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 indrectly: proportional elections induce a more fragmented party system and a larger incidence of coalition governments than do majoritarian elections. Empirical evidence from postwar parliamentary democracies strongly supports these predictions.

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1. Introduction

How do electoral rules influence government spending? We address that 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, showing that majoritarian electoral rules produce few parties or outright two-party systems. In parliamentary democracies, as a consequence, majoritarian elections produce single-party governments more often than proportional elections, which instead produce fragmentation of political parties and coalition, or minority, governments. But the political science literature has generally stopped at the level of parties or types of government, and has not examined the implications for fiscal policy.[1]

Second, recent empirical research in economics has shown electoral rules to exert a strong effect on fiscal policy: majoritarian elections are associated with smaller government spending, smaller budget deficits and smaller welfare states, than are proportional elections. An important question left open in this research concerns the "structural form" 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?[2]

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 the coalition does not fully internalize the fiscal costs of spending. Even though this claim finds some support in the data.[3], it has been derived from rather superficial assumptions. Specifically, a single-party government behaves as a unitary decision maker, while a coalition government faces a collective choice problem. But why should a large single party representing several groups in society

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[1] See, for instance, Cox 1990, 1997, Laver and Schofield, 1990, Lijphart, 1984, 1994, 1999, Palfrey 1989, Powell, 1982, 2000, and Taagepera and Shugart, 1989. Austen-Smith 2000 studies taxation and government formation under alternative electoral rules, but takes party structures as exogenous.

[2] This latter incentive interpretation is implicit or explicit in the recent empirical contributions by economists, such as Milesi-Ferretti, Perotti and Rostagno, 2002, Persson and Tabellini 2003, 2004a – see also the survey by Persson and Tabellini 2004b.

[3] See, e.g., the contributions in Poterba and von Hagen, 1999, in particular the chapter by Kontopoluos and Perotti.

behave in a different way than a coalition of smaller parties representing the same groups? Moreover, the economic literature on the common pool problem takes not only the motivation of parties, but also 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 show that the indirect effects of electoral rules – on the number of parties and the type of government – are essential to the finding 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. We derive this result in a model where politicians are opportunistic and the policy preferences of parties are endogenous. The central mechanism is that, at the polls, voters can discriminate between the parties of a coalition government, while they cannot discriminate between different factions of a single party in 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 (2006), to which we owe considerable inspiration, discusses a similar idea in a less formal framework.

From the stepping stone of this result, we endogenize party formation and the type of government by assuming that primitive groups of politicians decide whether to form large or small parties. Specifically, we provide an example where proportional elections lead to a more fractionalized party system than majoritarian elections. While we do not pretend to have a general and comprehensive theory from party formation to economic policy choices, the model example we present 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.

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 on the within-country variation around reforms of electoral systems. Both types of estimates support our key 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 about 5% of GDP.

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Section 2 presents and discusses our basic model of policymaking, taking the number of parties as given. Section 3 derives equilibrium policy choices of different types of government under proportional elections, while Section 4 shows that – for a given number of parties – the equilibrium under majoritarian elections is identical. Section 5 extends the model to draw conclusions about the effects of electoral rules on spending, through the number of parties and the type of government. Section 6 presents our data, and Section 7 presents empirical evidence in support of the theoretical predictions. Section 8 concludes.

2. The model

A population consists of 4 economic groups, of equal size normalized to unity, and indexed by J. Individuals in group J have preferences represented by:

$$V^J(\mathbf{g}) = 1 - \tau + H(g^J) \ . \tag{2.1}$$

Income is normalized to 1 for all individuals, τ is a head tax constrained to be non-negative and g^J is a local public good that only benefits economic group 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:

$$4\tau = \sum_J g^J \ . \tag{2.2}$$

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

A benevolent, utilitarian social planner would treat all groups in the same way and equate the marginal utility of the local public good g^J for a quarter of the population to the opportunity cost of private consumption for the whole population. The condition for this is:

$$\hat{g}^J = H_g^{-1}(1), \ \text{all} \ J \ , \tag{2.3}$$

where subscripts denote partial derivatives and $^{-1}$ an inverse function, and where taxes are residually determined from the government budget constraint (we assume an interior optimum).

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 two polar cases: (i) a four-party system with $P = 1, 2, 3, 4$ where each party represents[4] 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.[5]

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 $\mathbf{g}$. 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 τ 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 assumption about the behavior of coalition governments can be interpreted as parties obtaining agenda-setting powers – say, in the form of ministerial positions – over the policy dimensions they care about the most (such powers could potentially be derived from bargaining over ministerial positions at a government formation stage, as in Laver and Shepsle, 1996). This agenda-setting power is strong enough to allow the minister in charge to do what is unilaterally optimal for her party. This would happen, for instance, 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, Roland and Tabellini (2000). The implication of our assumptions about policy formation will be that coalition governments, but not single-party governments, face an electoral common-pool problem in policy formation.

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[4]The precise meaning of "represent" is explained below when we describe the election stage.

[5]Other combinations of party mergers or coalition governments would deliver the same qualitative results as these two polar cases, as will become clear in the analysis to follow.

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 J votes for party J, when the latter is in government, if:

$$V^J(\mathbf{g}) \geq \omega^i + \delta + V^{*J} . \tag{2.4}$$

If the inequality turns the other way, she votes for the opposition; if the opposition has more than one party, each of these receives her vote with equal probability. If party J is *not* in government and inequality (2.4) is satisfied, then each party in the coalition receives her vote with equal probability; if the inequality is not satisfied, she votes for party J. Voters in J thus reward their own party J more often than other parties.

The first term on the right-hand side of (2.4) depicts an individual component of reservation utility: ω^i is uniformly distributed within each group of voters, with mean zero and density ϕ. Individuals with higher values of ω^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 δ is also uniformly distributed, with mean 0 and density ψ. Thus, ϕ measures dispersion of voters' bias within each group and it determines the responsiveness of voters to policy favors: a higher value of ϕ, corresponding to less within-group dispersion, means that policy favors buy more "swing" voters in each group. The parameter ψ is instead a measure of aggregate dispersion, and hence of aggregate uncertainty about the election outcome: a higher value of ψ 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 (2.4) is given by $V^{*J} = V^J(\mathbf{g}_G^*)$, 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 ω^i and δ, but not the realization of the aggregate popularity shock δ. 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 (2.4)) through its choice of **g**. The term V^{*J} on the right hand side of (2.4) (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.[6]

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 fully intertemporally rational, and not modeled as strategic players. Despite the proliferation of strategic voting models in the theoretical literature, we are not too apologetic about treating voters in this simplified fashion. Instances of strategic voting are certainly observed in the real world. However, given the low individual stakes for a single atomistic voter, sophisticated strategic voting is not necessarily more plausible than simple retrospective voting. For the problem at hand, we believe it is much more important to model professional politicians as strategic and fully rational.

The second central assumption is that voters identify with and only reward their own party (rather than its coalition partner) when they are pleased with government performance. Again, the specific modeling of this behavior 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 behavior of voters 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 (2006), 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).

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[6]In the equilibrium with rational expectations discussed in section 5, of course, we will have $V^J = V^{*J}$.

(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 Section 5 we analyze, in a simple example, the incentives of parties to merge under the two electoral rules, thereby endogenizing party structure and type of government.

3. Policy choices under proportional electoral rule

Under *proportional* elections all voters belong to a single national district and the electoral formula is proportional representation. It follows that each party receives a seat share in the next legislature identical to its vote share in the national district. Hence, expected seat shares and vote shares coincide, $E(s_G^P) = E(v_G^P)$, and 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. Given the symmetry of the model, it does not matter whether the opposition consists of a single party or two distinct parties. To fix ideas, we 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 $J = 1, .., 4$. Pick a voter in this group with a value of ω^i exactly equal to $V^J - V^{*J} - \delta$. By (2.4), this "swing voter" in group J is just indifferent between voting for the party in government or voting for the opponent. All voters of the same group with a lower value of ω^i vote for the party in government. Let $F(\cdot)$ denote the cumulative distribution function of ω^i in (2.4). The fraction of voters in group J voting for the party in government is thus $F(V^P - V^{*P} - \delta)$, while the complementary fraction $1 - F(V^P - V^{*P} - \delta)$ votes for the opposition.

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

$$v_S^P = \frac{1}{4}[\sum_{J=1}^{4} F(V^J - V^{*J} - \delta)] , \qquad (3.1)$$

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

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As ω^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 two facts and simplifying, we can express the expected vote share for party P as:

$$E(v_S^P) = \frac{1}{2} + \frac{\phi}{4} \sum_{J=1}^{4} (V^J - V^{*J}) . \tag{3.2}$$

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, ϕ. 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 (3.2) with regard to all policy instruments, subject to (2.1) and (2.2). It is easy to see that this policy corresponds to the social optimum in (2.3) because all groups have the same weight.

Coalition government To analyze the case of a coalition government, we now assume (without loss of generality) that parties 1 and 2 form a coalition government, while parties 3 and 4 are in the opposition. Consider the voters in group $J = P$, where $P = 1, 2$ is one of the two parties in government. By the same argument as above, the fraction of voters in group $J = P$ 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:

$$v_C^P = \frac{1}{4}[F(V^P - V^{*P} - \delta) + \frac{1}{2} \sum_{J=3}^{4} F(V^J - V^{*J} - \delta)] . \tag{3.3}$$

Of the terms between square brackets, the first reflects the share of voters in group P whose reservation utility is satisfied, and the second the share of satisfied voters from the out-of-government groups ($J = 3, 4$). 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 represented by the coalition partner. It is this feature of voters' behavior that pits the electoral interests of the two coalition partners against each other .

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

$$E(v_C^P) = \frac{1}{4} + \frac{\phi}{4}[(V^P - V^{*P}) + \frac{1}{2}\sum_{J=3}^{4}(V^J - V^{*J})] \ . \tag{3.4}$$

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

We then derive the equilibrium policy. Party $P = 1, 2$ in the coalition government sets g^J, $J = P$, so as to maximize (3.4), subject to (2.1) and (2.2) and taking as given the policy choice of his coalition partner. Since both parties in the coalition government 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^J, $J \neq 1, 2$. Moreover, the policymaking incentives are identical independently of whether the opposition consists of one or two parties.

The resulting optimality conditions for spending imply:[7]

$$g_C^{*J} = \begin{cases} H_g^{-1}[\frac{1}{2}] & \text{if} \quad J = 1, 2 \\ H_g^{-1}[1], & \text{if} \quad J = 3, 4 \ . \end{cases} \tag{3.5}$$

Retrospective voting induces opportunistic politicians to enact a suboptimal allocation of local public goods, relative to the choices of a social planner or a single party government. The groups represented in government have an advantage, and spending on the local public good benefiting them is above the social optimum: $g_C^{*J} > \hat{g}^J = H_g^{-1}(1)$, $J = 1, 2$. 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 overspend on their constituencies. Conversely, the economic groups not represented in government ($J = 3, 4$) receive the efficient amount of public goods although they pay higher than optimal 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.

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[7]In deriving (3.5), we use (2.1) and (2.2) which imply that $\frac{\partial V^J}{\partial g^J} = H_g(g^J) - 1/4$ for $I = J$, and $\frac{\partial V^J}{\partial g^I} = -1/4$ for $I \neq J$.

In summary, coalition governments face a conflict within government because each party is eager to satisfy its own voter base. Therefore, they behave differently than single-party governments, where this kind of conflict is not present.

To be sure, we are not stating that single party governments behave more efficiently 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. As voters cannot discriminate between different politicians under the same political banner, 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. This would remove the social efficiency of policy under single party 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.[8]

We can summarize the above discussion 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.

4. 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.

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[8]If politicians were not opportunistic but instead motivated directly by all aspects of policy (e.g., as "citizen candidates"), conflicts would arise between the legislators inside a single-party government. But the differences between single-party and coalition governments induced by voting 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.

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 $E(_N s_G^P)$. 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 in government is:

$$E(_N s_S^P) = \text{Prob}[v^P \geq {}_N \bar{v}_S] . \tag{4.1}$$

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 δ.

Recall that δ has a uniform distribution with mean 0 and density ψ, implying a c.d.f. $G(\delta) = \frac{1}{2} + \psi\delta$. Using this distribution function and the expression in (3.1), we can rewrite evaluate the expression in (4.1) and write the expected seat share of the single party in government as:

$$E(_N s_S^P) = \frac{1}{2} + (\frac{1}{2} - {}_N \bar{v}_S)\frac{\psi}{\phi} + \frac{\psi}{4} \sum_{J=1}^{4}(V^J - V^{*J}) . \tag{4.2}$$

This expression is similar to equation (3.2) under proportional elections. But the density ϕ of the idiosyncratic reservation utility ω^i is replaced by the density ψ of the popularity shock δ. 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 in Section 5). It is easy to

verify that the equilibrium expressions for g_S^J are identical to those in (2.3) 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? The two parties in government always have the same vote share: since the random popularity shock δ affects these two parties in the same way, equation (3.3) implies that $_N v_C^1 = {}_N v_C^2$. 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 δ. 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.[9]

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

$$E(_N s_C^P) = \frac{1}{2} \, \text{Prob}[_N v_C^P \geq {}_N \bar{v}_C] \, . \tag{4.3}$$

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.

Using (3.3) and the distributional assumptions about δ, we can evaluate (4.3) to obtain the expected seat share in the next legislature for a party in a coalition government:

$$E(_N s_C^P) = \frac{1}{4} + (\frac{1}{4} - {}_N \bar{v}_C)\frac{\psi}{\phi} + \frac{\psi}{4}[(V^P - V^{*P}) + \frac{1}{2}\sum_{J=3}^{4}(V^J - V^{*J})] \, . \tag{4.4}$$

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

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[9]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.

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the opposition. Moreover, the *relative* weights attached to different group voters in (4.4) are the same as in (3.4) 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 (3.5) in Section 3. 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.*

5. Electoral rules and party formation

So far we have taken the number of parties and the type of government as given. But the electoral rule is likely to 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 this indirect effect of electoral rules on government spending.

Extending the model   Modelling 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 only an example of the forces at work rather than anything close to a general theory. In particular, we neglect strategic voting: voters continue to vote sincerely and retrospectively. We also simplify the problem of government formation when there are multiple parties. The extension instead focuses 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 independent, in terms of political rents when 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

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party system through the strategic behavior of politicians, even though voters do not behave strategically.[10]

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, according to the rules described in previous sections.[11]

For simplicity, we assume that each political group has an initial seat share of 1/4. The decision whether to merge or remain split is made strategically by these groups, taking 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 not restrictive 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

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[10]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).

[11]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.

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.[12]

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:

$$_N W_G^P = R_G + E(_N s_G^P) , \qquad (5.1)$$

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

$$_N W_O^P = E(_N s_O^P) , \qquad (5.2)$$

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 and reflects the idea that each party in the coalition can unilaterally grab some rents for itself.[13]

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

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[12]Taking minority governments seriously would require a richer model of policy formation than the one coinsidered 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, Eraslan and Merlo (2003a) provide detailed game-theoretic analyses of government formation, but neglect most of the remaining political interactions (party formation, policy formation, and elections).

[13]Persson, Roland and Tabellini, 2003 derived the value of office from an endogenous policy choice over political rents by the government and obtained $R_S < 2R_C$.

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:

$$_{IV}W^P = \frac{1}{4} + \frac{1}{2}R_C \ .$$ (5.3)

Under our assumptions on government formation and party formation, the probability of a coalition government made up of, say, 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:

$$_{II}W^P = \frac{1}{2} + \frac{1}{2}R_S \ .$$ (5.4)

By the assumptions spelled out above, two small parties that merge each get half the expected utility accruing to a large party. Hence, we have a four party equilibrium if $_{IV}W^P > \frac{1}{2}{}_{II}W^P$, 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 (5.3) is always larger than half the right hand side of (5.4). 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 nad 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 and government 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 now depend both on party size and on the overall number of parties in the legislature via the second term on the right-hand side of (4.2) and (4.4). This creates a trade-off between the rents captured if 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

$$_{IV}W^1 \geq \frac{1}{2} \,_{III}W^{12} \; . \tag{5.5}$$

The left-hand side of (5.5) is the expected payoff of party 1 in a four-party system. The right-hand side of (5.5) 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 (5.5) holds for party $P = 1$, it also holds for all the other parties. Exploiting the results in the appendix, condition (5.5) can be re-written as:

$$R_C \geq \frac{1}{2}R_S + \frac{1}{6}\frac{\psi}{\phi} \; . \tag{5.6}$$

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:

$$\frac{1}{2} \,_{II}W^{12} \geq \,_{III}W^1 \; . \tag{5.7}$$

The right-hand side of (5.7) is the expected payoff to group 1 of remaining a group-specific party when the opposition groups have merged. The left-hand side of (5.7) is the expected payoff accruing to group 1 if it merges with group 2: the term $_{II}W^{12}$ is divided in half because each group gets half the party payoff resulting from the merger. Exploiting the results in the appendix, condition (5.7) for a two-party equilibrium is just the reverse of condition (5.6) above.

Summarizing, we have:

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Proposition 4

Under majoritarian elections, the equilibrium is unique. If condition (5.6) 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 $\psi/\phi = \mathrm{Std}(\omega)/\mathrm{Std}(\delta)$ 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 "first pass the post" in all districts. If aggregate uncertainty is small ($\mathrm{Std}(\delta)$ 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, Roland, and Tabellini (2003) examine a more general case where some parties may have a skewed distribution of their voters across districts. In that formulation, the conditions for a two party equilibrium are less easily satisfied and a three-party equilibrium is 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 theoretical part of the paper by summarizing the empirical implications of our results. According to **Propositions 3** and **4,** the equilibrium number of parties – and hence the incidence of coalition governments – are 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 rhyme well with a general idea in the political-science literature, namely 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 for party structures, types of government,

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and economic policies to the data. Indeed, the model predicts that the type of government shapes government spending, while – given the type of government – the electoral system does not exercise any direct effect on government spending. However, the electoral system shapes the type of government via the party system, and thus exercises only an indirect effect on government spending.

6. Data

We limit the empirical investigation to parliamentary regimes, as in the model, and discard all presidential democracies. In defining which countries have a parliamentary 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: 1) a broad cross sectional data base assembled and presented in detail by Persson and Tabellini (2003), 2) another data base 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.

Our first data set includes 50 parliamentary democracies where each observation is an average of annual data over the period 1990-98. We include a country in the sample if the average of the Gastil indices of political rights and civil liberties (denoted *gastil*) in the 1990-98 period does not exceed 5 (low values being associated with better democratic institutions).

Our second data set covers the period 1960-98 for 40 parliamentary democracies. Here, 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 (higher values are associated here with better democracies). We restrict the panel to countries and years with positive values of *polity* (censored observations are treated as randomly missing). Persson and Tabellini (2003) provide further details on our sample selection criteria.[14] The resulting variable is called *polity_gt*.

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[14] 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).

Electoral rules In the model, the most important aspect of the electoral system is the electoral formula. We rely on the binary indicator variable *maj,* used in 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. A few parliamentary democracies rely on a mixed-majoritarian electoral system, with some version of plurality rule in certain districts and proportional rule in others. We code these mixed systems with the variable *semi*, taking a value of 1 if the electoral system is mixed, and 0 otherwise. The default is thus the group of proportional countries. Mixed-proportional systems such as Germany, for which the electoral formula is strictly proportional at the level of the whole nation, are coded as proportional. The model also assumes that proportional elections are performed in a nation-wide district and majoritarian elections in single-member districts. We include the variable *district* to allow for the positive expected association between large districts and party proliferation. This standard district magnitude variable measures the number of seats awarded in the average electoral district, rescaled to vary between 0 and 1.

These three variables vary both across countries and over time but the time variation is small: there are only seven electoral reforms relevant enough to change our classification of maj or $semi$, including two mid-1980s reforms in France (that switched from majoritarian and then back to proportional) and the mid 1990s reforms in Japan and New Zealand (both replacing a form of plurality rule with a mixed electoral system). District magnitude varies more frequently over time, although the size of these changes is often small.

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 of party fragmentation. It is labeled *party_frag* and defined as $1 - \Sigma_P(s^P)^2$, where s^P is the seat share of party P and the summation runs over all parties in the legislature (lower house). As an alternative measure, we also use the number of parties in the lower house, *nparties*.

Types of government Our simple model excludes minority governments and only allows for two types of government: single-party majority and coalition governments. We follow the model, and classify these types of government through simple indicator variables, called *single* and *coalition*, respectively. Thus, *single* takes a value of 1 if the government consists of 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*. As an alternative measure of government type, we use the number of parties in the governing coalition, *ngov*.

Other constitutional variables   We also measure some other features of the constitution, which are likely to influence the party structure or the type of government. 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 reduce party-fragmentation. We also construct (0,1) indicator variables for three additional constitutional features: *investiture*, set to 1 if a new government must win majority support in an investiture vote; *constructive*, set to 1 if the government can be dismissed only by electing a replacement; *bicam*, set to 1 if the legislature has two chambers (irrespective of their relative strength). Bicameralism raises the probability of surplus coalitions (since it increases the majority required to form a government or to pass legislation), and thus we expect it to have a positive effect on the incidence of coalition governments and a negative one on single-party governments. The investiture vote and the constructive vote of no confidence reduce the probability of minority governments, and thus, for a given party structure, are expected to increase the incidence of coalition governments, but have no expected effect on single-party majority governments – see, in particular, the recent work by Diermeier, Eraslan, and Merlo (2003a and b). When time periods are defined as the whole legislature in our panel data, we also measure the length of the legislature, *leg_length*, in years, to control for different durations of legislatures.

Economic and social variables   To measure the overall size of government, we rely on central government spending as a percent of GDP, *cgexp*, used in Persson and Tabellini (2003) and based on data from the IMF.[15] Since government spending is affected by many other determinants, we also control for

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[15]The original IMF data contain some breaks in the series and inconsistencies, that were corrected by Persson and Tabellini (2003).

several variables that reflect the economical, political, geographical, and historical characteristics of the countries in the sample. The following variables refer to economic and social determinants of fiscal policy or of political outcomes: openness to international trade, measured as exports plus imports over GDP ($trade$), population size measured in logs ($lpop$), the percentage of the population above 65 years of age ($prop65$), the log of real per capita income (lyp), the output gap ($ygap$), measured as the log-deviation of output from the country specific trend (only in the panel data), a measure of ethno-linguistic fractionalization ($avelf$). 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).

Because many majoritarian countries are former British colonies and colonial history may have an independent effect on the political and economic outcomes, we typically control for British colonial origin. Because 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 col_uka. Finally, since spending refers to central government, we also use an indicator variable for federal political structures ($federal$).

The results reported below are robust to alternative specifications involving 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 particular legislature in a country in the 1960-98 panel. The statistics are computed from pooling these observations. Most observations are either classified as majoritarian or proportional. We immediately find large differences between these two systems in line with the theory. Compared to proportional systems, majoritarian electoral systems have a less fragmented party system, a smaller incidence of coalition governments, and a larger incidence of single party government. The smaller incidence of coalition governments is indeed associated with smaller government spending. Outcomes in the few mixed electoral systems lie in between the polar types. Interestingly, 63% of the observations from 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 elec-

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tions 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).

7. Empirical results

We now show that more careful statistical analysis confirms the simple message entailed in *Table* 1 and provides support for the precise predictions of our model.

Political outcomes   First, we study the predictions of the theory concerning the *political* variables, asking how party structure and type of government vary with electoral rules. Second, we study the *economic* policy predictions, asking how government spending is affected by the type of government, given how the latter varies with the electoral system (and other aspects of he constitution). Since we have relatively few observations, we keep the specification with regard to other variables as parsimonious as possible.

Do electoral rules shape the party structure, as measured by party fragmentation (*party_frag*) or by the number of parties (*nparties*)? Columns 1 and 2 of *Table* 2 display the results for the 1990s cross section. Here, we control for UK colonial origin, country size, and ethno-linguistic fragmentation. As expected, plurality rule (as measured by *maj*) is associated with less party fragmentation and fewer parties. Mixed electoral systems also appear to generate less fragmented party systems (compared to the proportional default). As expected, larger electoral districts (typical of proportional elections) are associated with a more fragmented party system and a larger number of parties. Finally, higher electoral thresholds reduces the number of parties, but only when the dependent variable is *nparties*. In column 6, for the cross section based on the longer time series, we have fewer observations, so we use a slightly more parsimonious specification. The results show that PR as well as larger electoral districts raise party fragmentation.

Our model suggests that the electoral system influences the type of government *only* 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, imposing the exclusion restriction that the electoral rules variables *maj*, *semi* and *district* do not appear in the second stage for the type of government. Given that the latter three variables are not highly mutually correlated, we can test the over-identifying restriction implied by this exclusion restriction, since we have a

variable (*threshold*) that measures different aspects of electoral systems than *maj*, *semi* and *district*. To control for other determinants of the type of government, we add our measures of bicameralism, the investiture vote and the constructive vote of no confidence to the second stage.

The results are displayed in columns 3-5 (for the 1990s) and 7-8 (for the long cross section) of *Table* 2. Party fragmentation has a strong and significant effect on the type of government, with the expected sign, and the number of parties in the legislature have a significant effect on the number of parties in government. The estimated coefficients of the party structure variables on the type of government are precisely estimated, and their size is similar across the two samples, a sign of robustness. Moreover, the test statistics (displayed in the row labelled Over-id) do not reject the over-identifying restrictions that three electoral-rule variables of interest have no direct effect on the type of government, except in the case of coalition governments in the 1990s, where we marginally reject at the 5% confidence level.

The results in *Table* 2 also give some comfort against the risk of misspecification. As mentioned in connection with *Table* 1, the observed variation in the type of government within each electoral system suggests stochastic shocks to government formation. Such shocks might 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 general inability to reject the over-identifying restrictions suggest that neglecting this prospective problem does not systematically 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, as electoral rules only exhibit limited variation over time. There have been a few reforms of electoral formulas, generally towards a mixed system from both extremes (plurality and strict proportionality) and mainly in the 1990s, while reforms of district magnitude have been somewhat more common. On the other hand, using the time variation is also more rewarding, because simultaneity bias due to omitted (time-invariant) confounding variables is less likely.

We confine the analysis to the 1960-98 data set, defining a time period as a whole legislature (see Persson, Roland, and Tabellini, 2003 for additional results when time is measured in calendar years). Legislatures correspond to our theoretical model, in the sense that our political and institutional variables remain constant (in practice, for party structure or type of government, or by definition,

for the electoral rules variables). 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.

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 generally include a lagged dependent variable in the specification. However, as the endogenous variables reflect unobserved country-specific determinants, we also we want to include fixed country effects. But it is well known that fixed-effects estimates are biased in the presence of lagged dependent variables and with only six observations per country in the panel this bias can be quite serious. We therefore estimate by GMM in first differences, as suggested by Arellano and Bond (1991), using lags of dependent and endogenous variables plus exogenous variables as instruments.[16]

Column 9 in *Table* 2 shows our estimates of the effect of electoral rules on party fragmentation. Here, we include lagged party fragmentation, and control for country size (measured by *lpop*) and quality of democracy (measured by *polity_gt)*, since many countries in the sample have become better democracies in more recent periods. As expected, district magnitude raises party fragmentation, confirming the cross sectional results. Plurality rule (measured by maj) has the expected negative sign, but is at best borderline significant (*p*-value of 0.11). We cannot reject the assumptions of no second-order serial correlation or validity of the lagged values used as instruments.

Columns 10 and 11 report on the structural estimates for the type of government. We treat party fragmentation as endogenous and use the electoral-rule variables (in first differences) as additional instruments (beyond one additional lag of the dependent variable and one lag of endogenous party fragmentation). The estimated coefficients on party fragmentation are significant with the expected sign: more fragmentation increases the likelihood of coalition governments and reduces the likelihood of single-party majorities. Moreover, we cannot reject the over-identifying assumptions on the validity of the instruments, meaning that the

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[16]This method produces consistent estimates even if the error term has first-order serial correlation, and makes efficient use of the instruments. But it makes demanding assumptions on the validity of the instruments. Because of the uncertain finite-sample properties of GMM estimators with many overidentifying restrictions, we choose a parsimonious set of instruments, exploiting only one extra lag of dependent or endogenous variables (rather than the full set of lags to the beginning of the sample). Persson, Roland, and Tabellini (2003) also report on fixed-effect, IV estimates on the basis of yearly data. The results are quite similar.

electoral rule variables do not exert a direct effect on the type of government.

These panel estimates are less precise than the cross-sectional estimates. Evidently, there is considerable time variation in the type of government, which cannot be easily explained by sluggish electoral rule variables. Nevertheless, the estimates confirm our earlier inference and give further support to the predictions of the model.

Policy outcomes   We now turn to the second set of predictions, concerning the effects on the size of government spending (as measured by *cgexp*). Throughout, we control for the economic, social, historical and geographic variables listed above, such as federalism, demographics, and British colonial origin. The specification is a bit more parsimonious in the 1960-98 sample, because we have fewer degrees of freedom and some controls are not available over this longer time period (see the notes to *Table* 3 for details). Our results are very robust to alternative specifications of the set of controls.

Columns 1 and 5 of *Table* 3 present reduced-form estimates of the effect of electoral rules on the size of government, for the 1990 and the 1960-98 samples respectively. To save on degrees of freedom, we omit the variable for mixed electoral systems (*semi*) as well as the constitutional variables, *bicam*, *investiture* and *constructive* for the 1960-98 sample. As expected, district magnitude (*district*) has a very strong positive effect on the size of government. Plurality rule (*maj*) has the expected (negative) effect, as well, but the estimated coefficient is not statistically significant. We omit the electoral threshold variable, as it is never statistically significant.

In columns 2-4 and 6-7 we estimate the effect of the type of government on government spending, treating the type of government as endogenous to electoral rules. We also ask whether the effect of electoral rules operates only through the type of government. The instruments for the type of government are the electoral-rule variables as displayed in columns 1 and 5, respectively, plus the investiture vote variable when the type of government is measured by coalition, and the electoral threshold variable when it is measured by the number of parties in government.[17] The effects of the type of government on government spending are strongly significant with the predicted sign. While the coefficients are not very precisely estimated, the point estimates are still large enough to keep them

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[17]Given the caveats above, we prefer not to use the constructive vote variable as an instrument, although its inclusion makes no difference. Here we also skip the intervening step of the party structure, regressing the type of government directly on the electoral rule variables.

comfortably away from zero, except in one case. Finally, we cannot reject the over-identifying restrictions, that the electoral rule variables have no direct influence on government spending, beyond their indirect influence through the type of government.

Despite the failure to reject the over-identifying restriction, a possible criticism of these regressions is that none of the electoral rule variables is a valid instrument, because countries might self-select into alternative electoral rules based on unobserved features correlated with government spending.[18] If that were the case, not even the reduced forms (columns 1 and 5 of *Table* 3) can 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 reduced form by a variety of methods, such as instrumental variables, a two-step Heckman procedure, and propensity-score methods. Their conclusion was 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 this particular concern about the validity of the electoral rule as an instrument for the type of government.

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). According to the estimate in column 2 of *Table* 3, the expected increase in government spending is thus on the order of 5% of GDP. This effect is large, but almost identical to the reduced-form estimate of Persson and Tabellini (2003, 2004a) for a broader set of democracies.

The last three columns of *Table* 3 display our panel estimates how the type of government and electoral rules influence government spending. In this case, we measure overall government spending *in the last year* of the legislature (rather than on average throughout the legislature), to allow the political variables to exercise their full effect. As our GMM estimates are based on differenced data, the dependent variable becomes the change in spending from the end of the previous legislature to the end of the current one.

Since the duration of legislatures varies across countries and time periods, these regressions include a variable measuring the length of the legislature, in years. One lag of spending is also included. The specifications always include other time-varying determinants of government spending, such as the output gap (to

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[18]The Sargan test of the over-identifying restrictions assumes that at least one of the instruments is valid.

measure cyclical influences on government spending), openness to international trade, and the proportion of the elderly in the population. Finally, to reduce collinearity among the electoral rule variables, we omit the indicator variable for mixed electoral rules, including only the indicator for plurality rule (maj) and the measure of district magnitude ($district$).

Column 8 shows the estimate of a reduced form of spending on the electoral rule variables. As expected, district magnitude has a positive and strongly significant coefficient (larger districts implying more spending) but the coefficient on plurality rule is insignificant.

Columns 9 and 10 displays the structural estimates of the type of government (coalition or single party majority) on government spending, when the type of government is endogenous and the electoral rule variables that appear in column 8 are used as additional instruments. The estimated coefficients all have the expected sign: coalition governments spend more, single party governments spend less. The effect of coalition governments in column 9 is precisely estimated and large in value. Given the coefficient on lagged spending, the implied long-run effect is 10% of GDP. Note that the over-identifying restrictions cannot be rejected. The effect of single-party government in column 10 is smaller and much less precisely estimated.

All in all, the panel estimates are a bit more fragile than the cross-sectional estimates, but this is perhaps to be expected given the paucity of electoral reforms in our data (and the real world). The overall picture emerging from all of our estimates is quite consistent and support the predictions of our model. They suggest that coalition governments indeed spend significantly more than single-party governments. Moreover, proportional electoral rules cause larger government spending than majoritarian electoral rules, but only indirectly by inducing more fragmented party systems and hence more frequent coalition governments.

8. Conclusion

When the government has parliamentary support by a single-party majority, voters 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, voters can cast their ballots 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 exoge-

nously given, our model predicts that government spending depends only on the type of government, but 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 to gain plurality in each district. For this reason, politicians have stronger incentives to merge into large parties, whereas they prefer to splinter in smaller parties 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 in a simple way, we have relied on simplifying assumptions, which restrict the feasible alliances among politicians and rule out strategic behavior of voters. 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 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 the size of government spending. The chain of causation in the data appears 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 strong 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 heterogenous districts is a difficult but important task for future research.

9. Appendix

9.1. Party payoffs under proportional electoral rule

We first compute the 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 (5.1) and (5.2), the expected utility for any of these parties, at the start of the government formation stage, is thus:

$$_{IV}W^P = \frac{1}{2}\left[R_C + E(_{IV}s_C^P)\right] + \frac{1}{2}E(_{IV}s_O^P) \ . \tag{9.1}$$

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 expression (3.4) in Section 3. Since in equilibrium $V^J = V^{*J}$ for all J, .(3.4) 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 (9.1) then simplifies to:

$$_{IV}W^P = \frac{1}{4} + \frac{1}{2}R_C \ . \tag{9.2}$$

Consider a two party system, $P = 12, 34$. Only single party governments are possible, with equal probability $1/2$. By (5.1) and (5.2), the expected utility of a generic party P, at the start of the government formation stage, is:

$$_{II}W^P = \frac{1}{2}\left[R_S + E(_{II}s_S^P)\right] + \frac{1}{2}E(_{II}s_O^P) \ . \tag{9.3}$$

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 in section 3, in equilibrium $E(_{II}s_C^P) = E(_{II}s_O^P) = \frac{1}{2}$. Hence, the right hand side of (9.3) simplifies to:

$$_{II}W^P = \frac{1}{2} + \frac{1}{2}R_S \ . \tag{9.4}$$

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 the parties differ, and we have to keep track of their identity. The large party, $P = 12$, can only be in a single-party government, so his expected value of being in government is $\frac{1}{2}R_S$. Moreover, the expected seat share of a large party is always equal to 1/2, irrespective of the number of parties in the legislature. Thus 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 $P = 12$, as given by the expression in (9.4). By similar reasoning, the smaller parties, $P = 3, 4$, can only be in a coalition government, and their expected payoff is the same as in a four-party system $_{III}W^P =_{IV} W^P$ as given by the expression in (9.2). All in all, the number of parties represented in the legislature does not matter for the parties' expected payoffs.

9.2. Party payoffs under majoritarian electoral rule

We now compute the parties' expected payoffs under all possible party configurations with majoritarian electoral rule.

Suppose that we have four parties: $P = 1, 2, 3$, and 4. The government can either be a coalition of parties 1 and 2, or of parties 3 and 4, with equal probabilities. Using the expressions for expected seat shares derived in section 4, in equilibrium (i.e. for $V^J = V^{*J}$), we have that for all values of P : $E(_{IV}s_C^P) = E(_{IV}s_O^P) = \frac{1}{4}$. The expected payoff of any party P, at the start of the government formation stage, is thus identical to that under proportional elections and four parties, and is given by (9.2) above.

In the case of two parties, $P = 12$ and 34,only single-party governments are possible, both with equal probabilities, 1/2. Using the expressions derived in section 4, their equilibrium expected seat share in the next legislature are the same in government and opposition: $E(_{II}s_S^P) = E(_{II}s_O^P) = \frac{1}{2}$. Once more, then, the expected payoff of any party P coincides with that under proportional elections and two parties, and is given by (9.4) above.

Finally, suppose we have a legislature with 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 that the small parties are in government. Using (4.4) in section 4, 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 Section 4, in a three party system $_N\bar{v}_C = 1/3$. Hence, the equilibrium expected seat share of a small party in government, when facing a single large party in the opposition, is[19]:

$$E(_{III}s_C^P) = \frac{1}{4} - \frac{1}{12}\frac{\psi}{\phi} \ . \tag{9.5}$$

Since the seats lost by government parties are gained by the opposition, we must also have that the equilibrium expected seat share of the single party in the opposition is:

$$E(_{III}s_O^P) = 2(1 - E(_{III}s_C^P)) = \frac{1}{2} + \frac{1}{6}\frac{\psi}{\phi} \ . \tag{9.6}$$

Suppose instead the large party is in government. By (4.2), 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 (9.6). Repeating the same analysis for the small parties in the opposition, we also get that their expected equilibrium seat share when in the opposition are: $E(_{III}s_O^P) = E(_{III}s_C^P)$, as given by the right hand side of (9.5). 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 expenses of small parties.

Based on these results, it is straightforward to compute the overall expected payoffs of a small party before the government formation stage in a three-party system as:

$$_{III}W^P = \frac{1}{2}R_C + \frac{1}{4} - \frac{1}{12}\frac{\psi}{\phi}, \qquad P = 3, 4 \ . \tag{9.7}$$

The first term on the right hand side of (9.7) 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):

$$_{III}W^P = \frac{1}{2}R_S + \frac{1}{2} + \frac{1}{6}\frac{\psi}{\phi}, \qquad P = 12 \ . \tag{9.8}$$

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[19]Since the expected seat share must lie between 0 and 1, we must have: $3\phi \geq \psi$

Of course, this difference between the expected welfare of the 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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Table 1
Political and economic outcomes
in alternative electoral systems

	Majoritarian	Mixed	Proportional
party fragmentation	0.54	0.54	0.70
	(0.17)	(0.12)	(0.09)
coalition governments	0.24	0.33	0.55
	(0.41)	(0.47)	(0.47)
single-party governments	0.63	0.40	0.17
	(0.47)	(0.50)	(0.37)
government spending	25.94	33.45	35.12
	(9.05)	(11.3)	(9.30)
N. obs.	138	7	187

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

Table 2 Party Structure, type of governments and electoral rules

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Dep. Var.	*party_frag*	*nparties*	*coalition*	*single*	*ngov*	*party_frag*	*coalition*	*single*	*party_frag*	*coalition*	*single*
party_frag			2.01 (0.71)***	-2.78 (0.50)***			2.62 (0.74)***	-2.63 (0.43)***		1.35 (0.81)*	-1.26 (0.63)**
nparties					0.25 (0.10)**						
maj	-0.12 (0.05)**	-2.10 (1.31)				-0.09 (0.05)*			-0.06 (0.04)		
semi	-0.22 (0.09)**	-3.76 (2.23)*				-0.01 (0.06)					
district	0.11 (0.07)	3.20 (1.56)**				0.14 (0.07)**			2.31 (0.24)***		
threshold	0.00 (0.01)	-0.39 (0.16)**				-0.01 (0.01)			-0.00 (0.00)		
bicam			0.15 (0.11)	-0.01 (0.08)	0.28 (0.24)						
investiture			-0.08 (0.12)		0.84 (0.35)**		-0.10 (0.11)				
constructive			0.53 (0.10)***		0.19 (0.33)		0.78 (0.12)***				
Sample	1990s cross	1990s cross	1990s cross	1990s cross	1990s cross	1960-98 cross	1960-98 cross	1960-98 cross	1960-98 panel	1960-98 panel	1960-98 panel
Estimation	OLS	OLS	2SLS	2SLS	2SLS	OLS	2SLS	2SLS	GMM	GMM	GMM
Over-id			7.91(3)**	4.33(3)	4.52(3)				4.16 (3)	3.70 (6)	3.70 (6)
AR(2)									0.68	0.46	0.46
N. countries (obs)	52	52	47	47	47	38	36	36	37 (141)	35 (97)	35 (97)

Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. Controls included in OLS: cols (1)-(2): *avelf, lpop, col_uka*, col (6) *lpop, col_uka*. Second-stage variables in 2SLS, cols (3)-(5): *avelf, lpop, col_uka, bicam, investiture, constructive,* cols (7)-(8) *lpop, col_uka, investiture, constructive*. First-stage variables in 2SLS: *maj, semi, district, threshold*, and all second-stage variables. Specification of GMM (all variables in first differences) in cols (9)-(11), always includes constant, *lpop; polity_gt* , and lagged Dep. var., once in col (9), twice in cols (10)−(11).. Instruments for lagged Dep. Var. is one additional lag of this variable. In cols (10)-(11), *party_frag* is treated as endogenous with additional instruments: one lag of *party_frag, maj, district*,.and *threshold*.. Over-id is Hansen-Sargan test statistic of over-identifying restrictions, chi-2(df) critical values at 5% significance 7.81(3), 12.59(6).. AR(2) is Arellano-Bond test for absence of second-order serial correlation.

Table 3   Size of government, type of government and electoral rules

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
coalition		17.00				30.07			6.51	
		(3.72)***				(10.79)***			(3.12)**	
single			-17.17				-24.47			-1.79
			(5.58)***				(14. 97)			(4.31)
ngov				7.74						
				(4.06)*						
maj	-4.76					-2.73		1.08		
	(3.39)					(2.55)		(1.67)		
semi	8.31									
	(4.53)*									
district	14.52					17.29		0.25		
	(2.05)***					(2.29)***		(0.08)***		
threshold								-0.12		
								(0.17)		
lagged cgexp								0.53	0.46	0.66
								(0.21)**	(0.18)**	(0.17)***
Sample	1990s cross	1990s cross	1990s cross	1990s cross	1960-98 cross	1960-98 cross	1960-98 cross	1960-98 panel	1960-98 panel	1960-98 panel
Estimation	OLS	2SLS	2SLS	2SLS	OLS	2SLS	2SLS	GMM	GMM	GMM
Over-id		2.16(3)	2.26(2)	0.02(2)		1.29(2)	1.60(1)	5.35(3)	10.24(9)	7.11(9)
AR(2)								0.76	0.52	0.96
N. countries (obs.)	46	46	46	46	34	34	34	34 (111)	32 (105)	32 (105)

Robust standard errors in parentheses;* significant at 10%; ** significant at 5%; *** significant at 1%. OLS specification, col (1), and second stage of 2SLS, cols (2)-(3) include: *lyp, trade, prop65, federal, avelf, col_uka.* OLS, col (4), and second stage 2SLS, cols (5)-(8), include: *lyp, prop65, federal, col_uka.* First-stage in 2SLS: as displayed in cols (1), (4) plus *investiture* (cols 2 and 6) and *threshold* (col 4), plus all second-stage variables. GMM specification (all variables in first differences) includes: constant, *lpop, prop65, ygap, leg_length.* In col (8), instrument for lagged *lagged cgexp* is one further lag. In cols (9)-(10), type of government (*coalition* or *single*) is treated as endogenous with one lag of this variable plus *maj, district,* and *threshold* as instruments. Over-id is Hansen-Sargant test statistic for over-identifying restrictions distributed as chi-2(df); critical values at 5% significance 3.84(1), 5.99(2), 7.81(3), 16.92(9). AR(2) refers to Arellano-Bond test for absence of second order serial correlation.