[0.777]	
Ideological range				-3.320***
				[0.150]
N	23499	23499	23499	28381
R^2	0.00	0.01	0.00	0.02

Notes: The dependent variable is an indicator for two parties belonging to a PEC, multiplied by 100. Standard errors clustered at the election level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1%, respectively.

Discussion and Concluding Remarks

In this paper, we study the logic of PEC formation and their effects. We analyze the process descriptively, but more importantly, we provide some of the first causal evidence of the direct benefits and costs of forming PECs for political parties. The two parts of our analysis are like two matching pieces of a puzzle. First, the descriptive analyses reveal that PECs are more likely to occur (possibly to signal the intention for future cooperation) when there are more parties in an election. Analysing the causal effects of PECs at the level of local governments shows that they, indeed, shape the distribution of political power and influence which parties govern. Second, we find evidence suggesting that parties are more likely to coalesce in more disproportional electoral environments. Looking at the effects of PECs helps us understand why. Third, the expected coalition size and size asymmetry matter as well. The party-level results offer a rationale for why parties avoid asymmetric coalitions: they are more prone to strategic voting. Fifth, our analysis of the dyadic data shows that PECs are less likely when parties are ideologically distant from each other. Additionally, the difference-in-differences results show that parties that join ideologically heterogeneous coalitions get punished by voters.

Taken together, our results indicate that coalition formation does not appear to be driven by purely vote-seeking motivations. Policy motivations appear to be more prevalent than the motivation to gain office, at least in part, because ideological proximity is an important determinant of PECs. Furthermore, PECs do not have a large impact on seat shares. Most importantly, we find that PECs prevent absolute majorities from forming. That is, PECs affect the overall distribution of power.

Our analysis has important lessons when thinking about party formation. The incentives created by the electoral rules and voter responses are similar in both cases. For example, we can conjecture based on our results that voter ideology and electoral rules combine to create natural boundaries for the parties (Grofman 2008; Matakos et al. 2018). Moreover, the party formateurs are likely to consider how creating or destroying parties affects the overall distribution of political power, not only the expected individual vote shares.

Different motivations of coalition formation are, of course, not mutually exclusive. But there may be important trade-offs as suggested by Strøm (1990). Quantifying these trade-offs should help to shed further light on party behaviour (Helboe Pedersen 2012). Some authors have argued that policy-seeking parties are more likely to form coalitions (Ibenskas 2015; Kellam 2017; Wahman 2011). Assessing these type of questions using a structural econometric approach could be an interesting avenue for future research.

Such approaches have already been used to understand post-electoral coalitions by scholars (see (Diermeier, Eraslan, and Merlo 2003)). Some steps in this direction in the study of PECs have already been taken by Montero (2016) and Frey, López-Moctezuma, and Montero (2018).

Besides offering insights into the creation and destruction of political parties, our results can be useful for policy-making. Whether PECs should be allowed or not has been debated throughout the world. For instance, countries such as Estonia and Holland ban formal pre-electoral agreements. One argument against electoral coalitions has been that they may distort the electoral result and policies away from citizens' preferences. However, our paper indicates that PECs give parties an opportunity to guarantee a broader substantive representation of citizens' policy preferences, because they might help preventing absolute majorities. However, PECs may play a different role in different electoral systems. We thus end with a call for more comparative research on the effects of different types of PECs across different electoral contexts.

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Pre-Electoral Coalitions:

Insights into the Creation and Destruction of Parties

Supplementary Information

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Contents

A Descriptive Statistics

Our data set, obtained from the Ministry of Justice, covers all local elections held between years 1996 and 2012. We report the summary statistics on our data in Table A1. Panel A focuses on the party-level data. Around 16% of the parties are part of an electoral coalition. We see that the parties that are part of an electoral alliance are smaller both before and after the election than parties that do not belong to an pre-electoral coalition. Furthermore, they have more concentrated within-party vote shares, as measured by the Herfindahl index.

We also use data that are collapsed to the municipality level. We report the descriptive statistics for our municipality-level data in Panel B. These data are composed of $1,914$ municipality-year observations. In 692 cases, some kind of electoral alliance has been formed.

Using the party-level data, we construct a data set of all possible two-party dyads to study what parties are more likely to coalesce with each other. These data are summarized in Panel C. Out of around 30,000 potential coalition pairs, only about 4% become actual coalitions. Coalitions are more likely to actualise when parties are ideologically closer to each other. Furthermore, coalitions that are expected to be larger are less likely to form. Asymmetry of the party size does not appear to play a major role.

Table A1. Summary statistics

Panel A: Party-level data	Full sample			Parties in PECs			Parties not in PECs		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
Electoral alliance	11063	0.16	0.36	1741	1.00	0.00	9322	0.00	0.00
Vote share	11063	16.72	16.50	1741	12.27	14.78	9322	17.55	16.68
Seat share	11063	16.76	17.83	1741	12.54	15.58	9322	17.54	18.11
Herfindahl (within-party vote shares)	11063	26.08	27.15	1741	36.96	31.29	9322	24.04	25.80
Board chairman	8627	0.17	0.37	1252	0.13	0.34	7375	0.17	0.38
Council chairman	8627	0.17	0.38	1252	0.13	0.34	7375	0.18	0.38
Seat share (t-1)	8627	16.37	18.05	1252	12.16	15.52	7375	17.08	18.35
Panel B: Dyad-level data	Full sample			Actualized PECs			Non-actualized PECs		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
Actualized PEC	29939	0.04	0.19	1134	1.00	0.00	28805	0.00	0.00
Difference in ideology	28381	1.41	0.88	1040	0.71	0.52	27341	1.44	0.88
Expected size	23499	29.03	21.82	777	22.76	17.96	22722	29.25	21.90
Asymmetry	23499	0.63	0.35	777	0.62	0.37	21556	0.63	0.35
Panel C: Municipality-level data	Full sample			PECs			No PECs		
	N	Mean	Std. Dev.	N	Mean	Std. Dev.	N	Mean	Std. Dev.
PEC in municipality	1914	0.36	0.48	692	1.00	0.00	1222	0.00	0.00
Number of represented parties	1914	4.86	1.42	692	5.42	1.29	1222	4.54	1.38
Seat share Herfindahl index	1914	3460.05	1377.66	692	3087.82	1084.38	1222	3670.84	1478.22
Max. seat share	1914	48.21	15.00	692	44.48	13.07	1222	50.33	15.61
Absolute majority	1914	0.40	0.49	692	0.30	0.46	1222	0.46	0.50
Number of parties in election	1914	5.78	1.92	692	6.63	2.00	1222	5.30	1.69
Council size	1914	29.64	11.72	692	33.60	13.01	1222	27.40	10.27
Polarization	1886	3.08	1.19	688	3.28	1.31	1198	2.97	1.10

B Measuring Party Ideology

We measure party ideology using so-called voting aid application data from the Finnish public broadcasting company *Yle*. Voting aid applications are interactive questionnaires, the purpose of which is to assist voters in finding a candidate with similar policy preferences to theirs. Candidates fill out the survey before elections, after which voters can take the same survey to find a suitable candidate. The voting aid applications include a number of claims mostly related to the size of the public sector and redistribution, such as: "Privatizing public services makes them more efficient and saves money" and "We have paid too little attention to marginalization of children and teenagers". A stronger agreement with the first claim is associated with a more right-leaning ideology, whereas the stronger agreement with the latter two claims is related to a more liberal ideology. Overall, the data contain seventeen claims. The candidates would give their answers on a 1-5 scale (from "completely disagree" to "completely agree" where the middle option was "I do not agree or disagree").

We employ a principal component analysis to compress the survey responses into a single measure of economic policy preferences. This is a commonly used approach to extract a one-dimensional measure of ideology from survey data (Ansolabehere, Snyder, and Stewart 2001; Heckman and Snyder 1997). See also Matakos et al. (2019) for further information and as an example of another study using these data. The first principal component captures the left-right dimension of economic ideology and explains about 15% of the variation in the data. We focus on this dimension of ideology, as it is more central for decision-making in local governments.

Table B1 reports results of the principal component analysis alongside with the questions included in our data. Claims where a stronger agreement implies more right-wing attitudes get larger positive values, whereas the opposite is true for claims where a stronger agreement is in line with more left-wing preferences. We multiply the resulting principal component by minus one in order to have a smaller score for left-wing parties. That is to say, the resulting ideology measure is the smaller the more liberal is a candidate. Table B2 reports summary statistics by party.

Table B1. PCA results.

	Loading	Mean	Standard deviation
Q1. The elderly should have a universal right to a retirement home similar to one enjoyed now by children and daycare.	-0.12	0.82	1.01
Q2. Privatizing public services makes them more efficient and saves money.	0.35	2.58	1.17
Q3. We can increase the user fees for public health care services.	0.32	2.62	1.24
Q4. Our municipality should take in refugees arriving in Finland.	-0.30	1.47	1.27
Q5. If one of the parents is at home, the right for public day care to children should be limited.	0.37	1.74	1.33
Q6. We have paid too little attention to marginalization of children and teenagers.	-0.09	1.38	1.17
Q7. It is too easy to obtain welfare benefits nowadays.	0.42	2.46	1.13
Q8. It should be possible to recycle trash in the public trash cans in my municipality.	-0.14	0.69	1.01
Q9. Our municipality should invest more in the maintenance of roads.	0.08	1.38	1.15
Q10. We should compromise on environmental protection if it can improve employment or citizens' welfare.	0.29	2.75	1.18
Q11. There is room for increasing the property tax in our municipality.	-0.14	2.54	1.19
Q12. If our municipality is planning to have a municipal merger, there should be an advisory referendum	-0.10	1.09	1.34
Q13. The voting age in the local elections should be decreased to 16 years.	-0.09	2.35	1.45
Q14. The user fees for local public services should be made higher for people with higher income.	-0.07	2.08	1.32
Q15. Members of the national parliament should not become candidates in local elections.	0.05	2.32	1.44
Q16. The five-year long dismissal period for the municipal employees in conjunction with municipal mergers is too long.	0.37	1.57	1.42
Q17. Public employees should not be allowed to be members of the municipal board.	0.25	1.92	1.45
Eigenvalue	2.54		
Proportion	0.15		

Table B2. Ideology by party.

	N	Mean	Std. dev.
Left Alliance	3301	-1.51	1.30
Green Party	3204	-1.06	1.11
Social Democratic Party	6521	-0.72	1.23
Christian Democratic Party	1852	0.05	1.18
Swedish Party	1477	0.17	1.33
Center Party	8887	0.42	1.21
True Finns	2585	0.54	1.28
National Coalition Party	8598	1.00	1.27

C Robustness and Validity Checks

This appendix contains a number of auxiliary robustness and validity checks.

C.1 Further Test of the Disproportionality and Signalling Hypotheses

In the main text, we measure disproportionality of the local electoral environment with the modified Gallagher index. Table C1 presents regression results where we measure disproportionality with the effective threshold instead. Columns (1) and (3) do not suggest that there is a relationship between PEC formation and electoral system disproportionality. If anything, there is an inverse relationship between disproportionality and PEC formation when there are very few parties (column 2). As the number of parties increases, this negative relationship gets diluted. Other than that, the regression results echo those that we report in the main text.

We present results from a specification with municipality and year fixed effects which allow us to hold all time-invariant municipality-level characteristics and time-specific common shocks constant in Table C2. Given that many features of the local political context are rather persistent, including municipality fixed effects leaves us with considerably less identifying variation. Indeed, while we still find a strong relationship between the presence of PECs and the number of political parties, the result we have for disproportionality vanishes.

Table C1. Testing disproportionality and signalling hypotheses (alternative measurement of disproportionality).

	(1)	(2)	(3)
Number of parties	7.814***	4.500***	7.850***
	[1.045]	[1.493]	[1.045]
Effective threshold	-1.546	-10.299***	-3.324
	[2.404]	[3.641]	[2.773]
Polarisation	0.322	-0.394	-3.908
	[1.567]	[1.624]	[3.819]
Number of parties × Effective threshold		1.818***	
		[0.631]	
Effective threshold × Polarisation			1.694
			[1.400]
N	1884	1884	1884
R^2	0.10	0.11	0.10

Notes: The dependent variable is an indicator for at least two parties forming a PEC, multiplied by 100. Standard errors clustered at the municipality level are reported in brackets. The estimation sample only includes municipalities that have at least three political parties. *, ** and *** denote statistical significance at 10%, 5% and 1%, respectively.

Table C2. Testing disproportionality and signalling hypotheses (fixed effects included).

	(1)	(2)	(3)	(4)
Number of parties	11.270***	13.579**	12.011***	11.260***
	[1.610]	[5.710]	[1.800]	[1.622]
Disproportionality	3.960	15.008	-0.401	17.837*
	[7.882]	[24.324]	[8.725]	[9.105]
Polarisation	-2.007	-1.881	3.915	44.804*
	[1.476]	[1.521]	[3.900]	[23.115]
Number of parties × Disproportionality		-2.515		
		[5.892]		
Number of parties × Polarisation			-0.775	
			[0.474]	
Disproportionality × Polarisation				-49.117**
				[24.044]
N	1871	1871	1871	1871
R^2	0.50	0.50	0.50	0.50

Notes: The dependent variable is an indicator for at least two parties forming a PEC, multiplied by 100. Standard errors clustered at the municipality level are reported in brackets. The estimation sample only includes municipalities that have at least three political parties. *, ** and *** denote statistical significance at 10%, 5% and 1%, respectively.

C.2 Additional Difference-in-Differences Results

This subsection presents additional difference-in-differences results. We start by re-estimating our party-level specification but only using a sample of parties that belong to a PEC at least once during the time period included in our data. This allows us to address the caveat that parties that join a PEC at least once may be very different from those that never join a PEC. These regression results are presented in Table C3. The results remain mostly unchanged. Joining a PEC leads to a lower vote share (column 1), and the effect is driven by parties that join more ideologically dispersed PECs (column 2). This negative effect carries on to seat shares (columns 3 and 4). Becoming a part of a PEC also leads to a more concentrated vote distribution (5). Finally, there is no statistically significant evidence that joining a PEC would matter for post-electoral bargaining outcomes (columns 6 and 7). Qualitatively, the point estimates suggest that parties that are part of a PEC become more likely to acquire the board chairmanship and less likely to get to nominate the council chairperson.

We then rerun our regressions including group-specific linear time trends. Note that the estimation sample differs slightly from that used in our main text, as we can now only include parties that are observed at least three times. Table C4 shows that the party-level results remain unchanged. Coalition formation appears to influence vote shares negatively, and this effect is larger when the coalition is ideologically dispersed. However, the regression coefficients are not statistically significant (columns 1 and 2). We do not see any effects on seat shares (columns 3 and 4). Even when controlling for the trends, we find that coalition may induce strategic voting that is more prevalent among smaller parties (column 5). Finally, we show suggestive evidence that smaller parties become more likely to acquire the board chairmanship after joining a PEC in column 6, while the opposite is true in the case of council chairmanship (column 7).

We also use a more limited sample of parties that are observed in three consecutive elections in order to run analyses including a lead and a lag of the PEC variable. One caveat with these analyses is that controlling for party size becomes more problematic, as it could be an outcome of

there being a PEC at $t-1$. Thus, we only include the *Seat share (t-1)* in specifications where we test for interaction effects. These results are reported in Table C5. We see that the regression coefficients associated with future coalition formation are statistically insignificant in all except one case. Column (5) indicates that coalescing parties are not perfectly comparable to non-coalescing parties in the sense that they tend to have more dispersed vote share distributions already before coalescing. However, the lead coefficient is only a third of the effect of interest. Moreover, robustness of the results to local party-specific time trends alleviates the concerns for identification.

In Table C6, we report the same analysis using the municipality-level data. We can see that the positive effect on the number of parties persists after controlling for the municipality-specific linear time trends (column 1). Seat shares also become less concentrated, and this effect is statistically significant (column 2). We lose the statistical significance of our point estimates in column 3 where we show the effect on the largest party's seat share, but the magnitude of the point estimate remains very stable. Finally, we do not see any clear effect on there being an absolute majority (column 4).

The results are robust also when we include a lead and a lag of PECs occurring at the municipality level (Table C7). Importantly, municipalities that eventually have PECs do not seem to be different before they are treated.

Table C3. Party-level difference-in-differences results (sample of parties that coalesce at least once).

	Vote share		Seat share		Vote concentration	Board chair	Council chair
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PEC	-0.663***	0.139	-0.164	0.567	7.527***	0.006	-0.009
	[0.186]	[0.340]	[0.223]	[0.389]	[1.226]	[0.010]	[0.011]
Seat share (t-1)	0.195***	0.197***	0.135***	0.137***	-0.461***	0.001	0.003
	[0.034]	[0.034]	[0.040]	[0.040]	[0.099]	[0.003]	[0.002]
PEC × Ideological range		-0.989***		-0.900**			
		[0.334]		[0.375]			
PEC × Seat share (t-1)					-0.232***	-0.002**	0.003***
					[0.038]	[0.001]	[0.001]
N	2189	2182	2189	2182	2189	2189	2189
Adjusted R^2	0.95	0.95	0.94	0.94	0.73	0.65	0.59
Mean of dependent variable	14.25	14.29	14.29	14.33	27.30	0.15	0.15

Notes: Vote and seat shares are measured in percentages. Chairmanship is an indicator variable that gets the value one if the party holds either board or council chairmanship (or both). The dependent variable in column (6) is Herfindahl index of within-party vote share concentration. Regressions control for the number of candidates relative to the council size, and year and party group fixed effects. Standard errors clustered at the party group level are reported in brackets. *, ** and *** denote statistical significance at 1%, 5% and 10%, respectively.

Table C4. Party-level difference-in-differences results (controlling for party-specific time trends).

	Vote share		Seat share		Vote concentration	Board chair	Council chair
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PEC	-0.365	0.076	0.192	0.554	5.877***	0.015	-0.004
	[0.231]	[0.399]	[0.269]	[0.460]	[1.856]	[0.014]	[0.012]
Seat share (t-1)	-0.236***	-0.235***	-0.355***	-0.354***	-0.046	-0.005**	-0.003*
	[0.024]	[0.024]	[0.026]	[0.026]	[0.057]	[0.002]	[0.002]
PEC × Ideological distance		-0.538		-0.442			
		[0.407]		[0.461]			
PEC × Seat share (t-1)					-0.155***	-0.004***	0.002
					[0.055]	[0.002]	[0.001]
N	8081	8072	8081	8072	8081	8081	8081
Adjusted R^2	0.98	0.98	0.97	0.97	0.86	0.69	0.68
Mean of dependent variable	17.31	17.32	17.40	17.42	23.81	0.17	0.18

Notes: Vote and seat shares are measured in percentages. Chairmanship is an indicator variable that gets the value one if the party holds either board or council chairmanship (or both). The dependent variable in column (6) is Herfindahl index of within-party vote share concentration. Regressions control for the number of candidates relative to the council size, and year and party group fixed effects. Standard errors clustered at the party group level are reported in brackets. *, ** and *** denote statistical significance at 1%, 5% and 10%, respectively.

Table C5. Party-level results controlling for lead and lag coalitions.

	Vote share		Seat share		Vote concentration	Board chair	Council chair
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
PEC (t-1)	0.021	-0.010	-0.056	-0.084	0.869	0.018	0.004
	[0.209]	[0.207]	[0.244]	[0.244]	[0.872]	[0.017]	[0.018]
PEC	-0.579***	0.165	-0.026	0.653*	8.191***	0.016	-0.016
	[0.209]	[0.317]	[0.250]	[0.386]	[1.505]	[0.013]	[0.016]
PEC (t+1)	-0.538***	-0.554***	-0.580**	-0.595**	2.677***	0.018	0.012
	[0.200]	[0.197]	[0.260]	[0.258]	[0.738]	[0.018]	[0.021]
Seat share (t-1)					-0.189***	-0.000	-0.001
					[0.043]	[0.002]	[0.002]
PEC × Ideological distance		-0.975***		-0.889**			
		[0.294]		[0.370]			
PEC × Seat share (t-1)					-0.216***	-0.003***	0.003***
					[0.042]	[0.001]	[0.001]
N	4619	4617	4619	4617	4619	4619	4619
Adjusted R^2	0.97	0.97	0.96	0.96	0.78	0.68	0.64
Mean of dependent variable	19.14	19.15	19.39	19.40	18.83	0.20	0.20

Notes: Vote and seat shares are measured in percentages. Chairmanship is an indicator variable that gets the value one if the party holds either board or council chairmanship (or both). The dependent variable in column (6) is Herfindahl index of within-party vote share concentration. Regressions control for the number of candidates relative to the council size, and year and party group fixed effects. Standard errors clustered at the party group level are reported in brackets. *, ** and *** denote statistical significance at 1%, 5% and 10%, respectively.

Table C6. Municipality-level results controlling for municipality-specific time trends.

	Parties	Seat concentration	Max. seat share	Absolute majority
	(1)	(2)	(3)	(4)
PEC	0.201***	-127.274***	-0.782*	-0.020
	[0.067]	[47.040]	[0.473]	[0.026]
N	1859	1859	1859	1859
Adjusted R^2	0.31	0.38	0.38	0.25
Mean of dependent variable	4.87	3454.01	48.13	0.40

Notes: Coalition is an indicator variable that gets the value 1 if there is at least one electoral alliance in a municipality, an 0 otherwise. Herfindahl refers to a Herfindahl index of the seat shares of the parties that are represented in the local council. All regressions include year and municipality fixed effects. Standard errors clustered at the municipality level are reported in brackets. *, ** and *** denote statistical significance at 1%, 5% and 10%, respectively.

Table C7. Municipality-level results controlling for lead and lag coalitions.

	Parties	Seat concentration	Max. seat share	Absolute majority
	(1)	(2)	(3)	(4)
PEC (t-1)	0.046	-50.485	-0.337	-0.026
	[0.078]	[45.244]	[0.485]	[0.029]
PEC	0.263***	-147.452***	-0.922*	-0.032
	[0.086]	[53.641]	[0.538]	[0.032]
PEC (t+1)	0.022	-59.839	-0.258	0.013
	[0.077]	[50.971]	[0.543]	[0.033]
N	1033	1033	1033	1033
Adjusted R^2	0.19	0.12	0.15	0.04
Mean of dependent variable	4.83	3464.89	48.34	0.40

Notes: Coalition is an indicator variable that gets the value 1 if there is at least one electoral alliance in a municipality, an 0 otherwise. Herfindahl refers to a Herfindahl index of the seat shares of the parties that are represented in the local council. All regressions include year and municipality fixed effects. Standard errors clustered at the municipality level are reported in brackets. *, ** and *** denote statistical significance at 1%, 5% and 10%, respectively.

C.3 Placebo Density Test

We provide more detailed results for the placebo density test in Table C8. As in the main text, we conduct the test following Cattaneo, Jansson, and Ma (2019). We construct the placebo seat shares using the data from municipalities that had PECs. We use the D'Hondt rule and redistribute the seats as if there were no PECs. There appear to be no jumps at the cutoff, as there should not be. This gives further support for our claim that coalitions among smaller parties may indeed prevent the largest party from obtaining an absolute majority when the election is very close.

Table C8. Placebo density test results.

Panel A: Separate bandwidths				
	$\hat{h}_-$ (N_-)	$\hat{h}_+$ (N_+)	T	p
$T_2(\hat{h}_1)$	2.752 (54)	2.801 (36)	-0.786	0.432
$T_3(\hat{h}_2)$	6.167 (111)	6.531 (81)	-1.342	0.180
$T_4(\hat{h}_3)$	10.739 (198)	10.891 (129)	-0.446	0.655
Panel B: Same bandwidth on both sides				
	$\hat{h}_-$ (N_-)	$\hat{h}_+$ (N_+)	T	p
$T_2(\hat{h}_1)$	4.603 (148)	4.603 (150)	0.476	0.634
$T_3(\hat{h}_2)$	7.673 (247)	7.673 (231)	0.371	0.711
$T_4(\hat{h}_3)$	10.243 (334)	10.243 (281)	0.434	0.664

Notes: The density test is conducted using `rddensity` package in Stata. $T_p(h)$ denotes the manipulation test statistic using pth order density estimators with bandwidth choice $h = (h_-, h_+)$. We employ uniform weighting (rectangular kernels) and vary the degree of local polynomials used. Moreover, we use two alternative ways to compute the optimal bandwidths $\hat{h_p}$. In Panel A, we use different bandwidths on different sides of the cut-off (bandwidth selection procedure `comb`), and the same bandwidth on both sides of the cut-off in Panel B (bandwidth selection procedure `sum`). N_- (N_+) is the effective number of observations on the left-hand (right-hand) side of the cut-off.

C.4 Covariate Smoothness

Finally, we present RD estimates on different covariates to explore if there is something special about the 50% maximum seat share threshold. We estimate

$$y_{m,t-1} = \alpha + \beta 1[\textit{Seat share margin}_{mt} > 0] + f(\textit{Seat share margin}_{mt}) + \varepsilon_{mt}. \quad (1)$$

Here, $\textit{Seat share margin}_{mt}$ is the distance between largest party's seat share and in municipality m at time t. The treatment of interest is an indicator variable for the largest party having an absolute majority. We run local linear regressions within MSE-optimal bandwidths, and allow for different slopes on different sides of the threshold. Besides the conventional estimation, we follow the robust bias-corrected approach proposed by Calonico, Cattaneo, and Titiunik (2014). Effectively, this means that we fit a second-order polynomial within the optimal bandwidth for the local linear specification. We run the covariate smoothness test for seven different pre-treatment covariates, $y_{m,t-1}$.

Table C9 shows the RDD estimates. In Panel A, we use data from municipal elections that do not have any PECs. There is no robust evidence that any of the covariates would systematically have jumps at the 50% seat share cutoff. Panel B shows regression results using data from municipalities that had at least one PEC. The point estimates are again convincing that there are no discontinuities in predetermined covariates. As we are interested in the difference in discontinuities, what is perhaps even more important in our setting is that there appear to be no massive differences between the estimates for municipalities with and without PECs. Finally, Panel C shows the RDD estimates using a placebo running variable: largest party's seat share that has been computed assuming that there are no PECs. The results from this placebo analysis are again good news for us. We do not detect any robust evidence of discontinuities at the threshold.

This analysis comes with the caveat that the largest party seat share does not satisfy the requirements of a proper regression discontinuity design; the running variable ought to be continuous. For instance, Meriläinen (2019) discusses this issue further.

Table C9. Covariate smoothness.

	Coalitions	Council parties	Herfindahl	Max. seat share	Absolute majority	Council size	Election parties
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Panel A: No PECs							
Conventional	-0.220	-0.416*	125.223	1.168	0.305**	-1.774	-0.894
	[0.206]	[0.251]	[148.582]	[1.386]	[0.135]	[2.716]	[0.616]
Robust	-0.230	-0.186	29.715	2.257	0.652	-9.981*	-3.350
	[0.591]	[0.766]	[353.387]	[2.794]	[0.413]	[5.310]	[2.126]
N	223	372	415	480	281	297	269
Bandwidth	5.00	7.30	9.21	10.30	6.39	4.33	4.04
Panel B: PEC							
Conventional	-0.132	-0.057	33.444	-3.136	-0.100	-7.188	-0.894
	[0.151]	[0.823]	[360.903]	[4.324]	[0.282]	[4.550]	[0.616]
Robust	-0.053	0.811	-266.435	-17.121	-0.006	-1.083	-3.350
	[0.343]	[2.130]	[901.881]	[16.863]	[0.823]	[2.711]	[2.126]
N	162	121	96	82	97	138	269
Bandwidth	7.60	5.57	4.86	4.15	5.32	4.63	4.04
Panel C: Placebo							
Conventional	-0.153	-0.945*	-37.714	0.385	0.005	-3.137	-0.714
	[0.155]	[0.505]	[214.169]	[2.054]	[0.174]	[3.610]	[0.617]
Robust	-0.369	-1.412	-703.013	-2.398	-0.111	-0.332	-3.200
	[0.324]	[1.201]	[618.728]	[5.131]	[0.441]	[6.474]	[2.113]
N	168	134	134	134	167	192	270
Bandwidth	7.82	6.06	6.78	6.45	7.18	6.23	4.18

Notes: The dependent variables in columns (1)-(6) are lagged. The table shows estimates from a local linear regression. We use a triangular kernel and MSE-optimal bandwidths. The optimal bandwidths have been estimated adjusting for clustering at the municipality level. For the bias-corrected specification, we use the same bandwidth for main and bias correction estimation. Standard errors clustered at the municipality are reported in brackets. *, ** and *** denote statistical significance at 1%, 5% and 10%, respectively.

C.5 Additional Analysis Using the Dyadic Data

In the main text, we do not include any additional covariates in the analyses that we conduct using the dyadic data. However, the conclusions from this investigation remain unchanged if we control for municipality and election year fixed effects. We show this in Table C10.

Column (1) first regresses an indicator variable for two parties forming a PEC on the difference between the dyad's expected seat share distance from majority, an indicator for the expected seat share being enough to give the parties more than half of the seats, and an interaction of these two terms. We see that when two parties do not expect to get a majority of the seats, a coalition is more likely to realise between them the smaller was the sum of their seat shares in the previous election. The coefficient of $Majority$ is positive (although not statistically significant), indicating that a coalition between two parties is more likely if their expected joint seat share is more than 50%. However, the interaction term had a negative regression coefficient—i.e. two parties are less likely to form a PEC the larger they are, if they expect to get a majority.

In column (2), we examine the role of expected coalitions size, size asymmetry, and their interaction. Given the negative coefficient of *Coalition size*, we can conclude that PECs are less likely to form between large parties of a similar size. Similarly, size asymmetry decreases the propensity of two parties coalescing. In column (3), we replace coalition size with an indicator variable for the two parties together acquiring an absolute majority. As before, size asymmetry is negatively correlated with the probability of two parties forming a PEC. Two parties of a similar size are also less likely to coalesce if they expect to get a majority of the seats together, but this negative association is diluted by size asymmetry. That is to say, two parties that expect to get more than half of the council seats become more likely to join their forces the larger is their size difference.

We investigate the role of ideology in PEC formation in column (4). We find strong support for the prediction that ideologically proximate parties are more likely to coalesce. The larger the ideological incompatibility between two parties, the less likely it becomes that they form a PEC.

Table C10. Dyad-level determinants of PEC formation (controlling for fixed effects).

	(1)	(2)	(3)	(4)
Distance from majority	0.036***			
	[0.011]			
Majority	0.255		-5.353***	
	[0.544]		[0.466]	
Distance from majority × Majority	-0.174***			
	[0.029]			
Coalition size		-0.135***		
		[0.011]		
Asymmetry		-3.098***	-0.842**	
		[0.631]	[0.429]	
Asymmetry × Coalition size		0.135***		
		[0.018]		
Asymmetry × Majority			4.639***	
			[0.990]	
Ideological range				-3.330***
				[0.157]
N	23499	23499	23499	28379
R^2	0.06	0.07	0.06	0.08

Notes: The dependent variable is an indicator for two parties belonging to a PEC, multiplied by 100. All specifications control for municipality and election year fixed effects. Standard errors clustered at the election level are reported in brackets. *, ** and *** denote statistical significance at 10%, 5% and 1%, respectively.

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