

## Electoral Rules and Government Spending in Parliamentary Democracies\*

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### ABSTRACT

We present a theoretical model of a parliamentary democracy where electoral competition inside coalition governments induces higher spending than under single party governments. Policy preferences of parties are endogenous and derived from opportunistic reelection motives. The electoral rule affects government spending, but only indirectly: proportional elections induce a more fragmented party system and a larger incidence of coalition governments than do majoritarian elections. Empirical evidence from post-war parliamentary democracies strongly supports these predictions.

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*Keywords:* Electoral rules; party systems; coalition governments; fiscal policy; electoral accountability.

*JEL Code:* JEL Classifications: H00, D72, D78.

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\* A longer version of this paper has circulated under the title: “How do electoral rules shape party structures, government coalitions and economic policies?” This research is supported by CIAR, the Swedish Research Council, Bocconi University, MIUR and the Communauté Française de Belgique, as well as a grant from the Center for Business and Policy Studies financing data collection. We are grateful to Nolan McCarty, two anonymous referees, Antonio Merlo, Matthias Messner, Roger Myerson, Fausto Panunzi, Ken Shepsle and Dan Treffer, Kåre Vernby, and seminar participants at Berkeley, Bocconi, CERGE-EI, CIAR, IIES, KUL, MIT, Pennsylvania, LSE, UC Irvine, UIUC and Yale for their helpful comments, and to Krister Lundell, Andrea Mascotto and Jose Mauricio Prado Jr. for their skillful assistance with data.

How do electoral rules influence government spending? We address the question building on three distinct lines of research.

A long research tradition in political science has studied the influence of electoral rules on party structures. Various models of Duverger's law predict that majoritarian electoral rule leads to a two-party system and many empirical studies have been devoted to testing this prediction. This literature implies that, via the party system, majoritarian elections produce single-party governments more often than proportional elections, which instead produce fragmentation of political parties and coalition, or minority, governments.<sup>1</sup>

Second, recent empirical research in economics has shown that electoral rules exert a strong effect on fiscal policy: majoritarian elections are associated with smaller government spending, smaller budget deficits and smaller welfare states, than proportional elections. An important question left open in this research concerns the mechanism behind these reduced form results. Is the association between electoral rules and policy outcomes due to different party structures and types of governments under alternative electoral rules? Or is it due to the direct effects of electoral rules on the incentives of politicians, for given party structures?<sup>2</sup> No clear and rigorous answer to these questions has been formulated so far.

The third line of research on which we build concerns the so-called common pool problem in fiscal policy. It is commonly argued that coalition governments spend more (or run larger budget deficits) than single-party governments, because each party in a coalition does not fully internalize the fiscal costs of spending. Even though this claim finds some support in the data,<sup>3</sup> it has not really been derived from first principles. Specifically, a single-party government is assumed to behave as a unitary decision maker, while a coalition government faces a collective choice problem. But why should a single party representing several groups in society behave any different than a coalition of parties representing the same groups? Moreover, the economic literature on the common pool problem takes the motivation of parties, as well as the number of parties, as given, with no link to the electoral rule.

This paper is an attempt to provide the missing links between these existing strands of research. We present a theoretical model where electoral rules shape the equilibrium number of parties and thus spill over on government formation and fiscal policy choices. When testing the empirical predictions of the model, we show that the indirect effects of electoral rules – on number of parties and type of government – drive

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<sup>1</sup> See, for instance, Cox (1990, 1997), Laver and Schofield (1990), Lijphart (1984a, 1984b, 1994, 1999), Palfrey (1989), Powell (1982, 2000), and Taagepera and Shugart (1989).

<sup>2</sup> The incentive channel is explicit in recent contributions by economists studying how electoral rules influence the composition (Lizzeri and Persico 2001, Persson and Tabellini 1999) or size (Milesi-Ferretti *et al.* 2002) of government spending. Persson and Tabellini (2003, 2004a) present reduced-form empirical results – see also the commentary by Acemoglu (2005) and the survey by Persson and Tabellini (2004b).

<sup>3</sup> See, e.g., the contributions by Poterba and von Hagen (1999), in particular the chapter by Kontopoulos and Perotti.

the result that majoritarian elections lead to less public spending than proportional elections.

Our main theoretical result shows that the distinction between single-party and coalition governments is indeed central for the size of public spending. In our model, politicians are opportunistic and the policy preferences of parties endogenous. The central mechanism is that voters can discriminate between the parties of a coalition government at the polls, while they cannot discriminate between different factions of a single-party government. This creates electoral conflict – an *electoral common pool problem* – within a coalition government, but not within a single-party government. A recent and very interesting paper by Bawn and Rosenbluth (forthcoming), to which we owe considerable inspiration, discusses a similar idea in a less formal framework.

Using this result, we endogenize party formation and the type of government. Specifically, we provide a simple model example where primitive groups of politicians decide whether to form large or small parties. Under proportional elections these choices lead to a more fractionalized party system than under majoritarian elections. The mechanism in our model generating this Duvergerian result is thus the strategic choice by active politicians, rather than strategic voting by the electorate – the common mechanism in the literature. Here, we follow the call of Riker, who in his survey of Duverger's law stated (Riker 1985, p. 764)

*The direction one must go, I believe, is to turn attention away from the expected utility calculus of the individual voter and to the expected utility calculus of the politician and other more substantial participants in the system.*

Our model example is not a general and comprehensive theory covering the entire political process from party formation to economic policy choices, but it has sharp and testable predictions: PR induces higher spending than majoritarian elections, but only through more party fragmentation and higher incidence of coalition government. In other words, if we hold the type of government constant, the electoral rule has no direct effect on public spending.

We believe that the specificity of our predictions illustrate the usefulness of formal modeling as a basis for empirical work. The theoretical predictions are confronted with political and economic data from up to 50 parliamentary democracies in the post-war period. We present empirical estimates relying on the cross-country variation in the data, as well as the within-country variation around reforms of electoral systems. Both types of estimates support our theoretical result that PR induces more government spending, but only indirectly, via party formation and the incidence of coalition governments. The overall effect is similar in magnitude to earlier empirical results on reduced form: a full scale shift from majoritarian to proportional elections raises overall public spending by roughly 5% of GDP.

The general issues studied in this paper have been the focus of many contributions by political scientists.<sup>4</sup> But to the best of our knowledge, no other paper (except Bawn and Rosenbluth, forthcoming), has tried to integrate in a single model endogenous

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party formation, government formation and fiscal policy choices. A few recent papers have analyzed one or more of the different links in the chain from electoral rules to policy choices. Austen-Smith (2000) studies taxation and government formation under alternative electoral rules but takes party structures as exogenous. Iversen and Soskice (2006) also take party structure as exogenous and derive a result that under majoritarian electoral rules and a two-party system middle class voters prefer to vote for a center-right party, whereas they prefer the party of the poor under proportional elections and a three-party system. The main intuition is similar to a model by Ticchi and Vindigni (2005): the middle class prefers low taxes by a center-right party under majoritarian rule for fear that a left-wing party would use high taxes to redistribute to the poor. Lizzeri and Persico (2005) develop a model where a larger number of parties reduces the support base of each party and raises the incentive of parties to propose targeted transfers to narrow groups instead of broad public goods. However, that paper concentrates on electoral platforms and does not consider the effect of party fragmentation on government formation.

## THE MODEL

A population consists of four economic groups, of equal size normalized to unity, and indexed by  $\mathcal{J}$ . Individuals in group  $\mathcal{J}$  have preferences represented by

$$V^{\mathcal{J}}(\mathbf{g}) = 1 - \tau + H(g^{\mathcal{J}}). \quad (1)$$

Income is normalized to 1 for all individuals,  $\tau$  is a head tax constrained to be non-negative and  $g^{\mathcal{J}}$  is a local public good that only benefits economic group  $\mathcal{J}$ .  $H$  is a well-behaved concave utility function, and  $\mathbf{g}$  denotes the vector of policy instruments. The government budget constraint equates total tax revenue to total spending:

$$4\tau = \sum_{\mathcal{J}} g^{\mathcal{J}}. \quad (2)$$

This is a standard setting of special-interest politics (see, e.g., Persson and Tabellini 2000, Chapter 7). The vector of policy instruments,  $\mathbf{g} = [\tau, \{g^{\mathcal{J}}\}]$ , clearly induces a conflict of interest among economic groups over the allocation of the (targeted) spending on local public goods,  $\{g^{\mathcal{J}}\}$ .<sup>5</sup>

**Parties and governments.** We want to compare policy decisions under a coalition government  $G = C$  and under a single-party government  $G = S$ . To do so, we consider

<sup>4</sup> See for example Acosta and Coppedge (2001), Cusack and Fuchs (2002), Franzese (2002), Tsebelis (1999).

<sup>5</sup> In a previous version of the model, we also included rents to politicians as a policy instrument. We obtained additional implications, but the results presented below are not affected by this extension. See Persson *et al.* (2003). We did not include general public goods as there would be no conflict of interest within government over their level.

two polar cases: (i) a four-party system with  $P = 1, 2, 3, 4$  where each party represents<sup>6</sup> an economic group, (ii) a two-party system with  $P = 12, 34$ , i.e., the parties representing groups 1 and 2 (3 and 4) have merged. In a single-party government, either  $P = 12$  or  $P = 34$  is in power while the other party is in the opposition. In a coalition government, either  $P = 1, 2$  are in government and  $P = 3, 4$  are in the opposition, or vice versa.<sup>7</sup>

Parties are opportunistic: they care only about winning an upcoming election. Specifically, the objective of party  $P$  in a government of type  $G$  is to maximize its expected seat share,  $E(s_G^P)$ , where the expectations operator  $E(\cdot)$  refers to the electoral uncertainty described below.

If a single party holds government, policy formation is straightforward: the party is a uniform actor choosing the vector of policy instruments  $g$ . In the event of a coalition government, we assume that each member of the coalition has unilateral decision making power over the specific public good benefiting the economic group represented by that party. What about spending on the public goods benefiting the groups out of government? As we shall see, all coalition members agree about how much to spend on these outside groups; thus, for simplicity, we assume that a coin is tossed about who is entitled to choose them. The tax rate  $\tau$  is residually determined so as to balance the budget, once all spending decisions have been made (assuming an interior optimum for the tax rate). This set up implies that coalition governments, but not single-party governments, face an electoral common-pool problem in policy formation.

The assumption about the behavior of coalition governments can be interpreted as parties having ministerial portfolios and hence agenda-setting powers in the policy dimensions they care about the most. Empirically, there is strong evidence that ministerial powers in coalition governments are, in fact, allocated to parties according to the salient issues in their party programs (see, e.g., Budge and Keman's (1990) study of 20 democracies over nearly 40 years).<sup>8</sup>

Theoretically, such agenda-setting powers could potentially be derived from bargaining over ministerial positions at a government formation stage (cf. Laver and Shepsle 1996). In our model, we assume that each minister is powerful enough to do what is unilaterally optimal for her party. This might happen, e.g., if rejection of a policy proposal led to a government crisis or some costly outcome for the coalition members (as in Diermeier and Feddersen 1998, or Persson *et al.* 2000). Crucial for our results is that there remains at least some inefficiency in bargaining, such that one party does not fully internalize the effects of its discretionary decisions on the coalition partner. Thus, Nash

<sup>6</sup> The precise meaning of *represent* is explained below when we describe the election stage.

<sup>7</sup> Other combinations of party mergers or coalition governments would deliver the same qualitative results as these two polar cases, as will become clear below. Indeed, since parties defend specific constituencies and not ideological positions, any combination of mergers or coalitions is equally plausible. The restriction we make on possible mergers or coalitions is thus without loss of generality.

<sup>8</sup> It is also common to see attempts to control the parties' discretionary powers by countervailing political forces or institutions. For example, Huber and Shipan, 2002 find that coalition governments tend to pass more detailed legislation so as to limit the discretion of ministries in implementing legislation. In Sweden, ministerial autonomy is limited by law and all government decisions have to be taken by the cabinet as a whole.

bargaining between the two parties in government would destroy the difference between coalition and single-party government, because it would lead to efficient bargaining outcomes. But other assumptions that give each party some room to unilaterally influence government spending on items valued by its constituency, either in the implementation phase or in cabinet decisions, would bring about the same qualitative results as in this paper. As already remarked in Footnote 5, the absence of transferable utility between coalition partners is not essential for our results.

**Voters.** We combine retrospective, sincere (see further below), and probabilistic voting (see, e.g., Persson and Tabellini 2000, Chapter 3). Specifically, we assume that citizens vote retrospectively based on economic considerations, rewarding or punishing the incumbent government as their individual utility is above or below a given reservation utility. Nevertheless, ideology or party attachment plays a role, as voters treat their own party differently than the parties representing other groups. Specifically, citizen  $i$  in group  $\mathcal{J}$  votes for party  $\mathcal{J}$ , when the latter is in government, if

$$V^{\mathcal{J}}(\mathbf{g}) \geq \omega^i + \delta + V^{*\mathcal{J}}. \quad (3)$$

If the inequality turns the other way, the citizen votes for the opposition; if the opposition has more than one party, each of these receives one's vote with equal probability. If party  $\mathcal{J}$  is *not* in government and inequality (3) is satisfied, each party in the coalition receives the vote with equal probability; if the inequality is not satisfied, the citizen votes for party  $\mathcal{J}$ . Voters in  $\mathcal{J}$  thus reward their own party  $\mathcal{J}$  more often than other parties.

The first term on the right-hand-side of (3) depicts an individual component of reservation utility:  $\omega^i$  is uniformly distributed within each group of voters, with mean zero and density  $\phi$ . Individuals with higher values of  $\omega^i$  are more demanding of the incumbent government (they have an idiosyncratic bias in favor of the opposition). The second term is a random shock to the popularity of the incumbent government, common to all voters. We assume that  $\delta$  is also uniformly distributed, with mean 0 and density  $\psi$ . Thus,  $\phi$  measures dispersion of voters' bias within each group and it determines the responsiveness of voters to policy favors: a higher value of  $\phi$ , corresponding to less within-group dispersion, means that policy favors buy more swing voters in each group. The parameter  $\psi$  is instead a measure of aggregate dispersion, and hence of aggregate uncertainty about the election outcome: a higher value of  $\psi$  means less uncertainty about the distribution of the popularity shock. (For more on this kind of probabilistic voting model, see, Persson and Tabellini 2000, Chapter 3.) The last term on the right-hand-side of (3) is given by  $V^{*\mathcal{J}} = V^{\mathcal{J}}(\mathbf{g}_G^*)$ , where  $\mathbf{g}_G^*$  denotes the equilibrium policy vector for a given type of government. It reflects the voters' expectations of what governments can reasonably be expected to deliver, given the political circumstances in which policy is set.

When the incumbent government sets policy, it knows the distributions for  $\omega^i$  and  $\delta$ , but not the realization of the aggregate popularity shock  $\delta$ . As in other probabilistic voting models, this uncertainty creates a smooth mapping from policy to expected vote shares and seat shares. More importantly, since voters vote retrospectively, the incumbent can only influence the election outcome by changing *actual* voters' welfare (the left-hand-side of (3)) through its choice of  $\mathbf{g}$ . The term  $V^{*\mathcal{J}}$  on the right-hand-side of (3)

(voters' expectations about their equilibrium utility) is taken as given by the incumbent when it sets policy. This term reflects the implicit assumption that voters are more demanding if they realize that in equilibrium the government can deliver a high level of welfare.<sup>9</sup>

These specific assumptions about voting behavior can be generalized in several ways without altering the nature of the results. Two assumptions are central to our argument, however. First, voters are not modeled as fully rational, strategic, and forward-looking players. Despite the proliferation of strategic voting in the theoretical literature, we are not too apologetic about retrospective voting. Instances of strategic voting are certainly observed in the real world. However, the low individual stakes for a single atomistic voter does not necessarily make sophisticated strategic voting more plausible than retrospective voting. For the problem at hand, we believe it is much more important to model professional politicians as strategic and fully rational.<sup>10</sup>

The second central assumption is that all voters identify with and only reward their own party (rather than its coalition partner) when pleased with government performance. Again, the specific assumption is not so important. The important notion is that at least some voters are ideologically attached to a party, and are able to discriminate between parties in a coalition government. This creates conflict among parties in a coalition government, as each party in government is induced to please the group it represents, but not the groups its coalition partners represent. If the parties merge, it becomes impossible for the voters to discriminate between them. As stressed by Bawn and Rosenbluth (forthcoming), the idea that voters can discriminate between parties in a coalition government, but not between groups inside a single party, may be at the core of why coalition governments behave differently than single-party majorities.

**Timing and equilibrium.** The timing of the game is as follows: (i) the parties in government set policy, (ii) voters observe the policy and vote. An equilibrium of this two-stage game is:

- (a) a policy optimally selected at stage (i) by the parties in each possible government, taking into account the expected equilibrium outcome at stage (ii).
- (b) an election outcome, given the equilibrium economic policy and the type of government.

In the next two sections, we treat the number of parties as exogenous and analyze policy choices by single-party governments and coalition governments under proportional and majoritarian electoral rule, respectively. In a later section, we analyze the incentives of parties to merge under the two electoral rules, thereby endogenizing party structure and type of government.

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<sup>9</sup> Of course, in the equilibria with rational expectations that we describe below, we will have  $V^J = V^{*J}$ .

<sup>10</sup> As already mentioned, this is exactly the position Riker (1985) took in his commentary on the literature on Duverger's law.

## POLICY CHOICES UNDER PROPORTIONAL ELECTORAL RULE

Under *proportional* elections all voters belong to a single national district and the electoral formula is proportional representation. Each party thus receives a seat share in the next legislature identical to its vote share in the national district. As expected seat and vote shares coincide,  $E(s_G^P) = E(v_G^P)$ , our assumption about expected seat-share maximization can be represented as expected vote-share maximization.

**Single-party government.** We first analyze policy choices by a single-party government. In our symmetric model, it does not matter whether the opposition consists of a single-party or two distinct parties. To fix ideas, assume that the opposition has a single party. Suppose that party  $P = 12$ , is in government and Party  $P = 34$  is in the opposition. Consider a voter in any group  $\mathcal{J} = 1, \dots, 4$  with a value of  $\omega^i$  exactly equal to  $V^{\mathcal{J}} - V^{*\mathcal{J}} - \delta$ . By (3), this *swing voter* in group  $\mathcal{J}$  is just indifferent between voting for the party in government or voting for the opponent. Everyone in the same group with a lower value of  $\omega^i$  votes for the party in government. Let  $F(\cdot)$  denote the cumulative distribution function of  $\omega^i$  in (3). The fraction of voters in group  $\mathcal{J}$  voting for the party in government is thus  $F(V^{\mathcal{J}} - V^{*\mathcal{J}} - \delta)$ , while the complementary fraction  $1 - F(V^{\mathcal{J}} - V^{*\mathcal{J}} - \delta)$  votes for the opposition.

The overall vote share of the government party is thus given by

$$v_S^P = \frac{1}{4} \left[ \sum_{\mathcal{J}=1}^4 F(V^{\mathcal{J}} - V^{*\mathcal{J}} - \delta) \right], \quad (4)$$

where we multiply the sum by 1/4 because each economic group constitutes a quarter of the electorate.

As  $\omega^i$  has the same uniform distribution in each group,  $F(\omega) = \frac{1}{2} + \phi\omega$ . Recall also that the expected value of the popularity shock is zero,  $E(\delta) = 0$ , at the time policy is set. Using these facts and simplifying, we can express the expected vote share for party  $P$  as

$$E(v_S^P) = \frac{1}{2} + \frac{\phi}{4} \sum_{\mathcal{J}=1}^4 (V^{\mathcal{J}} - V^{*\mathcal{J}}). \quad (5)$$

The expected vote share of the single party in government depends linearly on the weighted indirect utilities of all voters, where all groups receive the same weight,  $\phi$ . This weight is the density of the distribution of idiosyncratic reservation utilities; it measures the response of the expected seat shares to economic policy.

Equilibrium policy results from the maximization of (5) with regard to all policy instruments, subject to (1) and (2). It is easy to see that this produces the policy

$$g_S^{*\mathcal{J}} = H_g^{-1}(1), \text{ all } \mathcal{J}, \quad (6)$$

where subscripts on functional operators denote partial derivatives and  $^{-1}$  an inverse function, and where taxes are residually determined from the government budget constraint (we assume an interior optimum). Because the objective function treats all the groups in the same way, it is optimal to equate the marginal utility of the local public good  $g^{\mathcal{J}}$  for each quarter of the population to the (common) opportunity cost of taxation, which is unity by assumption. In fact, this is the choice a social planner would have made.<sup>11</sup>

**Coalition government.** To analyze coalition governments, we assume (without loss of generality) that parties 1 and 2 form a government, while parties 3 and 4 are in opposition. Consider the voters in group  $\mathcal{J} = P$ , where  $P = 1, 2$  is one of the parties in government. By the same argument as above, the fraction of voters in group  $\mathcal{J} = P$  voting for party  $P$  is  $F(V^P - V^{*P} - \delta)$ , while the complementary fraction  $1 - F(V^P - V^{*P} - \delta)$  votes with equal probability for each of the opposition parties. The vote share for each party in coalition government ( $P = 1, 2$ ) becomes:

$$v_C^P = \frac{1}{4} \left[ F(V^P - V^{*P} - \delta) + \frac{1}{2} \sum_{\mathcal{J}=3}^4 F(V^{\mathcal{J}} - V^{*\mathcal{J}} - \delta) \right]. \quad (7)$$

The first term between square brackets reflects the share of voters in group  $P$  whose reservation utility is satisfied, and the second reflects the share of satisfied voters from the out-of-government groups ( $\mathcal{J} = 3, 4$ ). As the latter split their vote equally between the two parties in the governing coalition, the second term is multiplied by  $1/2$ . Note that each of the two parties in government receives the votes of all the satisfied voters in its own group, but none of the satisfied voters in the group of its coalition partner. It is this feature of voters' behavior that pits the electoral interests of the two coalition partners against each other.

Given our assumptions on the distribution of reservation utilities, the expected vote share (seat share in the next legislature) for party  $P$  reduces to

$$E(v_C^P) = \frac{1}{4} + \frac{\phi}{4} \left[ (V^P - V^{*P}) + \frac{1}{2} \sum_{\mathcal{J}=3}^4 (V^{\mathcal{J}} - V^{*\mathcal{J}}) \right]. \quad (8)$$

Note that a group represented by a party in government has twice the weight of the groups in the opposition.

We then derive equilibrium policy. Party  $P = 1, 2$  in the coalition sets  $g^{\mathcal{J}}$ ,  $\mathcal{J} = P$ , so as to maximize (8), subject to (1) and (2) and taking as given the policy choice of

<sup>11</sup> The result that a single-party government exactly implements the social optimum is not general, but reflects the assumed symmetry of our model. If each group of voters responded differently to policy favors (if the parameter  $\phi$  differs across groups), then a single-party government would allocate spending differently from a utilitarian social planner. But the over-spending by coalition governments would not be affected.

its coalition partner. Since both parties in the coalition agree over spending on the groups not represented in government, it is irrelevant who sets it; we thus let either of  $P = 1, 2$  optimize with regards to  $g^{\mathcal{J}}$ ,  $\mathcal{J} \neq 1, 2$ . Moreover, the policymaking incentives are identical independently of whether the opposition consists of one or two parties.

The resulting optimality conditions for spending imply<sup>12</sup>:

$$g_C^{*\mathcal{J}} = \begin{cases} H_g^{-1}[\frac{1}{2}] & \text{if } \mathcal{J} = 1, 2 \\ H_g^{-1}[1], & \text{if } \mathcal{J} = 3, 4. \end{cases} \quad (9)$$

Retrospective voting induces opportunistic politicians to enact a different allocation of local public goods than in a single-party government. The groups represented in government have an advantage, and spending on the local public good benefiting them is above the level under single-party government:  $g_C^{*\mathcal{J}} > g_S^{*\mathcal{J}} = H_g^{-1}(1)$ ,  $\mathcal{J} = 1, 2$ . Intuitively, the disproportionate electoral response by its own voters induces each party in government to give them more weight. Since coalition members choose local public goods unilaterally, these electoral concerns give rise to an electoral common-pool problem: the necessary financing comes out of taxes levied on all groups, and the resulting electoral losses are partly borne by the coalition partner. As a result, both parties in government spend more on their constituencies. Conversely, the economic groups not represented in government ( $\mathcal{J} = 3, 4$ ) receive the same amount of public goods as under single-party government, although they pay a higher amount of taxes. Intuitively, the parties in government agree to give less weight to groups 3 and 4 because electoral support in these groups is less sensitive to their welfare compared to the electoral support in the coalition partners' own constituencies.

To be sure, we are not stating that single-party governments behave differently because conflict inside the party is addressed more efficiently than conflict inside government. In our model, there is no conflict at all over policy inside a single-party in government. It is because voters cannot discriminate between different politicians under the same political banner at the polls that the electoral interests of these politicians are aligned. When instead the government is supported by different parties that run separately in elections, voters can discriminate and this induces electoral competition inside government.

Of course, we could introduce other inefficiencies of policy formation for both types of government. But the basic insight about the absence of electoral conflict inside single-party government and the unavoidable presence of electoral conflict inside coalition government, is general and robust.<sup>13</sup>

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<sup>12</sup> In deriving (9), we use (1) and (2) which imply that  $\frac{\partial V^{\mathcal{J}}}{\partial g^{\mathcal{J}}} = H_g(g^{\mathcal{J}}) - 1/4$  for  $I = \mathcal{J}$ , and  $\frac{\partial V^{\mathcal{J}}}{\partial g^I} = -1/4$  for  $I \neq \mathcal{J}$ .

<sup>13</sup> If politicians were not opportunistic but motivated directly by policy (e.g., citizen candidates), conflicts would arise between the legislators inside a single-party government. But the differences

We can summarize the results in this section as follows:

**Proposition 1.** *Under proportional electoral rule, the overall level of government spending is higher under coalition governments than under single-party governments. Coalition governments spend more on programs favored by the groups represented in government. Spending on programs favored by opposition groups are the same under the two types of government.*

### POLICY CHOICES UNDER MAJORITARIAN ELECTORAL RULE

Under *majoritarian* elections, voters are distributed in a continuum of single-member districts, and the electoral formula in each district is plurality rule. In other words, each district has one seat in the next legislature, which is won by the party with the highest vote share in the district. In the event of a tie, a coin is tossed between the parties with the same vote share in the district.

We assume that the distribution of economic groups is the same in all districts. Because of the first-past-the-post feature of majoritarian elections, the expected seat share of a party depends on the probability that its vote share exceeds a certain threshold, which in turn depends on the number of other parties competing in the election. Hence, we index the expected seat share by the overall number of parties in the legislature,  $N$ , and denote it by  $E_{(Ns^P)}$ . The possible party configurations are  $N = II, III, IV$ .

**Single-party government.** Consider first a government supported by a single-party majority, say  $P = 12$ . In a two-party system ( $N = II$ ), the single-party incumbent wins the whole legislature if its vote share exceeds  $1/2$ . If instead the opposition consists of two parties ( $N = III$ ), then the incumbent wins the whole legislature if its vote share exceeds that of the largest opposition party. Under our symmetry assumption, all votes lost by the incumbent party are split equally among the two parties in the opposition. Hence, the incumbent wins the whole legislature (its seat share is 1) if its vote share exceeds  $1/3$ , and it does not get any seat at all if its vote share is less than  $1/3$ . This implies that the expected seat share in the next legislature for the single-party government is:

$$E_{(Ns^P)} = \text{Prob}[v^P \geq N\bar{v}_S], \quad (10)$$

where  $II\bar{v}_S = \frac{1}{2}$  and  $III\bar{v}_S = \frac{1}{3}$  and where the probability is taken over the realization of  $\delta$ .

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between single-party and coalition governments due to voter behavior would still remain. With conflicting interests between legislators in merged parties, modeling within-party bargaining (and its differences from within-coalition bargaining) would be crucial.

Recall that  $\delta$  has a uniform distribution with mean 0 and density  $\psi$ , implying a c.d.f.  $G(\delta) = \frac{1}{2} + \psi\delta$ . Using this distribution function and the expression in (4), we can evaluate the expression in (10) and write the expected seat share of the single-party in government as

$$E(Ns_S^P) = \frac{1}{2} + \left(\frac{1}{2} - N\bar{v}_S\right) \frac{\psi}{\phi} + \frac{\psi}{4} \sum_{j=1}^4 (V^j - V^{*j}). \quad (11)$$

This expression is similar to Eq. (5) under proportional elections. But the density  $\phi$  of the idiosyncratic reservation utility  $\omega^i$  is replaced by the density  $\psi$  of the popularity shock  $\delta$ . Moreover, a new term, namely the second one, appears on the right-hand-side. This new term depends on the overall number of parties in the legislature, but enters as a constant such that the number of parties in the opposition does not influence policy decisions (however, this second term plays an important role in our analysis of party formation below). It is easy to verify that the equilibrium expressions for  $g_S^j$  are identical to those in (6) for a single-party government under proportional elections. Intuitively, the response to policy changes by voters alters expected seat shares in a different way than under proportional elections, but the *relative* response of different groups stays exactly the same.

**Coalition government.** What happens when parties 1 and 2 are in a coalition government? They always have the same vote share as the random popularity shock  $\delta$  affects them in the same way: Eq. (7) implies that  $Nv_C^1 = Nv_C^2$ . Moreover, since all electoral districts are homogenous, either the two parties in government win the whole legislature, or the opposition wins the whole legislature, depending on the realization of  $\delta$ . If the two parties in government win, we may assume that a coin is tossed to award the seat in each district to one of them. With a continuum of districts, each winning party in government ends up with half the seats in the legislature in equilibrium.<sup>14</sup>

This argument implies that the expected seat share of party  $P = 1, 2$  in a coalition government, is

$$E(Ns_C^P) = \frac{1}{2} \text{Prob}[Nv_C^P \geq N\bar{v}_C]. \quad (12)$$

Repeating the same argument as in the previous subsection, and recalling that votes are split equally between the two parties in government, we have  $IV\bar{v}_C = \frac{1}{4}$  if the opposition is split, and  $III\bar{v}_C = \frac{1}{3}$  if the opposition consists of a single-party.

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<sup>14</sup> The reader may wonder why then the coalition parties do not strategically agree to split the districts among themselves running only an electoral cartel with a single coalition candidate in each district. But in our simple model, these agreements would not be self-enforcing. To satisfactorily address this issue, a richer model is needed.

Using (7) and the distributional assumptions about  $\delta$ , we can evaluate (12) to obtain the expected seat share in the next legislature for a party in a coalition government:

$$E(N^P_C) = \frac{1}{4} + \left(\frac{1}{4} - N \bar{v}_C\right) \frac{\psi}{\phi} + \frac{\psi}{4} \left[ (V^P - V^{*P}) + \frac{1}{2} \sum_{j=3}^4 (V^j - V^{*j}) \right]. \quad (13)$$

The number of parties in the opposition only affects the magnitude of the second term on the right-hand-side. Since this term is a constant, the optimal policy choices of a coalition government also do not depend on the number of parties in the opposition. Moreover, the *relative* weights attached to different group voters in (13) are the same as in (8) under proportional elections. Because of this, the equilibrium allocation of spending coincides with that under proportional elections. In equilibrium, a coalition government under majoritarian elections thus sets  $g_C^j$  according to (9) in previous section. In other words, when electoral districts are homogenous, coalition governments make the same spending decisions, independently of the electoral rule.

Combining this result with the earlier result for single-party government, we thus have a sharp and testable prediction, summarized in the following:

**Proposition 2.** *Equilibrium public spending only depends on the type of government (coalition vs. single-party), as described by Proposition 1, and not directly on the electoral rule or the number of parties in the opposition.*

## ELECTORAL RULES AND PARTY FORMATION

So far we have taken the number of parties and the type of government as given. But how does the electoral rule influence the number of parties and, through this channel, the type of government (coalition vs. single-party)? As we have seen in the two previous sections, this may ultimately change fiscal policy. In this section, we extend the model to illustrate such indirect effects of electoral rules on government spending.

**Extending the model.** Modeling the whole chain of causation, from electoral rules to party system to type of government to economic policy, is a difficult and ambitious goal. Unavoidably, we have to make a number of simplifying assumptions, and the extension presented in this section is really an example of the forces at work rather than anything close to a general theory. In particular, we assume that voters continue to vote sincerely and retrospectively. We also simplify the problem of government formation. Instead, we focus on strategic behavior at the party formation stage, where politicians trade-off the electoral advantage of being a large party, against the short term benefit of remaining an independent party in government. This trade-off is affected by the electoral rule: plurality rule increases the electoral advantage of large parties, which induces politicians to merge into bigger parties. Plurality rule thus facilitates the emergence of a two party

system through the strategic behavior of politicians, even though voters do not behave strategically.<sup>15</sup>

We extend the model laid out above with two initial stages of party and government formation. At the outset, the legislature consists of four groups of legislators, numbered from 1 to 4, each representing one of the economic groups in the model. These four groups of legislators each make a simple choice: whether to form a group-specific party, or merge into a larger party with another group. Once these choices are made and we have a set of parties, a government is formed. Then, policy is set and elections are held, as described in previous sections.<sup>16</sup>

Each political group has an initial seat share of 1/4. The decision whether to merge or remain small takes into account subsequent equilibrium outcomes. We simplify the strategy space by only allowing mergers between groups 1 and 2, and groups 3 and 4, respectively. Given the symmetry between groups, this assumption is without loss of generality in the sense that any combination of two parties would lead to the same qualitative predictions. We also exclude mergers between more than two parties.

For a party merger to take place, both groups must agree; if not, they stay on as separate parties. If political group  $J$  remains a party on its own, its expected continuation payoff coincides with that of the group-specific party. If instead two political groups merge, each one expects to receive one half of the expected continuation payoff of the merged party. Three outcomes are thus possible: a two-party system, ( $P = 12$  and  $P = 34$ ), a four-party system ( $P = 1, 2, 3, 4$ ), and a three-party system ( $P = 12, 3, 4$ , or  $P = 1, 2, 34$ ).

Once we have a party system, a government is formed. We postulate an exogenous stochastic process for government formation. Any government needs the support of at least half the legislature. In line with our assumptions about party formation, we only allow governing coalitions, when relevant, between parties 1 and 2, or between parties 3 and 4. We thus rule out minority governments, as well as surplus coalitions, by assumption.<sup>17</sup>

<sup>15</sup> Earlier theoretical work in political science has studied the implications of strategic voting for the number of candidates who receive votes under plurality rule – see, in particular, Palfrey (1989) and Feddersen (1992). Myerson and Weber (1993) also study how candidates position themselves under alternative electoral systems when voters are strategic. Attempts to measure the size of strategic voters in UK elections have come up with estimates ranging from 5% to over 20% of active voters (see, Sinclair 2005). Such attempts are critically evaluated by Merlo (2006).

<sup>16</sup> The assumption of four primitive groups in the legislature is not restrictive. We could instead have assumed the initial legislature to consist of two or three parties, allowing them to splinter into smaller group-specific parties. Nothing of substance would change in this alternative formulation and the same set of equilibrium party systems would result with suitable changes in notation.

<sup>17</sup> Taking minority governments seriously would require a richer model of policy formation than the one considered below. In particular, we would have to take into account the strategic interactions in the legislature, given the specific rules for government breakup and formation. Laver and Shepsle (1996) and Diermeier *et al.* (2003a) provide detailed game-theoretic analyses of government formation, but neglect most of the remaining political interactions (party formation, policy formation, and elections).

To create a trade-off in the choice whether to merge, we also add a benefit from being in government (as opposed to just being in the legislature). Let  $R_G$  be the value to any party from being in a government of type  $G$ , relative to the value of expected seats in the next legislature (as before  $G = C, S$  denotes coalition or single-party government). Then, the expected payoff of party  $P$  in a government of type  $G$  is

$${}_N W_G^P = R_G + E({}_N s_G^P), \quad (14)$$

while its expected payoff out of government is simply the expected seat share in opposition

$${}_N W_O^P = E({}_N s_O^P), \quad (15)$$

where the index  $O$  refers to a party out of government. Throughout, we treat the benefit of being in government as exogenous. We also assume that  $R_S < 2R_C$ : the total value of being in coalition government for two small partners exceeds the value of being in single-party government for a large party. This assumption is in line with the common pool problem analyzed in this paper. It reflects the idea that each party in the coalition can use its control over specific cabinet portfolios to unilaterally set a policy that gives rents to the party.<sup>18</sup>

A four-party system is an equilibrium if – taking into account the expected equilibrium outcome of subsequent stages – the groups of legislators representing economic groups  $I$  and  $J$  find it optimal to remain split, given that the other two groups have also decided to stay split. Equilibrium conditions for a two-party, or a three-party, system are formulated in an analogous way.

**Proportional elections.** First, we examine incentives to merge under proportional electoral rule. To derive the equilibrium party system, we need to compute the expected payoffs accruing to each party under any possible party configuration, under the assumptions spelled out above. In the Appendix, we show that the expected payoffs to a small party are the same in a four-party system as in a three-party system, and given by

$${}_{IV} W^P = \frac{1}{4} + \frac{1}{2} R_C. \quad (16)$$

Under our assumptions on government and party formation, the probability of a coalition government made up of parties 1 and 2 is the same irrespective of whether parties 3 and 4 have merged. Likewise, given proportional elections, the combined expected seat share of parties 1 and 2 is always equal to  $1/2$  in equilibrium, independently of whether parties 3 and 4 have merged.

The expected payoff to a large party (resulting from the merger of two political groups), also derived in the Appendix, is the same in a two-party system as in a three-party system. This payoff is

$${}_{II} W^P = \frac{1}{2} + \frac{1}{2} R_S. \quad (17)$$

<sup>18</sup> Persson *et al.* (2003) derived the value of office from an endogenous policy choice over political rents by the government and obtained  $R_S < 2R_C$ .

Recall that two small parties that merge each get half the expected utility accruing to a large party. Hence, we have a four-party equilibrium if  $IVW^P > \frac{1}{2}IIW^P$ , and a two-party equilibrium with the reverse inequality. Under our assumption about the relative values of being in coalition vs. single-party government, however,  $R_C > \frac{1}{2}R_S$  and the right-hand-side of (16) is always larger than half the right-hand-side of (17). Hence, remaining small is a dominant strategy for all parties:

**Proposition 3.** *In a proportional electoral system, the unique equilibrium outcome has four parties represented in the legislature. As a result, only coalition governments are observed.*

Because the joint rents in a coalition government of two small parties are more than double the rents enjoyed by a single-party government parties do not merge. The electoral rule plays in the hand of this effect: as PR makes vote shares equal to seat shares, merging yields no particular advantage by extending the voter base.

**Majoritarian elections.** We now turn to party formation in a system with majoritarian elections. The Appendix gives the expected payoffs to small and large parties under all possible party configurations. Since large parties have an electoral advantage under plurality rule, these payoffs depend both on party size and the overall number of parties via the second term on the right-hand-side of (11) and (13). This creates a trade-off between the rents captured in government (pushing parties to remain small), vs. the electoral advantage of being a large party (pushing in the opposite direction). Depending on which effect prevails, we can have either a two-party system or a four-party system.

A four-party equilibrium arises if all groups of legislators prefer to remain split rather than to merge, given two group-specific parties on the opposition side. More precisely, using the above notation, a four-party system is an equilibrium if

$$IVW^1 \geq \frac{1}{2} IIIW^{12}. \quad (18)$$

The left-hand-side of (18) is the expected payoff of party 1 in a four-party system. The right-hand-side of (18) is the expected payoff accruing to group 1 if it merges with party 2, given that the opposition remains split and the payoffs are divided equally between the merging groups. Given the symmetry of the model, if condition (18) holds for party  $P = 1$ , it also holds for all the other parties. Exploiting the results in the appendix, condition (18) can be re-written as

$$R_C \geq \frac{1}{2}R_S + \frac{1}{6}\frac{\psi}{\phi}. \quad (19)$$

If this condition is met, a four-party system is an equilibrium under majoritarian elections.

Conversely, a two-party system is an equilibrium if all groups prefer to merge rather than to remain split, given that the two opposition groups have also merged:

$$\frac{1}{2} IIW^{12} \geq IIIW^1. \quad (20)$$

The right-hand-side of (20) is the expected payoff to group 1 of remaining a group-specific party when the opposition groups have merged. The left-hand-side of (20) is the expected payoff accruing to group 1 if it merges with group 2: the term  $\frac{1}{2}W^{12}$  is divided in half because each group gets half the party payoff resulting from the merger. Exploiting the results in the appendix, condition (20) for a two-party equilibrium is just the reverse of condition (19) above.

Summarizing, we have:

**Proposition 4.** *Under majoritarian elections, the equilibrium is unique. If condition (19) holds, the equilibrium has four parties and coalition government. Otherwise, the equilibrium has two parties and single-party government.*

A two-party equilibrium is more likely to exist if  $\psi/\phi = \text{Std}(\omega)/\text{Std}(\delta)$  is large, which is the case if aggregate electoral uncertainty is small relative to within-group voter dispersion. This makes intuitive sense. Under proportional elections, the expected seat share of a party is equal to its expected vote share, whereas under plurality rule the expected seat share is the probability that a party will get more votes than other parties in all districts. If aggregate uncertainty is small ( $\text{Std}(\delta)$  small), the electoral advantage of a large party facing two small parties is very significant, which raises the incentive to merge.

Throughout the paper, we have assumed the distribution of voters to be homogeneous across electoral districts. Persson *et al.* (2003) examine a more general case where parties have a skewed distribution of their voters across districts. Then, the conditions for two-party equilibrium are less easily satisfied and three-party equilibria are also possible. Intuitively, the gains from merging are lower the higher the degree of district heterogeneity. To see this, consider the extreme case where group 1 is only represented in the first half of the districts and group 2 only in the other half of the districts. In that case, groups 1 and 2 have no incentives to merge because a merger would give no additional expected seats relative to the expected seats of the coalition of the two parties. On the other hand, the costs of the merger would still be there.

**Empirical predictions.** Let us conclude the theory by summarizing its empirical implications. According to **Propositions 3 and 4**, the equilibrium number of parties – and hence the incidence of coalition governments – is smaller under majoritarian elections. According to **Propositions 1 and 2**, overall government spending is always larger under coalition governments than under single-party governments, but does not depend directly on the electoral rule. Taken together, these results imply that the electoral rule affects spending only via its effect on the incidence of coalition governments.

These predictions resonate well with the idea that proportional elections go hand in hand with *representativeness* and majoritarian elections go hand in hand with *accountability*. But the predictions are sharper than these general insights and give clear guidance on how to take the model's implications to the data. Indeed, the model predicts that the type of government directly shapes government spending, while the electoral system has no direct effect on government spending. However, the electoral system shapes the type of government via the party system, and thus exercises an indirect effect on government spending.

How do these predictions differ from others in the related literature? The influence of the electoral rule on the party system and hence the type of government is of course predicted also by a large literature in political science (see Footnote 1). Most contributions have emphasized strategic voting, rather than the strategic behavior of politicians, however. Thus our prediction is the same as in existing research, but the mechanism is different. In the empirical work below, we are unable to discriminate between strategic voters vs. strategic politicians. We test for the link between the electoral rule and the number of parties or type of government, confirming earlier results in the literature. This step is important in our empirical strategy, however, because we do not want to assume that the type of government is exogenous when investigating the effects of coalition governments on public spending.

The second prediction, that coalition governments spend more and that there are no direct effects of the electoral rule, is specific to our model. Previous theoretical work by economists on how the electoral rule shapes public spending has neglected the party system (see Footnote 2). And most earlier work on the spending patterns of coalition governments treated the party system and the type of government as exogenous and random (see Footnote 3). One of the contributions of our theoretical model is to suggest a specific identifying assumption, that we exploit in the empirical analysis: according to **Proposition 2**, the electoral rule is a valid instrument for the type of government in a regression of total public spending. Because we measure alternative and weakly correlated features of the electoral rules, we estimate an over-identified model. Hence we can test the prediction that none of the observed features of the electoral rule has an effect on the size of public spending, after controlling for the type of government.

## DATA

We limit the empirical investigation to parliamentary regimes, as in the model, and discard all presidential democracies. In identifying alternative forms of government, we follow Persson and Tabellini (2003) who use the existence of a confidence vote for the executive as the main basis for distinguishing between parliamentary and presidential democracies.

We use two different data sets. One is a broad cross sectional data set assembled and presented in detail by Persson and Tabellini (2003). The other is a panel data set resulting from a collaborative data collection effort with political scientists from Åbo Akademi (see, Lundell and Karvonen 2003). Both combine first-hand information from constitutional documents with second-hand information from a variety of sources.

The cross-sectional data set includes 50 parliamentary democracies, where each observation is an average of annual data over the period 1990–1998. We include a country in this sample if the average of the Gastil indices of political rights and civil liberties in the 1990–1998 period does not exceed 5 (low values associated with better democracies).

Our panel data set covers the period 1960–1998 for 40 parliamentary democracies. To define the sample, we rely mainly on the Polity IV data that goes farther back and is more comparable over time than the Gastil data. The encompassing *polity* index assigns to each

country and year an integer score ranging from  $-10$  to  $+10$  (high values associated with better democracies). We restrict the panel to countries and years with positive values of *polity* (censored observations treated as randomly missing). Persson and Tabellini (2003) provide further details on our sample selection criteria.<sup>19</sup>

In the panel, we define a time period as a whole legislature. Legislatures correspond to our theoretical model, in the sense that the political and institutional variables remain constant (in practice, for party structure or type of government, or by definition, for the electoral-rule variables). We measure overall government spending *in the last year* of the legislature (rather than averaging over the legislature) to allow the political variables to exercise their full effect. For the remaining variables, we just take averages over each legislative period. Since almost all the reforms are concentrated in the two most recent decades, we include at most the six latest legislatures in each country.<sup>20</sup>

**Electoral rules.** In the model, the most important aspect of the electoral system is the electoral formula. We rely on the binary indicator *plurality rule*, defined and used by Persson and Tabellini (2003). The indicator is coded 1 for countries relying exclusively on plurality rule in the elections to the lower house, and 0 otherwise. The few parliamentary democracies that rely on mixed electoral systems – with some versions of plurality rule in certain districts and proportional rule in others – are thus coded as 0. In the model, plurality rule (PR) goes hand in hand with small (large) electoral districts. The model also makes assumptions about *district magnitude*. As a second measure of the electoral rule, we therefore divide the number of seats awarded in the average electoral district, by the number of seats in the legislature. In fully proportional systems with a single national district, *district magnitude* is equal to 1, while in systems with single-member districts it is close to 0.<sup>21</sup> These two variables capture different aspects of electoral rules, as confirmed by their low correlation coefficient in our sample ( $-0.3$ ).

*Plurality rule* and *district magnitude* vary both across countries and time, but the latter variation is small. Specifically, only five electoral reforms in the panel are substantial enough to change our classification by *plurality rule*, including two mid-1980s reforms in France (a switch from majoritarian to proportional and back) and the mid 1990s reforms in Japan and New Zealand (both replacing a form of plurality rule with a mixed electoral system). *District magnitude* undergoes more frequent time variation, although the size of the underlying reforms are often quite small.

Finally, in some electoral systems a party has to overcome a minimum electoral threshold to gain representation in the legislature. We call this variable *threshold*, and measure it as a percent of the total vote at the national level. A higher threshold is expected to

<sup>19</sup> For a few small countries, the Polity IV data are not available. We thus interpolate Polity IV with the Freedom House data to make an out of sample prediction. See Persson and Tabellini (2003).

<sup>20</sup> A previous version published as NBER working paper also considers yearly data as well as cross country data averaged over the whole period 1960–1998, and shows that the results are robust.

<sup>21</sup> The NBER working paper version also includes a dummy variable for mixed electoral systems and defines average district magnitude in absolute terms (rather than in proportion to the size of the legislature), and obtains similar results.

reduce party-fragmentation and reduce the likelihood of coalition governments (increase the incidence of single-party governments).

**Party structure.** Our simplified model has only three possible outcomes: two, three or four parties. To normalize real-world party structures into a comparable measure, we use the standard Herfindahl-like index. Labeled *party fragmentation* this variable is defined as  $1 - \sum_P (s^P)^2$ , where  $s^P$  is the seat share of party  $P$  and the summation runs over all parties in the legislature (lower house). The results are robust to using the number of parties in the lower house as an alternative measure (see our NBER working paper version).

**Types of government.** Our simple model excludes minority governments and only allows for single-party majority and coalition governments. We follow the model, and classify these types of government through simple indicator variables, called *single-party* and *coalition* government. The former takes a value of 1 if the government consists of a single-party majority in that year and country, and 0 otherwise (for coalition and minority government). Similarly, *coalition* takes a value of 1 for coalition governments and zero otherwise (for single-party and minority government). This way, we classify the missing real-world category of minority governments together with either coalition or single-party governments. When we take the average of these two indicator variables, we obtain two incidence measures: *coalition* measures the incidence of coalition governments over the relevant time period, and likewise for *single-party*.<sup>22</sup>

**Government spending.** To measure the size of government, we rely on central *government spending* as a percent of GDP. This measure is based on data from the IMF.<sup>23</sup>

**Other variables.** Because government spending is affected by many different forces, we control for economic, political, geographic, and historical characteristics that may shape either government spending or political outcomes: *openness* to international trade, measured as exports plus imports over GDP, *population size* measured in logs, the percentage of the *population over 65* years of age, the log of real *per-capita income*, the *output gap*, measured as the log-deviation of output from the country specific trend (only in the panel data), a measure of *ethno-linguistic fractionalization*. These variables have been shown to correlate with measures of fiscal policy in previous studies, such as Cameron (1978), Rodrik (1998), and Persson and Tabellini (2003).

<sup>22</sup> As an alternative measure of government type, the NBER working paper version used the number of parties in the governing coalition and showed that the results are robust. The results were also robust to including controls for other constitutional features, such as bicameralism, the requirement of an investiture vote, electoral thresholds for party representation in the lower house, or a constructive vote of no-confidence. Some of these other constitutional features were significant in some regressions, others were never significant, but their inclusion never affects the results of interest.

<sup>23</sup> The original IMF data contain some breaks in the series and inconsistencies, that were corrected by Persson and Tabellini (2003).

Since many majoritarian countries are former British colonies and colonial history may have an independent effect on political and economic outcomes, we typically control for British colonial origin. As the influence of colonial heritage is likely to fade over time, we weigh colonial origin by the time since independence, giving more weight to colonial history in young independent states and no weight at all to colonial rule more than 250 years ago. The colonial history variable is called *UK colony*. As spending refers to central government, we also use a binary indicator (*federalism*) for federal political structures.

The length of the legislature varies across countries (and time): averaging over different lengths in the panel could potentially introduce heteroskedasticity in the error term. As mentioned above, however, spending is measured in the last year of the legislature. Moreover, we always report standard errors robust to heteroskedasticity. One may also speculate that legislature length could affect the government's planning horizon, and therefore its spending decisions. We therefore measure the *length of the legislature*, in years, and in some regressions we also control for different durations of legislatures across countries and time.<sup>24</sup>

The results reported below are robust to specifications with alternative combinations of these control variables. To save on degrees of freedom, we generally include controls only when they are statistically significant, or when we have strong priors that they belong to the specification.

Table 1 displays means and standard deviations of the main variables of interest, in majoritarian, mixed and proportional electoral systems. Each observation corresponds to a single legislature in a country in the 1960–1998 panel. The statistics are computed from pooling these observations. Most observations are either classified as majoritarian or proportional. The table shows large differences between these two systems in line with the theory. Compared to proportional rule, majoritarian rule is correlated with a less fragmented party system, a lower incidence of coalition governments, and a higher incidence of single-party governments. The lower incidence of coalition governments is indeed associated with lower government spending. Outcomes in the few mixed electoral systems lie in between the two polar types. Interestingly, 63% of the observations in majoritarian systems exhibit single-party government, whereas the incidence of single-party government in proportional systems is only 17%. Taking our model literally, the residual presence of coalition governments under majoritarian elections might reflect the heterogeneity of districts in a subset of countries. Note also that the standard deviation of the type of government is large within each class of electoral rules, suggesting that there may be independent shocks to coalition formation, a feature not present in our model (see further discussion below).

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<sup>24</sup> About 80% of legislatures in our sample last at least 3 years. The mean of the length of the legislature is 3.6 years with a standard deviation of 1.2 years.

**Table 1.** Political outcomes and government spending under alternative electoral systems

	(1) Majoritarian	(2) Mixed	(3) Proportional
Party fragmentation	0.54 (0.17)	0.54 (0.12)	0.70 (0.09)
Coalition governments	0.24 (0.41)	0.33 (0.47)	0.55 (0.47)
Single-party governments	0.63 (0.47)	0.40 (0.50)	0.17 (0.37)
Government spending	25.94 (9.05)	33.45 (11.3)	35.12 (9.30)
Observations	138	7	187

Simple averages. Standard deviations in parenthesis. Observations pooled across countries and legislatures.

## EMPIRICAL RESULTS

We now show that more careful statistical analysis not only confirms the simple message from Table 1 but also provides support for the precise predictions of our model. First, we test the predictions concerning *political* variables, asking how party structure and type of government vary with electoral rules. Then, we study – at more length – if *government spending* is affected by the type of government, given how the latter varies with the electoral system.

**Political outcomes.** Do electoral rules shape the party structure, as measured by party fragmentation? Column 1 in Table 2 displays the results for the 1990s cross section. The estimates are by ordinary least squares (OLS), when we control for UK colonial origin, country size, and ethno-linguistic fractionalization. As expected, plurality rule is associated with less party fragmentation, while larger electoral districts (typical of proportional elections) are associated with a more fragmented party system.

Our model suggests that the electoral system only influences the type of government through its effect on the party structure. To test this prediction, we estimate the effect of party structure on the type of government by two-stage least squares (2SLS), using the two electoral-rule variables as instruments for *party fragmentation*. Thus, we identify the effect of *party fragmentation* on the type of government by the exclusion restriction that the variables *plurality rule* and *district magnitude* do not appear in the second stage for the type of government. The first-stage regression is identical to the specification in column 1. The second-stage results are displayed in columns 2 and 3. As the theory

Table 2. Party structure, type of government and electoral rule

	(1)	(2)	(3)	(4)	(5)	(6)
	Party fragmentation	Coalition government	Single-party government	Party fragmentation	Coalition government	Single-party government
Plurality rule	-0.14*** (0.04)			-0.010 (0.046)		
District magnitude	0.11** (0.05)			3.46*** (1.26)		
Party fragmentation		1.90*** (0.54)	-2.85*** (0.50)		0.78*** (0.24)	-0.90*** (0.28)
Sample						
Estimation method	Cross section OLS	Cross section 2SLS	Cross section 2SLS	Panel OLS with country FE	Panel OLS with country FE	Panel OLS with country FE
First stage <i>F</i> statistic		15.98	15.98			
Sargan-Hansen statistic (df)		2.56(1)	0.30(1)			
Observations (Countries)	47	47	47	179	168	168
<i>R</i> -squared (overall)	0.63			0.128	0.034	0.107

Robust standard errors in parentheses; \* significant at 10%; \*\* significant at 5%; \*\*\* significant at 1%. Controls in columns (1)–(3); *Ethnolinguistic fractionalization*, *log of population size*, *UK colony*. In cols (2)–(3), *party fragmentation* is endogenous. First-stage instruments (columns 2–3): *plurality rule*, *district magnitude* and all controls. Controls in columns (4–6): Lagged dependent variable, log of population size, polity 2 score. Critical value of Sargan-Hansen statistic with 1 degree of freedom at 5% significance is 3.84.

predicts, more *party fragmentation* raises the incidence of *coalition* governments and reduces the incidence of *single-party* governments.

With two instruments and only one endogenous variable, these statistical models are over-identified. Therefore, the hypothesis that the electoral rule influences the type of government *only* through party fragmentation can be tested as an over-identifying restriction. In practice, this compares the estimates of the over-identified model reported in columns 2 and 3 with just-identified models where the electoral rule variables enter the second-stage regressions one at a time. According to the Sargan–Hansen statistics reported in columns 2 and 3, we cannot reject the hypothesis that the electoral rule variables have no direct effect on type of government, once we control for party fragmentation (although in the case of coalition government the Sargan–Hansen statistic is almost significant at the 10% level).

These results give some comfort against the risk of misspecification. As mentioned in connection with Table 1, variation in the type of government within each electoral system indicates stochastic shocks to government formation. Such shocks could be systematically correlated with electoral rules, e.g., through strategic decisions in government and/or party formation, which would make the electoral rule an invalid instrument for the party structure. Our inability to reject the over-identifying restrictions suggests that neglecting this prospective problem does not bias our inference. To address these issues properly, however, would require a more general model, incorporating a non-trivial strategic analysis of government formation.

Next, we look at the time variation in the data. On the one hand, this is more demanding. The estimates are now identified entirely from reforms of electoral systems. As mentioned earlier, the reforms of electoral formulas, generally toward a mixed system from both extremes (plurality and strict proportionality), have been few and occurred mainly in the 1990s. Reforms of district magnitude have been somewhat more common. On the other hand, using the time variation is also more rewarding. By including fixed country effects in the estimation, we can eliminate simultaneity bias due to omitted, time-invariant confounding variables.

Panel-data estimation raises a new issue because our endogenous variables – party structure and the type of government – move slowly over time. To cope with this aspect of the data, we include a lagged dependent variable in the specification. With only five or six observations per country, such dynamic panel estimates may be biased, although the bias should mainly affect the estimated coefficient of the lagged dependent variable.<sup>25</sup>

Column 4 in Table 2 shows the estimated effect of electoral rules on *party fragmentation*. The specification includes lagged party fragmentation, and controls for population size (since larger countries may have more parties) and the quality of democracy (since

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<sup>25</sup> A previous version obtained similar results on yearly data, where the bias is smaller because each country has a much longer time series. That version also estimated the model by GMM in first differences, as suggested by Arellano and Bond (1991), using lags of dependent and endogenous variables plus exogenous variables as instruments. GMM estimates are consistent even if the error term has first-order serial correlation, and make efficient use of the instruments. But they make demanding assumptions on the validity of the instruments, and increase the relevance of measurement error.

many countries in the sample have become better democracies in more recent periods which may raise the number of parties). In line with our prediction, and consistently with the cross sectional results, *district magnitude* significantly raises *party fragmentation*. *Plurality rule* has no significant effect, probably because there is not enough variation over time.

Columns 5 and 6 report estimates for the type of government. Given the limited time variation in the party system, we treat *party fragmentation* as exogenous. As expected, *party fragmentation* increases the incidence of *coalition* governments and reduces the incidence of *single-party* majorities.

These panel estimates are less precise than the cross-sectional estimates. Evidently, a considerable share of the time variation in the type of government cannot be easily explained by the sluggish electoral rule variables. Nevertheless, the estimates are significant at the 1% level and give further support to the theoretical predictions.

**Government spending.** We now turn to the predictions for government spending. Throughout, we control for the economic, social, historical and geographic variables listed in the section on data, such as federalism, demographics, and British colonial origin. In the panel, the specification is a bit more parsimonious than in the cross section, because the country fixed effects already capture the effects of the time invariant variables (see the notes to Table 3 for details). Our results are very robust to alternative specifications of the set of controls.

Consider first the cross section. Column 1 of Table 3 presents a reduced-form estimate of the effect of electoral rules on the size of government. Both *district magnitude* and *plurality rule* exert strong effects on government spending with the expected sign. Large electoral districts raise spending, while plurality rule reduces spending (although here the effect is less precisely estimated). These estimates are consistent with the reduced-form findings in Persson and Tabellini (2003, 2004a).

Next, we turn to the hypothesis that coalition (single-party) governments induce higher (lower) public spending. We first treat the type of government as exogenous, estimating by OLS. This is a strong assumption, because omitted variables – e.g., presence of strong parties in the extreme left – could lead to a high incidence of coalition governments as well as large spending. The OLS estimates are best interpreted as summarizing the partial correlations in the data, rather than as estimates of a causal effect. This correlation is displayed in Figure 1, which plots government spending against the incidence of coalition government, after removing the effect of all other regressors.<sup>26</sup> It is obtained by regressing both variables on per-capita income, population over 65, openness, federalism, ethno-linguistic fractionalization, and UK colony, and then plotting the resulting residuals against each other. Each diamond corresponds to a country in our 1990s sample. The slope of the regression line in Figure 1 is the OLS slope coefficient of coalition government in a regression for spending that also includes all the other controls. Clearly, coalition governments are associated with higher spending, and this

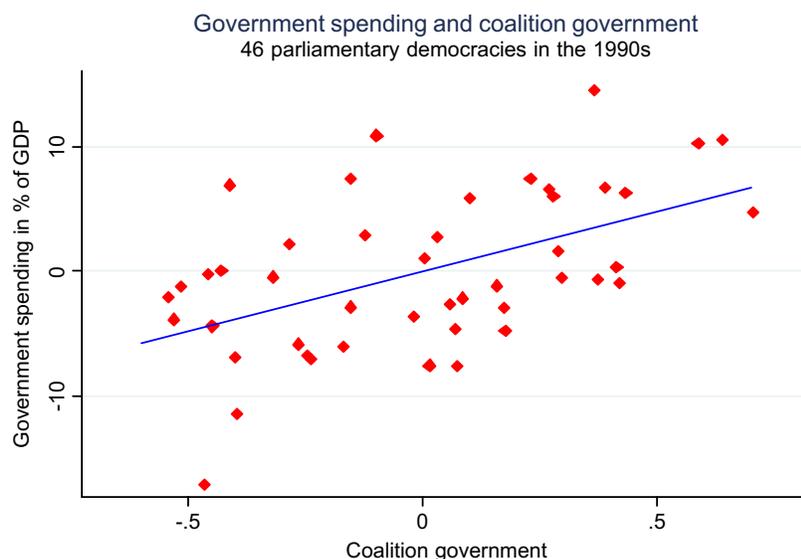
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<sup>26</sup> The controls are those used in column 1 of Table 3, except for the two electoral rule variables.

Table 3. Government spending and type of government

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Plurality rule	-5.34* (3.18)			6.76 (7.72)					
District magnitude	11.59*** (3.07)				6.47 (4.60)				
Coalition government		18.30*** (4.59)		29.41*** (11.45)	12.99** (6.23)	2.36** (1.11)		7.20*** (2.57)	
Single-party government			-16.18*** (5.76)				-2.41* (1.26)		-11.32* (5.81)
Lagged government spending						0.21 (0.13)	0.21 (0.13)	0.44* (0.27)	0.54*** (0.26)
Sample Estimation method	Cross section OLS	Cross section 2SLS	Cross section 2SLS	Cross section 2SLS	Cross section 2SLS	Panel OLS with country and period FE	Panel OLS with country and period FE	Panel GMM with country and period FE	Panel GMM with country and period FE
First-stage $F$ -statistic		23.02	16.88	7.25	6.15				
Sargan-Hansen statistic(df)		0.98(1)	2.03(1)					4.30(5) 0.63	2.51(5) 0.11
AR2 (p-value)									
Observations (Countries)	46	46	46	46	46	140 (34)	140 (34)	105 (32)	105 (32)
$R$ -squared	0.71					0.12	0.09		

Robust standard errors in brackets. \*\*\* significant at 1%, \*\* significant at 5%, \* significant at 10%. Controls in columns (1)–(5): per-capita income, openness, population over 65, federalism, ethno-linguistic fractionalization, UK colony. Controls in columns (6)–(9) except country and period fixed effects: log population size, population share over 65, output gap, length of legislature. AR(2) refers to Arellano–Bond test for absence of second order serial correlation. Critical values of the Sargan–Hansen test statistic is distributed as  $\chi^2$ . Critical values at 5% significance are 3.84 with 1 degree of freedom and 11.07 with 5 degrees of freedom.



**Figure 1.** Partial correlation between coalition government and government spending in the 1990s cross section.

correlation is not driven by outliers. If this were a causal effect, a permanent switch from single-party government to coalition government would increase long-run spending by almost 7% of GDP.

To identify the causal effect of the type of government on public spending, we rely on the exclusion restrictions implied by the theory. According to our model, the electoral rule influences the size of public spending only through its effect on the type of government. Hence, the electoral rule may be a valid instrument for the type of government, in a regression where the dependent variable is the size of public spending. Columns 2 and 3 of Table 3 report the 2SLS estimates for *coalition* and *single-party* government, respectively. The instruments for the type of government are the variables that appear in column 1, namely *plurality rule* and *district magnitude*.<sup>27</sup> The estimated coefficients on the type of government are strongly significant with the predicted sign, and larger than the OLS estimates displayed in Figure 1. While the estimates are not very precise, the coefficients are still comfortably different from zero (at the 1% level).

To gauge the quantitative importance of electoral reform, consider a switch from PR to plurality rule in a country drawn at random. According to the data displayed in Table 1, this is associated with a higher incidence of coalition governments on the order of 0.3 (0.55–0.24). Given this, the estimate in column 2 of Table 3 says that the expected

<sup>27</sup> Here we also skip the intervening step of the party structure, regressing the type of government directly on the electoral rule variables.

increase in government spending is about 5%–6% of GDP, like in the reduced form (column 1 of Table 3). This effect is large, but similar in magnitude to the reduced-form estimate in Persson and Tabellini (2003, 2004a) for a broader set of democracies.

As discussed with respect to Table 2, with two instruments for a single endogenous variable we have an over-identified model.<sup>28</sup> This allows us to test the null hypothesis that the electoral rule affects public spending *only* through the type of government. As shown by the Sargan–Hansen statistics in columns 2 and 3, we cannot reject this over-identifying restriction. Columns 4 and 5 shed further light on these tests. In each of them, we estimate an alternative just-identified model where one of the electoral rule variables enters in the second-stage regression. The effect of coalition governments on public spending remains large and significant, while neither electoral-rule variable has a significant estimated coefficient. Together with the Sargan–Hansen statistics, these results strongly suggest that majoritarian elections indeed reduce public spending because they lead to a lower incidence of coalition governments.

A possible criticism of these specifications is that none of the electoral rule variables is a valid instrument, because countries might self-select into electoral systems based on unobserved features that are correlated with government spending.<sup>29</sup> If that were the case, not even the reduced form (column 1 of Table 3) would be consistently estimated by OLS. This concern was at the core of the empirical analysis of Persson and Tabellini (2003, 2004a), who estimated the effect of the electoral rule on the reduced form by a variety of methods, such as instrumental variables, a two-step Heckman procedure, and propensity-score methods. They found that the electoral rule appears to be exogenous to government spending, and OLS estimates of reduced forms yield very similar results to those obtained by other estimation methods. That conclusion ought to dispel the concern that the electoral rule may not be exogenous to spending.

We then turn to the panel estimates, which always include country fixed effects so the estimates only reflect within-country variation in the data. To remove an upward trend in government spending, we also include a non-parametric trend in the form of period (i.e., legislature) fixed effects. One lag of spending is also included, as well as time-varying determinants of government spending, such as the output gap (to measure cyclical influences on government spending), openness to international trade, the proportion of the elderly in the population, the log of population size and the length of the legislature.

Columns 6 and 7 of Table 3 estimated by OLS, treat the type of government as exogenous. Coalition governments indeed raise public spending, while single-party governments reduce it. Although the effects are statistically significant, they are smaller than those obtained from the 1990s cross section. But the estimates shown in the table are impact effects (i.e., within one legislature) of the type of government. Taking into account the estimated coefficient on the lagged government spending, the long-run effect

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<sup>28</sup> The correlation coefficient between *plurality rule* and *district magnitude* is  $-0.3$ , so they really capture different dimensions of the electoral rule.

<sup>29</sup> The Sargan test of the over-identifying restrictions assumes that at least one of the instruments is valid.

on spending of a permanent switch from single-party to coalition government would be about 3% of GDP, about half of the OLS estimate in the 1990s cross section.

In such a short panel, however, dynamic panel estimates may be biased. To check for such bias columns 8 and 9 report GMM estimates, where the type of government is treated as endogenous with plurality rule, district magnitude and electoral thresholds as additional instruments. These GMM estimates are based on differenced data, so the dependent variable becomes the change in spending from the end of the previous legislature to the end of the current one. The estimated coefficients retain the expected sign and rise in absolute value, such that the implied long-run effects on government spending are in line with those obtained from the cross-country estimates in columns 2 and 3 of Table 3. Once more, the over-identifying restrictions cannot be rejected.

All in all, the panel estimates are a bit more fragile than the cross-sectional estimates given the paucity of electoral reforms in our sample. The overall picture from all our estimates is very consistent and strongly supports the predictions of our model. Coalition governments indeed spend significantly more than single-party governments. Moreover, proportional electoral rules cause larger government spending than majoritarian electoral rules. But this effect is an indirect effect from more fragmented party systems and more frequent coalition governments.

## CONCLUSION

When the government has parliamentary support by a single-party majority, each voter cannot easily discriminate at the polls between different politicians in government. Therefore, the main electoral conflict runs between government and opposition. When the government is supported by a coalition of parties, each voter can cast her ballot for either of the coalition parties. This creates electoral conflict within the government coalition. Such intra-government conflict induces higher spending under all electoral rules. When the number of parties is exogenous, our model predicts that government spending depends only on the type of government, not on the electoral rule.

This is not the end of the story, however. Plurality rule gives an electoral advantage to larger parties more likely win in each district. Politicians then have stronger incentives to merge into large parties than they have under proportional rule. Such strategic behavior of politicians implies that single-party governments are more likely under plurality rule, whereas coalition governments are more likely under proportional rule. Our model thus predicts that the effect of the electoral rule on government spending is indirect and works via party and government formation.

To illustrate these two ideas, we have relied on simplifying assumptions which restrict the feasible alliances among politicians and rule out strategic voting. But we are confident that the main insights of the paper are robust to alternative assumptions.

Empirical evidence based on the observed variation across parliamentary democracies, and variation across time in connection with electoral reforms, strongly supports the theoretical predictions. Proportional rule is indeed associated with more fragmented party structures, which in turn lead to more frequent coalition governments, which

spend more than single-party majority governments. Moreover, the electoral rule does not seem to exert direct influence neither on the type of government, nor on government spending. The causal links revealed by the data appear to coincide with the causal chain predicted by the theory.

We have confined the analysis to total government spending. But the difference between coalition and single-party governments emphasized in this paper is likely to influence other economic policy dimensions, such as budget deficits or the composition of spending and taxation. Moreover, dimensions of electoral rules other than those emphasized in this paper may influence policies, directly or indirectly. One should therefore be cautious in drawing normative conclusions about the general desirability of one electoral system over another.

Finally, our theoretical analysis of plurality rule assumes that electoral districts are homogeneous. With district heterogeneity, party fragmentation and coalition governments are likely to arise even under plurality rule, and the electoral rule could have a direct impact on policy outcomes (in a way depending on the precise form of heterogeneity). Systematic analysis of plurality rule with heterogeneous districts is a difficult but important task for future research.

## APPENDIX

**Party payoffs under proportional electoral rule.** We first compute expected party payoffs under proportional elections, for all possible party systems.

Suppose that the legislature consists of four parties  $P = 1, 2, 3, 4$ . Given the rules of government formation, only coalition governments are possible in this case: coalitions of parties 1 and 2, and 3 and 4, are formed with equal probability given by 0.5.

By (14) and (15), the expected utility for any of these parties, at the start of the government formation stage, is thus

$${}_{IV}W^P = \frac{1}{2} \left[ R_C + E({}_{IV}s_C^P) \right] + \frac{1}{2} E({}_{IV}s_O^P). \quad (\text{A.1})$$

With probability 1/2, party  $P$  is in a coalition government in the current period, earning an expected utility given by the first square-bracketed term; with probability 1/2, the party is out of government in the current period, earning expected utility given by the second term.

Under proportional electoral rule, the expected seat share coincides with the expected vote share for each party. Moreover, the equilibrium expected vote share can easily be computed from the equation (8) in the main text. Since in equilibrium  $V^J = V^{*J}$  for all  $J$ , (8) immediately implies that, in a four-party system,  $E({}_{IV}s_C^P) = E({}_{IV}s_O^P) = 1/4$ . As seen from the government formation stage, the expected equilibrium votes share is the same for the parties in government and opposition. The right-hand-side of (A.1) then simplifies to

$${}_{IV}W^P = \frac{1}{4} + \frac{1}{2} R_C. \quad (\text{A.2})$$

Consider a two-party system,  $P = 12, 34$ . Only single-party governments are possible, with equal probability  $1/2$ . By (14) and (15), the expected utility of a generic party  $P$ , at the start of the government formation stage, is:

$${}_{II}W^P = \frac{1}{2} \left[ R_S + E({}_{II}s_S^P) \right] + \frac{1}{2} E({}_{II}s_O^P). \quad (\text{A.3})$$

The first term is the expected utility of party  $P$  when in government, in the current period, and the second term is its expected utility when out of government. Using the results on policy choices under proportional electoral rule in equilibrium  $E({}_{II}s_C^P) = E({}_{II}s_O^P) = \frac{1}{2}$ . Hence, the right-hand-side of (A.3) simplifies to

$${}_{II}W^P = \frac{1}{2} + \frac{1}{2} R_S. \quad (\text{A.4})$$

Finally, consider a three-party system, say  $P = 12, 3$  and  $4$ . Then both a single-party government and a coalition government are possible, with equal probabilities,  $1/2$ . Here parties differ, and we have to keep track of their identity. The large party,  $P = 12$ , can only be in single-party government with expected value of being in government  $\frac{1}{2} R_S$ . Moreover, the expected seat share of a large party is always equal to  $1/2$ , irrespective of the number of parties. It follows that the expected payoff of a large party is the same as in the two-party system,  ${}_{III}W^P = {}_{II}W^P$ , for  $P = 12$ , given by the expression in (A.4). By similar reasoning, smaller parties,  $P = 3, 4$ , can only be in coalition government, and their expected payoff is the same as in a four-party system  ${}_{III}W^P = {}_{IV}W^P$  given by the expression in (A.2). In sum, the number of parties in the legislature does not matter for the parties' expected payoffs.

**Party payoffs under majoritarian electoral rule.** We now compute expected party payoffs under the possible party configurations with majoritarian rule.

Suppose we have four parties:  $P = 1, \dots, 4$ . The government can either be a coalition of 1 and 2, or of 3 and 4, with equal probabilities. The expressions for equilibrium expected seat shares (i.e., for  $V^{\mathcal{J}} = V^{*\mathcal{J}}$ ), imply that for all  $P$ ,  $E({}_{IV}s_C^P) = E({}_{IV}s_O^P) = \frac{1}{4}$ . The expected payoff of any party  $P$ , before government formation, is thus identical to that under proportional elections and four parties, and given by (A.2).

With two parties,  $P = 12$  and  $34$ , only single-party governments are possible, with equal probabilities,  $1/2$ . From the expressions for equilibrium seat share, their expected payoffs in the next legislature in government and opposition coincide:  $E({}_{II}s_S^P) = E({}_{II}s_O^P) = \frac{1}{2}$ . Once more, the expected payoff of any party  $P$  coincides with that under proportional elections and two parties given by (A.4).

Finally, suppose we have three parties, say  $P = 12, 3$  and  $4$ . Then, both single-party governments and coalition governments are possible, with equal probabilities,  $1/2$ . But the expected equilibrium payoffs are no longer the same for all parties in the legislature.

Suppose the small parties are in government. Using (13), their equilibrium expected set share is  $N\bar{s}_C = \frac{1}{4} + (\frac{1}{4} - N\bar{v}_C) \frac{\psi}{\phi}$ . As discussed in the text, a three-party system implies

$N\bar{v}_C = 1/3$ . Hence, the equilibrium expected seat share of a small party in government, when facing a single large party in the opposition, is<sup>30</sup>

$$E(III s_C^P) = \frac{1}{4} - \frac{1}{12} \frac{\psi}{\phi}. \quad (\text{A.5})$$

As the seats lost by government parties are gained by the opposition, the equilibrium expected seat share of the single-party in the opposition is

$$E(III s_O^P) = 2(1 - E(III s_C^P)) = \frac{1}{2} + \frac{1}{6} \frac{\psi}{\phi}. \quad (\text{A.6})$$

Suppose instead the large party is in government. By (11), its equilibrium expected seat share is  $N\bar{s}_S = \frac{1}{2} + (\frac{1}{2} - N\bar{v}_S) \frac{\psi}{\phi}$ . With  $N\bar{v}_S = 1/3$ , this simplifies to  $E(III s_S^P) = E(III s_O^P)$ , as given by the right-hand-side of (A.6). Repeating the analysis for the small parties in the opposition, we get that their expected equilibrium seat shares are:  $E(III s_O^P) = E(III s_C^P)$ , as given by the right-hand-side of (A.5). Thus, the expected equilibrium seat share of any party only depends on its size, and not on whether it is in government or in the opposition. Moreover, under plurality rule, large parties gain at the expense of small parties.

Based on these results, we can compute the overall expected payoffs of a small party before the government formation stage in a three-party system:

$$III W^P = \frac{1}{2} R_C + \frac{1}{4} - \frac{1}{12} \frac{\psi}{\phi}, \quad P = 3, 4. \quad (\text{A.7})$$

The first term on the right-hand-side of (A.7) is the expected payoff of being in government, the last two terms correspond to the expected equilibrium seat share. Similarly, the expected payoff of a large party before the government formation is (the interpretation is the same)

$$III W^P = \frac{1}{2} R_S + \frac{1}{2} + \frac{1}{6} \frac{\psi}{\phi}, \quad P = 12. \quad (\text{A.8})$$

Of course, this difference between small and large parties in a three-party system reflects the extra electoral bonus for a large party facing two small parties under plurality rule.

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<sup>30</sup> Since the expected seat share must lie between 0 and 1, we must have:  $3\phi \geq \psi$ .

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