ELECTORAL SYSTEMS AND PUBLIC SPENDING*

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We study the effects of electoral institutions on the size and composition of public expenditure in OECD and Latin American countries. We emphasize the distinction between purchases of goods and services, which are easier to target geographically, and transfers, which are easier to target across social groups. We present a theoretical model in which voters anticipating government policymaking under different electoral systems have an incentive to elect representatives more prone to transfer (public good) spending in proportional (majoritarian) systems. The model also predicts higher total primary spending in proportional (majoritarian) systems when the share of transfer spending is high (low). After defining rigorous measures of proportionality to be used in the empirical investigation, we find considerable support for our predictions.

I. Introduction

In modern democracies, elected representatives making decisions on fiscal policy face a basic trade-off between allegiance to a social constituency and allegiance to a geographic constituency. Elected officials represent a specific district, but also typically advance the interests of specific social groups that spread across many districts or the whole nation. This trade-off is relevant to fiscal policymaking because it parallels the distinction between the two main types of government spending: transfers and purchases of goods and services. The former are mostly targeted to groups of individuals with certain social characteristics, such as the unemployed and the elderly; the scope for targeting them geographically is therefore limited. The latter (which we will call public goods) instead are typically targeted along geographical lines.

In this paper we study how the electoral system shapes this trade-off and the incentives of elected officials to allocate revenues to the two types of spending. We show that proportional systems are more geared to spending on transfers, while majoritarian systems are more prone to public good spending. Thus, loosely speaking, our model captures the widespread notion that "proportional systems allow representation of a greater variety of interests" (a frequent claim by advocates of this system), while "majoritarian systems are more grounded in local interests."

The model is based on the logic of strategic delegation of Chari, Jones, and Marimon [1997] and Besley and Coate [1999], extended to a framework with two types of government spending and with different electoral systems. In a majoritarian system, each district elects one representative. If the distribution of different social groups is similar across districts, all representatives will belong to the same social group. Hence, all elected representatives derive utility from the same type of transfers, but each derives utility from a different public good. It follows that electors will have an incentive to vote for individuals with stronger preferences for public goods relative to transfers, in order to bias government expenditure on public goods toward their district. In equilibrium the result is just high expenditure on public goods.

In a proportional system, each district elects more than one representative. Hence, more than one social group will be represented in Parliament; in contrast to the majoritarian system, each representative now derives utility from a different type of transfer. Individuals have an incentive to vote for representatives with stronger preference for transfers, in order to bias the spending decisions of the government toward their own type of transfers. In equilibrium, high spending on transfers is the result. The model then predicts that spending on transfers is higher in proportional systems, and spending on public goods is higher in majoritarian systems. Total government spending is higher in proportional systems if the median voter values relatively little the public good and relatively highly private consumption and transfers, lower in the opposite case.

One virtue of our model is that it captures common and, we believe, plausible views both of the properties of different electoral systems *and* of different types of government spending. Other recent positive models of electoral systems—such as Persson and Tabellini [1999a, 2000] and Lizzeri and Persico [2001]—exploit the differences between alternative types of government

spending, but they emphasize a different breakdown, that between a "universal" expenditure and a more targetable one. Our model does not have a universal type of spending, but two types of goods with different targeting characteristics: this is what generates the dichotomy between "allegiance to social constituencies" and "allegiance to geographic constituencies," and that between "greater variety of interests" in proportional systems and "greater importance of local interests" in majoritarian systems.[1]

In the empirical part of this paper, we construct rigorously defined measures of the degree of proportionality of electoral systems in OECD and Latin American countries, and use them to explore the reduced-form relationship between electoral systems and government spending. In both cross-section and panel regressions, we find considerable support for the predictions of our model for OECD countries, and weaker results for Latin America. In particular, we document the existence of a strong and very robust positive relationship between the degree of proportionality of the electoral system and the size of transfer spending among OECD countries.

The plan of the paper is as follows. The next section presents the model. Sections III and IV solve it in the majoritarian and proportional systems, respectively. Sections V and VI discuss how to operationalize voting systems in view of an empirical test of the model. Section VII presents the cross-sectional evidence; Section VIII the panel evidence. Section IX discusses further the relationship to the recent literature, both theoretical and empirical. Section X concludes. Some of the more technical passages in the solution of the model are presented in Appendix 1; details on the construction of the electoral variables are given in Appendix 2; Appendix 3 presents the data.

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1. We discuss these models more in detail in Section IX; an important difference with our model is that they allow for binding promises by candidates, which we rule out. We also rule out strategic voting. Austen-Smith and Banks [1988] and Baron and Diermeier [2001] show in different contexts how voters can behave strategically in their electoral decision, internalizing the expected coalition bargaining that will lead to policy formation after the election. Strategic voting can lead electors to pick a party whose preferences or policy platform are more distant from theirs than another party's. Key issues are how the right to propose a government coalition is attributed (typically depending on vote shares) and what is each party's utility out of the status quo outcome in case an agreement is not reached. As we will see, these issues do not arise in our model, because the right to form a government is attributed randomly and all representatives who refuse an offer to take part in the government receive the same utility.

II. The Model

II.1. Population and the Fiscal System

The country is populated by a continuum of individuals, with total mass 1. The population is divided into three groups, A, B, and C, with size μ_A, μ_B, and μ_C, respectively. These sizes can be different, but no group can include more than 50 percent or less than 25 percent of the population.[2] The country is composed of three geographic regions. A region can be thought of as the basic subnational unit of the country: hence, government spending cannot be targeted more finely than a region.

There are two types of government spending: transfers and purchases of goods and services, or "public goods." Typically, the government fixes the eligibility criteria for a specific transfer, and all citizens who meet the criteria are then eligible for that transfer, regardless of their region of residence. For instance, old age pensions are paid to all national residents above a certain age who have paid enough contributions, and unemployment benefits are paid to all unemployed individuals with a work history. In contrast, spending on goods and services is local in nature. The government can always decide to build a school or to hire more policemen in a city and not in another; it is a matter of policy how evenly distributed these expenditures are on the national territory.[3]

Of course, the distinction is not always precise. Certain goods or services purchased by the government are available virtually to the whole population (for instance, a plane in a state-owned airline company). But it is rarer for transfers to households provided by the central government to be explicitly localized: legislation usually does not bar citizens from a certain transfer only because of where they live.[4] Thus, we believe that, by and large, the distinction we have made is conceptually and empirically sound.

We capture this difference between the two types of govern-

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2. As we will see, this condition ensures that all three groups are represented in a proportional system.
3. Some public goods—such as defense—clearly have a nationwide externality. However, expenditure on these goods is still localized: a military base can be built in a specific state. Ceteris paribus, residents of a state prefer to have the military base in their own state than in another state.
4. Of course, transfers can end up being more concentrated in certain areas because of the demographic or labor market characteristics of these areas: thus, Florida receives more old-age pension expenditure per person than most other states, and high-unemployment areas receive a larger share of unemployment-related transfers.

ment spending in a simple way. Because of some different underlying characteristics, individuals in the three groups differ in the types of transfers they are entitled to: an individual in group j benefits from the transfer s_j, but not from the transfers specific to the other groups. In contrast, individuals in region k derive utility from public good spending in region k, g_k, and not from the public goods specific to the other regions.

All individuals have the same productivity, which we normalize at 1. The utility of individual i of group j in region k is

$$(1) \qquad U_{ijk} = (1 - t)^{\alpha_i \beta_i} s_j^{\alpha_i(1 - \beta_i)} g_k^{1 - \alpha_i},$$

where t is the proportional tax rate, and $(1 - t)$ is therefore an individual's posttax income. Thus, individuals have Cobb-Douglas preferences over public goods and private income, and Cobb-Douglas preferences over the breakdown of disposable income into primary income and transfer income. Within each group, the parameters α_i and β_i are distributed uniformly over the intervals $[\alpha_L, \alpha_H]$ and $[\beta_L, \beta_H]$, respectively, with α_L, $\beta_L \geq 0$ and α_H, $\beta_H \leq 1$.[5]

II.2. The Electoral System and Government Formation

The values of taxes t, transfers s_j, and public goods g_k, are decided by elected representatives. We describe first how representatives are elected, and then how their preferences are aggregated to deliver the policy outcomes $[t, s_j, g_k]$.

The first stage corresponds to the electoral system. We fix the number of representatives at three, and characterize an electoral system by the number of electoral districts. At one extreme, each of the three regions is a separate electoral district electing one representative; we call this the **majoritarian system.** At the other extreme, the whole country makes up a single electoral district, electing three representatives; we call this the **proportional system.**

Representatives of group j from different regions all derive utility from the same transfer s_j, but from different public goods. When a district comprises more than one region, as in the proportional system, it is not necessary for our purposes to specify

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5. The assumption of a uniform distribution ensures the existence of a noncycling majority when individuals vote on the two issues contemporaneously. The assumption could be relaxed if we assumed that voting on the two issues is sequential—see Appendix 1.

fully the process by which public good spending within the district is then allocated to the regions within the district; we simply assume that, whatever process is in place, the equilibrium outcome is a uniform allocation of total public good spending among the regions.[6] Our model focuses on the allocation to districts at the central government level; in turn, in deciding its allocation, the central government takes into account that it will be divided equally among the regions in the district.

The second stage describes how governments are formed and how their decisions are taken. The literature has provided a large number of possibilities here. In our setup, one simple way to formalize government formation is the following. One of the three representatives (the Prime Minister) is randomly selected to form a government. He makes an offer to join the government to another representative, subject to the constraint that the government maximizes the joint utility of its members. If the second representative accepts, the government is formed, and policy is decided by maximizing the joint utility function of the two representatives. If the second representative does not accept, the Prime Minister makes an offer to the third representative. If he also refuses, then no spending on transfers and public goods is authorized, and all representatives receive a status-quo utility of zero. It should be clear that (*i*) it is not in the interest of the Prime Minister to offer more than one representative to join the government; (*ii*) it is in the interest of a representative to accept an offer by the Prime Minister.[7]

Besides its simplicity, this formulation of the political process has the important virtue that it separates the electoral system from the formation of government; that is, electoral systems differ only in the way representatives are elected, and not in the way governments are assumed to be formed.

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6. The within-district allocation can be interpreted as a subnational voting or bargaining process that takes as given the total amount of public goods allocated to that district by the central government. All results would go through even if we treated the subnational governments symmetrically to the national government: namely, the subnational government at the district level is formed by the representative of a randomly chosen subregion, who then invites the representative from another subregion to join the government.

7. The assumption that the government has to maximize the joint utility of its members reduces the importance of agenda control. As an alternative, we could assume that two of the three representatives are selected at random to form a government. If they agree, the government is formed, and policy is decided by maximizing a joint utility function. If they do not, then no spending on either transfers or public goods can be authorized, and all representatives receive a status quo utility of 0.

III. Majoritarian System

In this system each of the three districts elects one representative. We solve the model backward, starting with the policies chosen by the government.

III.1. The Policy Formation in the Government

In our main analysis we shall assume for simplicity that one group is larger than the other two.[8] Because all districts have the same composition, the three representatives will all belong to the largest group. Assume that group B is such a group: thus, the government will be composed of two B-individuals, elected in two different districts. Denote by k_1 and k_2 the districts where the two members of the government have been elected, and let an asterisk denote an elected individual. Taking logs, the government will maximize the joint utility:

$$(2) \quad V^M(k_1, k_2) = (\alpha^*_{k_1}\beta^*_{k_1} + \alpha^*_{k_2}\beta^*_{k_2}) \log (1 - t) + (\alpha^*_{k_1}(1 - \beta^*_{k_1})$$
$$+ \alpha^*_{k_2}(1 - \beta^*_{k_2})) \log s_B + (1 - \alpha^*_{k_1}) \log g_{k_1} + (1 - \alpha^*_{k_2}) \log g_{k_2},$$

where the superscript M denotes a majoritarian system and $\alpha^*_{k_i}$ and $\beta^*_{k_i}$ represent the preferences of the individuals elected in district k_i. These representatives (and their constituencies) want different public goods, but both derive utility only from the transfer s_B. Maximization of the above objective function is subject to the government budget constraint,

$$(3) \qquad\qquad t = \mu_B s_B + g_{k_1} + g_{k_2},$$

where t is the proportional tax rate and the aggregate income of the economy is 1. To understand the above expression, recall that the per capita transfer is s_B: only individuals of type B (a fraction μ_B of the population) receive it: there is no reason for the two representatives in the government to vote for a positive transfer that benefits the other two groups.

Let $\bar{s}_j = \mu_j s_j$ denote total spending on transfers to group j; let $\bar{s}$, g, and t denote the shares in GDP of transfers, expenditure on the public goods and total expenditure, i.e., $\bar{s} \equiv \Sigma^C_{j=A} \mu_j s_j$; $g \equiv$

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8. The assumption that a group larger than the others exists considerably simplifies the algebra in the majoritarian case, but in no way is it essential to our argument. All our results would go through if we assumed that all groups have the same size one-third—see the discussion at the end of this section.

$\sum_{k=1}^{3} g_k$, and $t \equiv \bar{s} + g$. It is straightforward to show that the government policies that maximize (2) are

$$t^M(k_1,k_2) = \frac{2 - (\alpha^*_{k_1}\beta^*_{k_1} + \alpha^*_{k_2}\beta^*_{k_2})}{2}$$

$$\bar{s}^M_B(k_1,k_2) = \frac{\alpha^*_{k_1}(1 - \beta^*_{k_1}) + \alpha^*_{k_2}(1 - \beta^*_{k_2})}{2}; \bar{s}^M_A(k_1,k_2) = 0; \bar{s}^M_C(k_1,k_2) = 0$$

(4)
$$g^M_{k_1}(k_1,k_2) = \frac{1 - \alpha^*_{k_1}}{2}; g^M_{k_2}(k_1,k_2) = \frac{1 - \alpha^*_{k_2}}{2}; g^M_{k_3}(k_1,k_2) = 0$$

$$g^M(k_1,k_2) \equiv g^M_{k_1}(k_1,k_2) + g^M_{k_2}(k_1,k_2) = \frac{2 - \alpha^*_{k_1} - \alpha^*_{k_2}}{2},$$

where $t^M(k_1,k_2)$ indicates the equilibrium value of total primary spending in the majoritarian system when the government is formed by representatives from districts k_1 and k_2, and similarly for the other fiscal policy variables. Similar results obtain in the case that all groups have the same size.[9]

III.2. The Choice of the Representatives

In the first stage, each group selects simultaneously by majority voting its own representative among its members, so that the space of possible candidates spans the rectangle with length $[\alpha_L,\alpha_H]$ and height $[\beta_L,\beta_H]$. In Appendix 1 we show that the individual with median values of the parameters α and β is the decisive voter in each group, despite the fact that the issue space is bi-dimensional. The median voter of group B in region k_1 maximizes with respect to $\alpha^*_{k_1}$ and $\beta^*_{k_1}$ the utility function,[10]

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9. When all groups are the same size, the election result is random. In this case we have two possible outcomes for government formation. The first occurs if the government is formed by two representatives belonging to the same social group. In this case the policy choice is analogous to the one in equation (4) above. The second outcome occurs if the government coalition is formed between two representatives belonging to different social groups (this will always occur when three candidates belonging to different parties are elected). In this case the optimal policy choice will be analogous to the one of equation (4) for taxation and public good spending (with the subscripts k_1, k_2 now indicating representatives from different social groups as well as regions); for transfer spending, the total is unchanged, but its composition now reflects the preferences of the two social groups in government, with $\bar{s}^M_{k_1}(k_1,k_2) = (\alpha^*_{k_1}(1 - \beta^*_{k_1}))/2$ and $\bar{s}^M_{k_2}(k_1,k_2) = (\alpha^*_{k_2}(1 - \beta^*_{k_2}))/2$.

10. For simplicity, we omit the social group and region subscripts from the utility parameters.

(5) $\quad E(V_{mBk_1}^M) = \sum_{r=2}^{3} [\alpha_m \beta_m \log (1 - t^M(k_1, k_r))$

$\qquad\qquad + \alpha_m(1 - \beta_m) \log s_B^M(k_1, k_r) + (1 - \alpha_m) \log g_{k_1}^M(k_1, k_r)],$

where t^M (k_1, k_r), s_B^M (k_1, k_r), and $g_{k_1}^M$ (k_1, k_r) are given by (4). Taking first-order conditions and imposing symmetry between the two districts, we obtain the α^* and β^* preferred by the median voter in a majoritarian system:

(6) $\qquad\qquad \alpha^{*M} = \dfrac{\alpha_m}{2 - \alpha_m}; \ \beta^{*M} = \beta_m.$

Hence, the median voter wants a representative with the median value of β but a value of α below the median. The logic is similar to that of Besley and Coate [1999], except that there are two types of public expenditures. In a majoritarian system, all representatives and members of the government benefit from the same transfer, but from different public goods. Hence, the median voter in district k tries to bias the decision of the government toward his own public good by electing an individual with preference for high spending on public goods relative to transfers. In equilibrium the result is just high spending on the two public goods that get funded.

Substituting (6) into (4), one finally gets

$$t^M = 1 - \frac{\alpha_m \beta_m}{2 - \alpha_m}$$

(7) $\qquad\qquad \bar{s}^M = \dfrac{\alpha_m(1 - \beta_m)}{2 - \alpha_m}$

$$g^M = \frac{2(1 - \alpha_m)}{2 - \alpha_m}.$$

Again, similar results obtain when all groups have the same size.[11]

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11. In this case, the solution for the values of α^* and β^* chosen by the median voter for each party representative in the district turns out to be a weighted average of the values in equation (6) and of those that occur under a proportional system (see equation (12) below). The weights are equal to the respective probabilities that a government will be formed by two representatives of the same party or by representatives of two different parties. Results are available from the authors upon request.

IV. Proportional System

Because each group has more than 25 percent but less than 50 percent of total population, in this system a representative from each group is elected.

IV.1. The Policy Formation in the Government

Suppose that the government is formed by representatives of group j_1 and j_2, who maximize joint utility[12]

$$(8) \quad V^P(j_1, j_2) = (\alpha^*_{j_1}\beta^*_{j_1} + \alpha^*_{j_2}\beta^*_{j_2}) \log (1 - t) + \alpha^*_{j_1}(1 - \beta^*_{j_1}) \log s_{j_1}$$
$$+ \alpha^*_{j_2}(1 - \beta^*_{j_2}) \log s_{j_2} + (2 - \alpha^*_{j_1} - \alpha^*_{j_2}) \log (g/3),$$

where $\alpha^*_{j_1}$ and $\beta^*_{j_1}$ are the two utility parameters of the representative from group j_1, and similarly for $\alpha^*_{j_2}$ and $\beta^*_{j_2}$. The maximization of the above objective function is subject to the government budget constraint,

$$(9) \qquad\qquad t = \mu_{j_1}s_{j_1} + \mu_{j_2}s_{j_2} + g.$$

It is straightforward to show that the solutions to this problem are

$$t^P(j_1, j_2) = \frac{2 - (\alpha^*_{j_1}\beta^*_{j_1} + \alpha^*_{j_2}\beta^*_{j_2})}{2}$$

$$\bar{s}^P_{j_1}(j_1, j_2) = \frac{\alpha^*_{j_1}(1 - \beta^*_{j_1})}{2}; \ \bar{s}^P_{j_2}(j_1, j_2) = \frac{\alpha^*_{j_2}(1 - \beta^*_{j_2})}{2}; \ \bar{s}^P_{j_3}(j_1, j_2) = 0$$

$$(10)$$
$$\bar{s}^P(j_1, j_2) \equiv \bar{s}^P_{j_1} + \bar{s}^P_{j_2} = \frac{\alpha^*_{j_1}(1 - \beta^*_{j_1}) + \alpha^*_{j_2}(1 - \beta^*_{j_2})}{2}$$

$$g^P(j_1, j_2) \equiv g^P_{j_1}(j_1, j_2) + g^P_{j_2}(j_1, j_2) + g^P_{j_3}(j_1, j_2) = \frac{2 - \alpha^*_{j_1} - \alpha^*_{j_2}}{2}.$$

For given α^* and β^*, total spending on each of the two instruments is the same as under a majoritarian system (see equation (4)); however, the optimal choices of α^* and β^* by the median voters will now be different, as we show next.

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12. Because in equilibrium public good spending is divided equally within the district, individuals are indifferent to the region of origin of a representative: the only relevant characteristic is to which social group the representative belongs.

IV.2. *The Choice of the Representatives*

The median voter of group j_1 maximizes with respect to $\alpha^*_{j_1}$ and $\beta^*_{j_1}$ the utility function:[13]

$$(11) \quad E(V^P_{j_{1m}}) = \sum_{r=2}^{3} [\alpha_m \beta_m \log (1 - t^P(j_1, j_r)) + \alpha_m (1 - \beta_m) \log s^P_{j_1}(j_1, j_r)$$

$$+ (1 - \alpha_m) \log g^P(j_1, j_r)],$$

where the values of t^P, $s^P_{j_2}$, and g^P are given by (10). Taking first-order conditions and imposing symmetry between the two groups, the values of α and β preferred by the median voter in the proportional system are

$$(12) \qquad \beta^{*P} = \frac{\beta_m}{2 - \beta_m}; \ \alpha^{*P} = \frac{\alpha_m (2 - \beta_m)}{1 + \alpha_m (1 - \beta_m)}.$$

Hence, the median voter selects a candidate with α higher and β lower than the median. This pattern is exactly the opposite that under a majoritarian system. The reason is intuitive: in a proportional system, spending on public goods is uniform across regions, but each member of the government benefits from a different type of transfer. Hence, the median voter tries to bias the decision of the government toward his own transfer by electing an individual with a preference for high spending on transfers relative to public goods. In equilibrium the result is just high spending on the two types of transfers that get funded. Using (12) in (10), one finally gets

$$t^P = \frac{1 + \alpha_m (1 - 2\beta_m)}{1 + \alpha_m (1 - \beta_m)}$$

$$(13) \qquad \bar{s}^P = \frac{2\alpha_m (1 - \beta_m)}{1 + \alpha_m (1 - \beta_m)}$$

$$g^P = \frac{1 - \alpha_m}{1 + \alpha_m (1 - \beta_m)}.$$

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13. Again, when this does not create any ambiguity, we omit the region and the group subscripts.

IV.3. Predictions

Comparing equations (6) and (13), it is easy to see that

$$\bar{s}^P > \bar{s}^M$$

(14)
$$g^P < g^M$$

$$t^P \gtreqless t^M \leftrightarrow \alpha_m \gtreqless \frac{1}{(2 - \beta_m)}.$$

Thus, the model delivers three predictions. First, suppose that one compares the outcome across electoral systems, holding constant the median voter's preference parameters; then we have just shown that

1. spending on transfers is higher in a proportional system; and
2. spending on goods and services is higher in a majoritarian system.

Now consider two countries, with different values of α_m and β_m. In the first, transfers are larger than public good spending under both electoral systems: from (7) and (13) this implies that $\alpha_m > 2/(3 - \beta_m)$. In the second country, public good spending is larger under both electoral systems, implying that $\alpha_m < 1/(3 - 2\beta_m)$. For $\beta_m < 1$, $2/(3 - \beta_m) > 1/(2 - \beta_m)$; hence, from (14) in the first country total spending is larger in a proportional system: $t^P > t^M$. Conversely, because $1/(3 - 2\beta_m) < 1/(2 - \beta_m)$, again from (14) in the second country, total spending is lower in a proportional system: $t^M > t^P$. Hence, we have the third prediction of the model:

3. Total government spending is higher in a proportional system if transfer spending is large relative to public good spending, regardless of the electoral system; conversely, total government spending is higher in a majoritarian system if transfer spending is low relative to public good spending, regardless of the electoral system.

Note that these results also hold when we compare the two electoral systems holding constant the number of parties in Parliament or in government. For example, when all social groups have the same size, we can have three parties in Parliament even in a majoritarian system. However, while *for given preferences of the representatives* the collective choices concerning public spending would be the same as in a proportional system, it is still the case that the representatives chosen under a majoritarian system have a stronger preference for public goods' spending. In fact,

when selecting candidates voters internalize the higher likelihood of a conflict of interest in government between public spending priorities than between transfer priorities.

V. OPERATIONALIZING VOTING SYSTEMS

To test these hypotheses, we need quantitative measures of the degree of proportionality of a system. The key variable we construct is the share of electoral votes that guarantees a party a parliamentary seat in an electoral district of average size. This variable, formally defined in subsection V.2, is denoted by *UMS* (upper marginal share). Clearly, the more proportional is a system, the easier it is for small parties to gain political representation, and hence proportionality is declining in the *UMS*.

Constructing such measure is not a straightforward matter, however, because real-life electoral systems are invariably more complicated than the stylized systems of the model. Three features of actual electoral systems need to be taken into account when constructing measures of proportionality: the number of tiers used to allocate seats; the presence or absence of legal thresholds to bar smaller parties from entering parliament; and the method used for translating seats into votes.

V.1. Electoral Tiers

Electoral systems in general have one or two tiers. In two-tier systems, a certain portion of parliamentary seats are allocated in a second tier comprising fewer, larger districts, each encompassing several first-tier districts. This second tier typically serves the function of increasing the degree of proportionality in the electoral system. We will use T1 and T2 as shortcuts for "first tier" and "second tier."

Let S_{ik} denotes the number of seats attributed to parties on the basis of votes in district k of tier i,[14] or its *district size*; $S_i = \Sigma_k S_{ik}$ is the total number of seats attributed to parties on the basis of votes in tier i, or the *tier size*; D_i is the number of districts in tier i; $\bar{S}_i \equiv S_i/D_i$ is the *average district size* of tier i.[15]

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14. The subscripts i and k in this section have a different meaning from the same letters in the presentation of the model (Sections II–IV).

15. In some electoral systems (see subsection V.4), S_{1k} can be an upper bound to the number of seats attributed in a T1 district: some seats could be left unfilled, transferred to T2, and attributed there; in these cases, the number of seats attributed in T2 depends on the number of seats effectively attributed in T1.

As is standard in the literature, whenever there are two chambers, all of these magnitudes refer to the lower chamber.

V.2. *Voting Method*

A voting method describes how party votes are converted into seats in each district of an electoral system. We distinguish between three voting methods:

1. *Majority/Plurality*. All the S_{ik} district seats are attributed to those parties that win an absolute majority of votes (Majority systems) or just more votes than other candidates/lists (Plurality systems). In our sample, Majority methods are represented by the Two-Round method (France) and the Alternative Vote method (Australia);[16] Plurality methods are represented by the First-Past-the-Post method (United Kingdom and several others).

2. *Highest Average*. The share of votes obtained by each party in each district is divided sequentially by a set of divisors: 1, 2, 3, . . . in the case of the *d'Hondt* formula, and 1,3,5, . . . in the case of the *St. Laguë* formula. Each of the S_{ik} highest quotients entitles the party that obtains them to a seat.[17]

3. *Largest Remainder*. In each district k of tier i, first a *quota* is calculated, defined as $1/S_{ik}$ in the *Hare* formula, $1/(S_{ik} + 1)$ in the *Droop* formula, and $1/(S_{ik} + 2)$ in the *Imperiali* formula. Then each party is allocated as many seats as full *quotas* it has obtained. The seats left unfilled after this allocation can be transferred to a higher tier, if it exists, or attributed in the same district to the parties or candidates with the largest remainders.[18]

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16. In the Australian system, voters rank candidates on the ballot. Any candidate with an absolute majority is elected. If no candidate reaches an absolute majority, the candidate with the lowest number of first preferences is eliminated, and his votes reassigned to all other candidates according to the ranking indicated on his ballots. The process is repeated until a candidate reaches an absolute majority.

17. As an example, consider a four-seat district with three parties (A, B, and C), 100 electors, and votes obtained by each party $V_A = 50$, $V_B = 30$, $V_C = 20$. Under a d'Hondt formula, the quotients obtained by A are 50, 50/2, and 50/3; by B, 30, 30/2, and 30/3; by C, 20, 20/2, and 20/3. The three highest quotients are 50, 30, and 50/2. Hence, A gets two seats, B one seat, and C no seats.

18. Two methods, the Single Transferable Vote (used in Ireland) and the Single Nontransferable Vote (used in Japan until 1995) are difficult to fit in our classification. In one important respect (the calculation of upper quotas—see below) they behave like Largest Remainder methods; hence, we will classify them as such. In the Irish STV method, voters rank candidates. Any candidate whose first preferences reach a full Droop quota is elected, and his votes above the quota are redistributed to the remaining candidates following the second preferences he

V.3. Legal Thresholds

Legal thresholds serve the purpose of limiting access to Parliament to parties receiving "small" shares of votes. Formally, the legal threshold of tier i, THR_i, is the minimum share of national votes, set by the electoral law, that a party must obtain in order to be eligible for a seat in the tier.[19]

V.4. Defining Proportionality of Electoral Systems

We now proceed to construct our measure of proportionality, in three stages. We first determine the share of votes that guarantees a seat in the average district of each tier, abstracting from electoral thresholds. We then take electoral thresholds into account. Finally, we determine in which tier the "marginal seat" is allocated.[20]

We start by defining the share of votes that, even under the most unfavorable distribution of votes among parties in the district, still guarantees a seat to the party that obtains it.

DEFINITION (UPPER QUOTA, Q_I). The upper quota of district k in tier i, $Q_i(S_{ik})$, is the share of district votes that would guarantee a party its first seat in that district, if there were no legal threshold.

Note that in general the upper quota depends only on the district size, not on the number of parties in the district.[21] We

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has received. If no candidates reach a full quota, the candidate with the lowest number of first preferences is eliminated. The process continues until all S_{ik} seats are filled. In the Japanese SNTV method, voters express a single vote; the S_{ik} most voted candidates are elected.

19. Thus, $THR_2 = .05$ would state that, in order to obtain at least one seat in T2, a party must win at least 5 percent of the national votes. If the same threshold also applies to T1, a party not meeting this threshold must relinquish any T1 seat that it might have obtained. Otherwise, the threshold is binding only for the allocation of T2 seats. Note that, if a legal threshold does not exist in tier i, this is equivalent to assuming that $THR_i = 0$. Sometimes the electoral laws state requirements on the vote shares of a party in a district, rather than a tier. These local requirements can be translated into a share of national votes, and therefore into a legal threshold, using the procedure described in Appendix 2.

20. To implement our measures of proportionality, we assume that the distribution of votes among parties is the same in all T1 districts. In other words, by this assumption a party's district share of votes in all T1 districts is equal to its national share. An obvious shortcoming of this assumption is that it does not deal well with regional parties. However, incorporating regional parties would require a detailed knowledge of actual results, election by election and district by district, which we do not have.

21. In a few cases (Hare and St. Laguë when the number of parties is below the district magnitude) the formula for the upper quota depends on the number of

provide formulas for the upper quota for each voting method in the Appendix.

By taking into account the electoral threshold, we can now define the share of votes that ensures a party electoral representation in a district of average size in tier i.

DEFINITION (UPPER MARGINAL SHARE OF VOTES OF TIER I, UMS_i). The upper marginal share of votes of tier i, UMS_i, is the share of national votes that guarantees a seat to a party in the district of average size of that tier: $UMS_i = \max(Q_i(\bar{S}_i), THR_i)$.

For multitier systems, we also need to establish in which tier the "marginal" seat is allocated: that tier is the **decisive tier** for the purpose of determining the degree of proportionality.

DEFINITION (DECISIVE TIER). The decisive tier of an electoral system is the tier with the lower Upper Marginal Share of votes.

In other words, the decisive tier is the tier where it is easier for a small party to gain representation. We can now define our proportionality variable.

DEFINITION (UPPER MARGINAL SHARE OF VOTES OF AN ELECTORAL SYSTEM, UMS). The upper marginal share of votes of an electoral system, UMS, is the share of national votes that guarantees a seat in the district of average size of the decisive tier: $UMS = \min(UMS_1, UMS_2)$.

V.5. *Implementing the Definition*

We now show how this definition can be applied in practice to the different types of electoral systems. The case of one-tier electoral systems is straightforward: UMS is just the larger between the upper quota in the average-size district and the electoral threshold in the only tier; that is, $UMS = \max(Q_1(\bar{S}_1), THR_1)$.

Constructing UMS in two-tier systems is more complicated. In order to determine the share of national votes that ensures a seat in the system as a whole, we need to address two issues: first, how is the total number of second-tier seats (S_2) determined, and second, which votes are used to allocate such seats. Table I summarizes the two-tier systems in our sample.

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parties. In these cases, we have collected data on the number of parties in each election.

TABLE I

TWO-TIER SYSTEMS

	SV	RV
AS	Denmark, Germany, **Greece,** Italy 1994–1995, Sweden 1971–1995, **Ecuador, Guatemala,** Mexico	Norway 1990–1995
RS	Belgium, Venezuela	Austria, Italy 1960–1995

In bold the parallel systems. The electoral systems of Belgium, Greece, and Venezuela have peculiarities that require some interpretation. A detailed description of these systems is available upon request.

With regard to the number of second-tier seats, in **Remainder Seats** systems (denoted by RS), S_2 is variable. T1 seats are attributed to parties using a Largest Remainder method; the remainder seats after this allocation are filled in T2. In **Adjustment Seats** systems (denoted by AS), S_2 (and therefore S_1) is fixed. Because AS systems must attribute a fixed number of seats in T1, they generally use a Highest Average method to attribute T1 seats (the exception in our sample being Ecuador, which uses the Hare formula in T1).

With regard to the votes used to allocate second-tier seats, in **Remainder Votes** systems (RV), seats in T2 district k are attributed using those votes not used in the allocation of seats in all the T1 districts included in k. These remainder votes are transferred to k, pooled[22] and used to attribute seats there, typically using a Highest Average method.

In **Superdistrict Votes** systems (SV), all votes cast in a T2 district—not just the remainder votes—are used to allocate seats. This can be done in two ways. In **Parallel** SV systems (SV-P), such as Greece, T2 seats are attributed independently of T1 seats. In this case, voters usually cast a separate ballot for each tier; the allocation of T1 seats is based on T1 votes, and the allocation of T2 seats is based on T2 votes. In **Mixed** SV systems (SV-M), seats in each T2 district are attributed to parties after taking into account the seats already attributed to candidates in the T1 districts that make up the T2 district in question. Specifically, seats in T2 are attributed in order to achieve an overall distribution of seats to parties as close as possible to the distribution that would obtain

22. The exception is Norway since 1990, which attributes the eight T2 seats to the lists with the highest quotas among all the quotas unused in the distribution of seats in T1.

if *all* seats were attributed based on the T2 votes, method, and number of districts. Effectively, then, if there are enough seats in T2, the seats attributed to *candidates* in T1 serve only to determine the names of as many representatives, but the distribution of seats to *parties* is determined wholly in T2. Since we are interested in the distribution of seats to parties, for our purposes the system effectively works as if $S_2 = S_{tot}$: this is what we will use in our empirical application.[23]

We can now turn to the determination of the degree of proportionality of two-tier systems. In **SV systems** we can determine UMS_2 by simply applying its definition: $UMS_2 = \max(Q_2(\bar{S}_2), THR_2)$.[24] The purpose of the second tier is to increase the proportionality of the system; hence, in all these systems $UMS_2 < UMS_1$, and T2 is the decisive tier: $UMS = UMS_2$.

In **two-tier RV systems** the lowest share of national votes that still guarantees a seat to a party in the average district of T2 occurs when the party does not win any T1 seat, transfers all its votes as remainders to T2, and these votes are enough to guarantee a seat in the average district there. Thus, as in SV systems $UMS = UMS_2$. However, now it is no longer true that the T2 shares of votes are the same as the national shares of votes: only the remainder votes from T1 are used to allocate T2 seats, and small parties (for instance, all those that did not obtain any seat in T1) have a much larger share of remainder votes than of all national votes. Appendix 2 shows how UMS_2 can be calculated in these cases.

VI. Measures of Proportionality

Typically, in the literature (e.g., Taagepera and Shugart [1989] and Lijphart [1994]) proportionality is captured by a measure of *district size,* rather than by a measure of *vote share* like UMS.[25] Thus, in this section we first convert UMS into a measure of average district size; then we present two more measures

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23. Obviously for the first tier in these systems to be *completely* irrelevant, a sufficient number of seats must be attributed in the second tier. In practice, this is the case for all SV-M systems in our sample.

24. Although the formula is the same, recall that $S_2 = S_{tot}$ in AS/SV-M systems, while in AS/SV-P systems $S_2 < S_{tot}$.

25. Taagepera and Shugart [1989] calculated average effective district magnitudes for a number of OECD countries in the seventies and mideighties. Our measure differs from theirs because it is based on the rigorously defined notion of Upper Marginal Share of votes, which incorporates the different types of two-tier systems and legal thresholds.

of proportionality, some variants of which have often been used in the literature. These measures try to formalize how easy it is for smaller parties to gain representation in Parliament.[26]

VI.1. *Average Standardized District Magnitude (SM)*

As made clear in the previous section, *UMS* is, ceteris paribus, inversely related to the average district size of the decisive tier. For instance, in a single-tier electoral system with no thresholds, which uses the d'Hondt voting method, *UMS* is equal to the upper quota in the "average" district: $UMS = Q_1(\bar{S}_1) = 1/(1 + \bar{S}_1)$. One can invert the above relation and back out a measure of average district magnitude from data on *UMS*. In doing so, however, it is important to partial out the voting method used in each system.[27] We use the d'Hondt formula, which does not depend on the number of parties and therefore provides a one-to-one mapping with *UMS*. By applying the inverse of the d'Hondt formula to *UMS*, we thus obtain the *Average Standardized District Magnitude,* or *SM*. More formally,

DEFINITION (AVERAGE STANDARDIZED DISTRICT MAGNITUDE, SM). Consider the electoral system Δ, possibly with two tiers and a legal threshold; and consider the electoral system Γ, with one tier, no legal threshold, and the d'Hondt formula. The average standardized district magnitude of system Δ, *SM*, is the average district size of system Γ in which a party with the same *UMS* of Δ would be guaranteed a seat.

Hence, $SM = \bar{S}^\Gamma = 1/UMS - 1$.

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26. In constructing these measures of proportionality, we ignore those tiers electing less than 5 percent of the total assembly size. In our sample, this excludes the second tier in the Norwegian AS/RV system in 1991–1995, which elects 8 out of 165 representatives, and the fourth parallel tier in the Greek AS/SV system, which elects 12 out of 300 representatives.

27. Suppose that two one-tier systems have the same value of *UMS* of 0.1, but the first uses the St. Laguë formula with six parties, the second the d'Hondt formula. Inverting the formulas for the upper quotas in Appendix 2, subsection 2, the average district magnitude would be 8.5 in the first system and 9 in the second system. Hence, it is important to convert the *UMS* of the system in the average district size of a standard system, with a fixed electoral formula. In the working paper version of this paper [Milesi-Ferretti, Perotti, and Rostagno 2001], we also consider an alternative measure of proportionality which uses the voting method of the decisive tier of the electoral system to invert the formula for the upper quota. In practice, this measure is very strongly correlated with *SM*.

VI.2. Average District Magnitude (AM)

A second measure of average effective district magnitude captures the notion of how large is the district where the "average" representative is formally elected. It is defined as follows:

DEFINITION (AVERAGE DISTRICT MAGNITUDE, AM). The average district magnitude of an electoral system is the weighted average of the average district sizes of the two tiers, with weights equal to the proportion of all representatives elected in the two tiers.

Thus, this variable is measured simply by $AM = (S_1/S_{tot})\bar{S}_1 + (S_2/S_{tot})\bar{S}_2$. Note that, for the purposes of computing this variable, S_1 and S_2 represent the number of representatives effectively elected in each tier.

VI.3. The Average Deviation from Proportionality (RAE)

The two variables described so far are ex ante measures of proportionality, being based on institutional characteristics. We also use one ex post measure, based on voting outcomes election by election. This variable was originally defined by Rae [1967] as follows:

DEFINITION (AVERAGE DEVIATION FROM PROPORTIONALITY, RAE). The Average Deviation from Proportionality (RAE) is the average of the deviations (in absolute values) of the share of seats of each party from its share of votes: $RAE = \sum_{p=1}^{P} |s_p - v_p|$, where p indexes a party, s_p is the share of seats and v_p is the share of votes obtained by party p.

Thus, this variable measures deviations of the shares of seats in Parliament from the share of votes obtained by parties in each election.[28]

VII. CROSS-SECTIONAL REGRESSIONS

VII.1. The Data

Our sample consists of twenty OECD and twenty Latin American countries, listed in Appendix 3. The data consist of the

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28. This variable is not independent of the number of parties and their size: it tends to give a small degree of disproportionality in systems with many small parties. An alternative measure, proposed by Gallagher [1991], is defined as the square root of the sum of squares of the deviations between seat and vote percentages. Thus, it gives more weight to large deviations. In practice, it is highly correlated with RAE.

political variables described in the previous section, the level and composition of public spending as well as a number of other control variables described in Appendix 3. The fiscal data include total primary government spending, government transfers to households, and expenditure on public goods, all by the general government. Transfers are defined as the sum of social security payments and other transfers to families, plus subsidies to firms.[29] Public goods are defined as the sum of current and capital spending on goods and services, i.e., the sum of government consumption and of capital spending.[30] The so-called "pork-barrel" expenditure, like building a bridge or hiring civil servants in a certain locality to please one own's constituency, falls mostly under one of the two components of our definition of public goods, government consumption and investment.

Data for the OECD sample start in 1960, with the exception of Greece, Portugal, and Spain whose data start in the mid-seventies. The time span for Latin American data is more limited—we have information on electoral variables for the early nineties. In our empirical investigation we first use the combined OECD and Latin American samples for cross-sectional estimates (based on averages of all variables over the four-year period 1991–1994 or the closest available periods[31]), and then we exploit the time-series dimension of the OECD sample to run panel regressions.

Table II displays the cross-sectional 1991–1994 average, standard deviation, minima and maxima for each variable, for the whole sample as well as for OECD and the Latin American countries separately. To make the reading of the empirical results easier, we will define all electoral variables as direct measures of proportionality. To do so, in the case of RAE we take the negative of the variable as originally defined, although we keep the original name.

A few points are worth noticing, because they will play a role in interpreting our results. Latin American countries have, on average, more proportional systems. They also have much

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29. For most Latin American countries we do not have enough information to separate social transfers to families from subsidies to firms.

30. The residual term in total primary expenditure is property income paid (net of interest payments), which is also largely not subject to political control at each moment in time. In the OECD sample, the residual term also includes subsidies to firms.

31. For some Latin American countries, we use a different period whenever the electoral law changes during the 1991–1994 period, in order to encompass only one electoral law. The details of the time periods used for Latin American countries are in Appendix 3, subsection 1.

TABLE II
SUMMARY STATISTICS

	All Mean	All SD	All Min	All Max	OECD Mean	OECD SD	OECD Min	OECD Max	LA Mean	LA SD	LA Min	LA Max
Avg. district magn. (AM)	16.1	30.7	1	150	15	32.3	1	150	17.3	29.9	1	120
Stand. district magn. (SM)	23.6	39.7	1	180.8	20.1	33	1	148.3	27.2	46	1	180.8
RAE	3	4.4	0.3	26.1	2.4	1.9	0.3	6.8	3.7	6.5	0.3	26.1
Primary expend./GDP	32.6	15.1	10.3	66.6	45.4	9.4	32.7	66.6	19.8	5.5	10.3	29.8
Tranfers/GDP	13.4	9.5	1.4	31.6	21.3	6.3	11.5	31.6	5.5	3.6	1.4	14.6
Public goods/GDP	18.1	5.6	7.1	29.9	21.9	4.2	16	29.9	14.4	4.1	7.1	23.5
GDP per capita	8400	5500	1200	18100	13200	2800	6800	18100	3500	1800	1200	7200
Popul. share over 65	9.7	5.2	2.9	19.5	14.4	2	11.3	19.5	5	2.2	2.9	11.8
Eff. numb. of parties	3.5	1.7	1.3	8.4	3.7	1.6	1.9	8.4	3.3	1.7	1.3	8.4
ETHNIC (fract. index)	20.1	19.8	1	75	22.1	22.1	1	75	18.1	17.5	1.1	59.9
OPEN (openness)	30.5	17.3	7.4	96.1	30.1	14.1	8.7	62.9	30.9	20.4	7.4	96.1

Cross-sectional averages, standard deviations, minimum and maximum values for all the variables for the full sample, the OECD sample and the Latin American sample. See the Appendix for variables' mnemonics. Each cross-sectional observation is the 1991–1994 (or closest available period) average of the variable for the country. Number of observations: 40 for the whole sample (35 for RAE); 20 for the OECD sample, 20 for the Latin American sample (15 for RAE).

TABLE III

AVERAGE VALUES OF ELECTORAL VARIABLES*

	AM	SM	RAE	ENPP		AM	SM	RAE	ENPP
Australia	1.0	1.0	−5.1	2.4	Argentina	10.7	10.7		3.0
Austria	19.4	38.0	−1.0	3.0	Bolivia	14.4	14.9	−2.2	3.3
Belgium	8.4	23.6	−1.1	8.4	Brazil	17.8	17.8	−1.8	8.4
Canada	1	1	−6.8	2.3	Chile	2.0	2.0	−1.8	5.0
Switzerland	7.8	7.8	−0.9	6.3	Colombia	4.9	4.9		3.1
Germany	10.8	19.0	−2.0	3.2	Costa Rica	8.1	8.8	−1.8	2.2
Denmark	15.3	49.0	−1.0	4.4	Dominican Rep.	30.0	39.0	−2.7	2.9
Spain	6.7	6.7	−1.8	2.9	Ecuador	4.4	12.2		6.4
Finland	13.3	13.3	−1.4	5.2	El Salvador	4.3	4.3	−2.0	3.0
France	1	1	−5.2	3.0	Guatemala	10.1	29.0	−3.4	4.7
United Kingdom	1	1	−5.0	2.2	Honduras	6.7	7.9	−1.5	2.0
Greece	5.7	10.4	−1.9	2.3	Jamaica	1	1	−26.1	1.3
Ireland	4.0	4.0	−1.5	3.2	Mexico	80.6	65.7	−1.2	2.3
Italy	17.2	29.3	−1.2	5.5	Nicaragua	10.0	12.3	−0.9	2.1
Japan	3.9	3.9	−1.7	3.4	Panama	1.7	1.7		1.4
Netherlands	150.0	148.3	−0.3	4.2	Paraguay	4.4	4.4	−1.1	2.5
Norway	8.7	8.6	−1.2	4.2	Peru	120	120		3.9
Portugal	10.5	10.5	−3.7	2.3	Trin. and Tob.	1	1	−8.1	2.1
Sweden	14.1	24.0	−1.0	4.1	Uruguay	5.2	5.2	−0.3	3.3
United States	1.0	1.0	−4.7	1.9	Venezuela	7.9	180.8	−0.9	3.4

* AM: Average district magnitude. SM: Average standardized district magnitude. RAE: (minus) index of deviations from proportionality. ENPP: effective number of political parties in Parliament. See Section VI and Appendix 3 for further details on the definition of variables.

smaller governments: average primary expenditure is 19.8 percent of GDP, less than half than in OECD countries; indeed, the largest Latin American government is smaller than the smallest OECD government. The largest difference between the two groups of countries is in transfers: on average, their ratio to GDP is four times higher in OECD countries; in contrast, the shares of public goods are much closer: 21.9 percent versus 13.9 percent. In Latin America public good spending is much larger than transfers, but the two items are virtually equal in OECD countries.[32]

Table III displays the average values over 1991–1994, country by country, of the electoral variables used in our estimation. Table IV displays the cross-country correlations among the averages of LogAM (the log of Average District Magnitude), LogSM (the log of Average Standardized District Magnitude), MAJ (a

32. Indeed, if one subtracts military spending from public good spending, transfer spending becomes larger than public good spending. The size of military spending is to a large extent dictated by international commitments, and its geographic targeting may be constrained by strategic considerations.

TABLE IV
PROPORTIONALITY MEASURES: CROSS-COUNTRY CORRELATIONS (1991–1994)

	Log SM	Log AM	RAE	MAJ	Log MAGN
Panel A. Whole sample					
Log SM	1				
Log AM	0.92	1			
RAE	0.52	0.55	1		
MAJ	−0.18	−0.17	−0.58	1	
Panel B. OECD					
Log SM	1				
Log AM	0.97	1			
RAE	0.85	0.84	1		
MAJ	−0.82	−0.82	−0.92	1	
Log MAGN	0.95	0.95	0.87	−0.87	1
Panel C. Latin America					
Log SM	1				
Log AM	0.86	1			
RAE	0.52	0.55	1		
MAJ	−0.18	−0.17	−0.58	1	

Measures of proportionality calculated as average during the period 1991–1994. AM: Average district magnitude. SM: Average standardized district magnitude. RAE: (minus) index of deviations from proportionality. MAJ: dummy variable taking the value of one if the electoral system is majoritarian and zero otherwise. MAGN: effective district magnitude. See Section VI and Appendix 3 for more details on the definition of variables. The variables SM and AM are available for all countries in the sample. The variable MAGN is available for OECD countries only. The variables RAE and MAJ are available for all OECD countries and fifteen and eighteen Latin American countries, respectively.

dummy variable taking the value of one in majoritarian systems and zero otherwise, from Persson and Tabellini [1999a]); and LogMAGN (the log of the measure of effective district magnitude by Taagepera and Shugart [1989] and Lijphart [1994], which we extended to 1995 using the same methodology). The high correlations between LogSM, LogAM, and LogMAGN, and between RAE and MAJ are noteworthy. Table A1, available from the authors at http://www.iue.it/Personal/Perotti, presents the details, country by country, of each electoral system.

VII.2. Basic Specification

Our basic cross-section specification is

$$(15) \qquad G_i = c + c_{OECD} + \alpha X_i + \beta POP65_i + \gamma LogGDPPC_i + \epsilon_i,$$

where i indexes a country. G is the average percent share in GDP of either total primary expenditure EXP, transfers TRAN, or public goods PGOOD. X is one of the three electoral system variables that we have introduced before; the first two, LogAM and LogSM, are the logs of the Average District Magnitude and of the Average Standardized District Magnitude, respectively.[33] The third electoral variable is RAE. POP65, the share of population over 65, is a potentially important determinant of the size of transfer expenditure;[34] and LogGDPPC, the PPP adjusted per capita income of the country, in logs of thousands of dollars, captures possible Wagner Law-type effects. In addition to the regression constant, c, we also include an OECD dummy variable, c_{OECD}, to allow for the large difference in the average government spending/GDP ratio between OECD and Latin American countries.

Our hypotheses imply that an increase in the value of any of the electoral variables should be associated with a higher share of transfers in GDP—a positive value of α when $G = TRAN$—and with a lower share of public goods in GDP—a negative value of α when G = PGOOD (see Results 1 and 2 in subsection IV.3). In addition, the effect on total spending depends on the initial share of transfers in total primary spending, and more fundamentally on the underlying preferences of the median voter. We have documented above the vastly different shares of transfers in GDP and in government spending between Latin American and OECD countries. If we interpret these differences as reflecting, at least in part, different patterns of distribution of preferences over fiscal policy between these two groups of countries, then when $G_i =$ EXP, we should expect a positive value of α in OECD countries, which have a large share of transfers in primary spending, and a negative value of α in Latin American countries, all of which have an extremely low share of transfers (see Result 3 in subsection IV.3).

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33. We use logs because increasing the average district magnitude by one representative has a very different effect on government spending when the initial district magnitude is 1 than when it is 50.

34. One could argue that POP65 is an endogenous variable, as higher spending on certain types of expenditure (notably health) can increase life expectancy. We cannot think of a good instrument in our sample, but we note that the correlation of POP65 with the electoral variable is quite low; in fact, when we reestimate our regressions dropping POP65, the estimated coefficients of the electoral variables are largely unchanged, and if anything, larger.

VII.3. Basic Results

In columns (1)–(3) of Table V the dependent variable is the total primary spending/GDP ratio, EXP. The estimated coefficients of the three electoral variables are positive, but none is significant at conventional levels. This result is consistent with our theoretical model, where a more proportional system can have an ambiguous impact on total primary government spending, depending on the relative strength of its effects on transfer and public good spending. In fact, we will see shortly that this result is the combination of two very different patterns in Latin America and in OECD countries.

Our model predicts that more proportional systems should be associated with higher spending on transfers. Columns (4)–(6) display the same regressions as columns (1)–(3), but with the share of transfers in GDP as the dependent variable. Now all the estimated coefficients of the electoral variables are significant at the 5 percent level. To assess the economic significance, consider the change in the dependent variable associated with a change in the electoral variable equal to its range (reported in the third to last row of the table). The range in the transfer/GDP ratio varies between about 6.9 (in the LogSM regressions of column (5)) and 9.8 percentage points of GDP (in the RAE regression of column (6)). Besides electoral variables, the only other significant variable in the regressions is POP65, which has the expected positive coefficient. Still, the explanatory power of these regressions is quite large, with adjusted R^2s always at or above .8.

The reader may question whether we are simply capturing a dichotomy between majoritarian and proportional systems, rather than a systematic relation between *the degree of proportionality* and transfers. Figure I provides a clear negative answer to this question. It shows that, for OECD countries, the positive relationship between LogSM and transfers survives (and actually becomes stronger) even if one excludes the countries with a majority/plurality system in the sample: Australia, France, United Kingdom, Canada, and the United States. A plot of the residuals of a regression of transfers on log GDP per capita and share of population above 65 (not included for reasons of space) conveys the same message. In Latin America, by contrast, there is no bivariate relation between proportionality and transfers (Figure II).

By comparing the coefficients of the electoral variables in each total spending regressions with the same coefficient in the

TABLE V
PRIMARY SPENDING, TRANSFERS, PUBLIC GOODS, AND ELECTORAL SYSTEMS (FULL SAMPLE)

Dep. var.	(1) EXP	(2) EXP	(3) EXP	(4) TRAN	(5) TRAN	(6) TRAN	(7) PGOOD	(8) PGOOD	(9) PGOOD
Log avg. dist. magn. (Log AM)	1.05 (1.10)			1.70 (3.49)**			−0.60 (1.12)		
Log stand. dist. magn. (Log SM)		0.74 (0.89)			1.32 (3.06)**			−0.48 (1.03)	
RAE			0.32 (1.05)			0.38 (2.21)**			−0.02 (0.13)
Pop. share over 65	1.13 (1.86)*	1.14 (1.87)*	1.30 (1.95)*	1.25 (4.04)**	1.27 (3.96)**	1.42 (3.81)**	−0.12 (0.34)	−0.12 (0.35)	−0.10 (0.27)
Log GDP per capita	1.16 (0.37)	0.83 (0.26)	0.54 (0.16)	2.19 (1.37)	1.69 (1.04)	1.45 (0.78)	−1.64 (0.92)	−1.46 (0.83)	−1.72 (0.93)
OECD dummy	13.49 (2.10)**	13.82 (2.14)**	11.55 (1.57)	1.20 (0.37)	1.75 (0.52)	−0.21 (0.05)	10.83 (2.98)**	10.64 (2.92)**	10.65 (2.60)**
Constant	2.75 (0.11)	5.74 (0.23)	10.86 (0.42)	−21.79 (1.73)*	−17.46 (1.36)	−11.75 (0.81)	29.32 (2.09)*	27.83 (2.01)	28.87 (2.00)*
Range	5.25	3.84	8.30	8.51	6.86	9.76	3.02	2.49	0.55
Observations	40	40	35	40	40	35	40	40	35
$\bar{R}^2$	0.76	0.75	0.73	0.84	0.83	0.80	0.44	0.43	0.38

Dependent variables: EXP: share of total primary spending in GDP (columns (1)–(3)); TRAN: share of transfers in GDP (columns (4)–(6)); PGOOD: share of spending on public goods in GDP (columns (7)–(9)), averages 1991–1994 or closest available period. See Appendix 3 for the definition of all variables. Estimation by ordinary least squares (t-statistics are in parentheses). * (**) significant at the 10 percent (5 percent) level. Range is range of variation of dependent variable, associated with range of variation of electoral variable, holding constant all other variables.
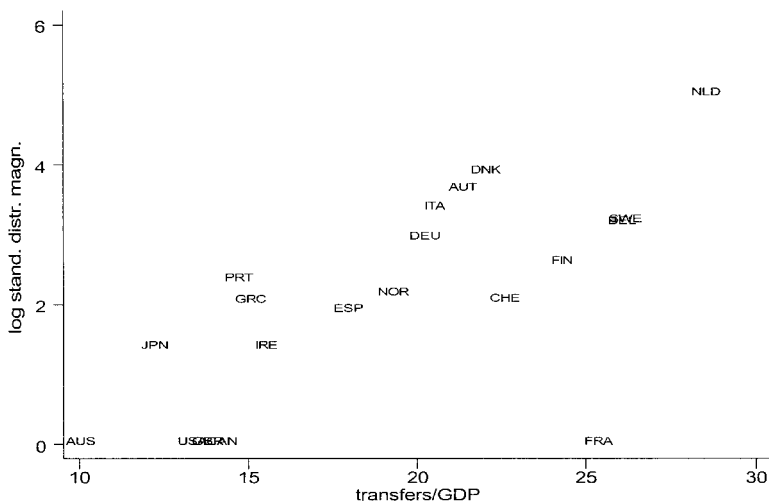
FIGURE I
Transfers and Standardized District Magnitude, OECD Countries

corresponding transfer regression, it is clear that one should expect a negative but small coefficient of the electoral variable in the public good regressions. This is in fact what we find: in all
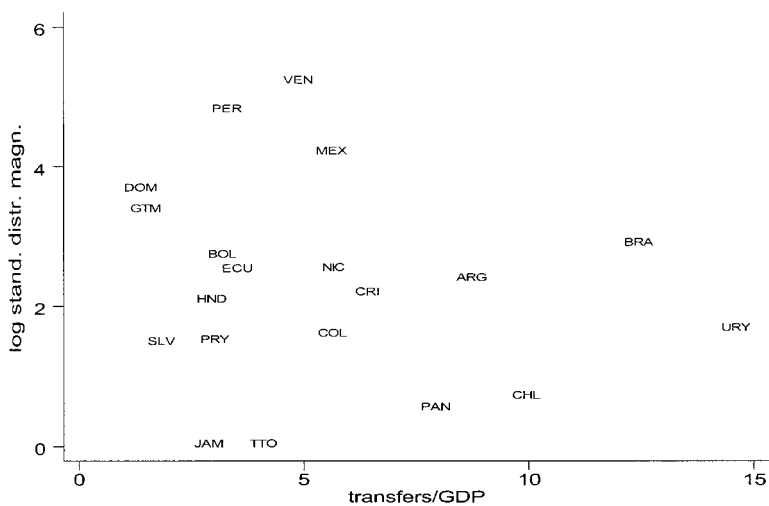
FIGURE II
Transfers and Standardized District Magnitude, Latin American Countries

public good regressions (columns (6)–(9)), the electoral variables have negative coefficients but never reach statistical significance.

However, Table V hides a substantial difference between the two subsamples. Table VI displays the same regressions as Table V for the subsample of OECD countries. In the primary spending regressions of columns (1)–(3), the coefficients of the electoral variables are three to five times larger in the OECD subsample than in the whole sample, and are now significant at the 10 percent level (except for RAE in column (3)). Even stronger results hold for the transfer regressions in columns (4)–(6): now the coefficients of the electoral variables are typically twice as big as in the corresponding columns of Table V, and all significant at least at the 2 percent level. The effect of electoral variables on transfers explains nearly all of their effect on total spending: as a result, we find small and statistically insignificant negative effects on public good spending (columns (7)–(9)).

Qualitatively, the results for Latin America, displayed in Table VII, are almost the mirror image of those for OECD countries, although they are statistically less strong (we do not display results with RAE, because in the Latin American sample we have only fifteen observations on this variable). The effect of electoral variables on total spending is now negative, although statistically insignificant (columns (1)–(3)). This is the result of almost no effect on transfers (columns (4)–(6)) and a large negative effect on public good spending (columns (7)–(9)), although with high p-values, between .15 and .20.

All the point estimates in Tables V to VII are consistent with the predictions of subsection IV.3. Consistent with Results 1 and 2, more proportional systems always have higher transfers and lower public good spending, ceteris paribus. Consistent with Result 3, more proportional systems are associated with higher total primary spending, in OECD countries, which have high transfer spending, and with lower primary spending in Latin American countries, which have low transfers regardless of the electoral system.

These results complement those of a related literature that has studied the difference in Latin American and OECD fiscal policy. As documented in Gavin and Perotti [1997], in Latin America most of the fiscal policy response to cyclical variations in the economy and to external shocks occurs on public good spending, in OECD countries on transfer spending. This paper shows that the (cross-country) response of fiscal policy to electoral insti-

TABLE VI
PRIMARY SPENDING, TRANSFERS, PUBLIC GOODS, AND ELECTORAL SYSTEMS (OECD COUNTRIES)

Dep. var.	(1) EXP	(2) EXP	(3) EXP	(4) TRAN	(5) TRAN	(6) TRAN	(7) PGOOD	(8) PGOOD	(9) PGOOD
Log avg. dist. magn. (Log AM)	3.05 (2.10)*			3.03 (4.03)**			−0.34 (0.41)		
Log stand. dist. magn. (Log SM)		2.56 (1.89)*			2.63 (3.64)**			−0.28 (0.37)	
RAE			1.41 (1.29)			1.62 (2.56)**			−0.64 (1.14)
Pop. share over 65	1.37 (1.49)	1.15 (1.17)	1.43 (1.40)	1.19 (2.50)**	0.95 (1.80)*	1.17 (1.99)*	0.22 (0.43)	0.25 (0.45)	0.40 (0.75)
Log GDP per capita	17.15 (2.36)**	16.39 (2.23)**	15.76 (2.03)	7.73 (2.05)*	7.05 (1.80)*	6.59 (1.48)	4.48 (1.08)	4.57 (1.11)	4.09 (1.03)
OECD	−142.10 (2.02)*	−131.54 (1.85)*	−120.92 (1.62)	−74.42 (2.04)*	−64.42 (1.70)	−54.04 (1.26)	−23.17 (0.58)	−24.34 (0.61)	−24.04 (0.63)
Range	15.28	12.80	9.11	15.18	13.13	10.45	1.69	1.41	4.13
Observations	20	20	20	20	20	20	20	20	20
$\bar{R}^2$	0.34	0.31	0.24	0.61	0.57	0.44	−.08	−.08	−.01

Dependent variables: EXP: share of total primary spending in GDP (columns (1)–(3)); TRAN: share of transfers in GDP (columns (4)–(6)); PGOOD: share of spending on public goods in GDP (columns (7)–(9)), averages 1991–1994 or closest available period. See Appendix 3 for the definition of all variables. Estimation by ordinary least squares (t-statistics are in parentheses). * (**) significant at the 10 percent (5 percent) level. Range is range of variation of dependent variable, associated with range of variation of electoral variable, holding constant all other variables.

TABLE VII
PRIMARY SPENDING, TRANSFERS, AND ELECTORAL SYSTEMS
(LATIN AMERICAN COUNTRIES)

	(1) EXP	(2) EXP	(3) TRAN	(4) TRAN	(5) PGOOD	(6) PGOOD
Log avg. distr. magn.	−0.91		0.36		−0.99	
(Log AM)	(0.86)		(0.67)		(1.31)	
Log stand. distr. magn.		−1.08		0.14		−0.96
(Log SM)		(1.13)		(0.28)		(1.40)
Pop. share over 65	0.69	0.49	0.98	0.95	−0.38	−0.52
	(0.96)	(0.65)	(2.69)**	(2.44)**	(0.75)	(0.97)
Log GDP per capita	−1.45	−0.77	1.50	1.44	−2.42	−1.83
	(0.51)	(0.27)	(1.04)	(0.96)	(1.20)	(0.89)
Constant	29.84	26.00	−12.12	−11.13	37.64	33.87
	(1.40)	(1.24)	(1.12)	(1.02)	(2.49)**	(2.26)**
Range	4.38	5.61	1.72	0.71	4.72	4.99
Observations	20	20	20	20	20	20
$\bar{R}^2$	−.04	0.00	0.40	0.38	0.09	0.10

Dependent variables: EXP: share of total primary spending in GDP (columns (1)–(2)); TRAN: share of transfers in GDP (columns (3)–(4)); PGOOD: share of spending on public goods in GDP (columns (5)–(6)), averages 1991–1994 or closest available period. See Appendix 3 for the definition of all variables. Estimation by ordinary least squares (t-statistics are in parentheses). * (**) significant at the 10 percent (5 percent) level. Range is range of variation of dependent variable, associated with range of variation of electoral variable, holding constant all other variables.

tutions also follows the same pattern: it affects mostly public good spending in Latin America, and mostly transfer spending in OECD countries.

For Latin America, results are statistically much weaker. We have two candidate explanations for this difference—besides the obvious one that our theory fits Latin America less well than OECD countries. First, measurement error: both the budget variables and the electoral variables are measured less precisely in Latin American countries. Second, Latin America and its fiscal policy are subject to larger and more frequent shocks than OECD countries (see, e.g., Gavin et al. [1996]); hence, it is likely that the role of electoral systems in shaping fiscal outcomes will be harder to detect in Latin America.

VII.4. Robustness

Because of the small sample size, our benchmark specification is necessarily very parsimonious. Several variables that we have omitted could conceivably be correlated both with the electoral systems and with fiscal outcomes. In Table A2, available

from the authors at http://www.iue.it/Personal/Perotti web site, we display the estimated coefficients of the electoral variables when we add these omitted variables, one at a time, in the specification estimated so far; we also display the estimated coefficient of the added variable. In this section we briefly discuss the main results: to conserve space, we focus on the most relevant dependent variables in the two groups of countries: transfer spending in OECD countries, and spending on public goods in Latin American countries. Also, we present results for LogSM only: results with the other variables are similar.

Conventional wisdom has it that proportional systems tend to be associated with a larger number of parties in Parliament and therefore with larger coalition governments. In turn, empirically larger coalitions tend to be associated with more expenditure, particularly on transfers (see Perotti and Kontopoulos [1999]). To address this issue, we add the log of the average effective number of parliamentary parties, LogENPP, to the list of independent variables. In OECD countries the estimated coefficient of LogENPP is positive, albeit insignificant; more importantly, the coefficient of LogSM remains significant at the 5 percent level. In Latin America the estimated coefficient of LogSM practically does not change.[35] Very similar results obtain when we use for OECD countries the number of parties in the coalition, from Perotti and Kontopoulos. We conclude that the electoral system has an effect on fiscal outcomes independent of its effects on the degree of party fractionalization both in elections and in Parliamentary representation.

In an influential paper Rodrik [1998] argues that more open societies spend more on government transfers as insurance against external shocks. When we include openness in our regressions, its coefficient is always entirely insignificant in both the OECD and Latin American samples; the coefficients of the electoral variables are largely unaffected. The same happens if we interact the openness variable with the volatility of the terms of trade, as suggested by Rodrik.[36]

One could also argue that more ethnically or linguistically

35. In a study of the effects of electoral institutions on fiscal performance in Latin America, Stein, Talvi, and Grisanti [1999] find that the only "political" variable correlated with the size of total spending (inclusive of interest payments) is the effective number of parties.

36. These results are potentially important in view of the considerable debate that Rodrik [1998] has generated. See, for instance, Alesina and Wacziarg [1998, 1999].

"fragmented" countries might have more proportional systems, to ensure the representation of all minorities; ethnolinguistic fractionalization might also independently affect the provision of public goods, for instance as a means to ensure the consensus of different groups, as in Alesina and Spolaore [1997]. When we include ethnolinguistic fractionalization in our regressions, its coefficient is insignificant, and the coefficient of the electoral variable is not affected.[37]

Another potentially relevant omitted variable is ideology. Countries with larger district magnitudes tend to be Nordic countries, with a Social-Democratic tradition, or Southern European countries, that have had leftist governments for long periods of time. Thus, when we add an ideology variable, IDEOL (not available for Latin American countries), which takes values ranging from 1 in more rightist governments to 5 in the more leftist ones (see Appendix 3 for a more detailed description). Its coefficient has a *t*-statistic very close to 0, while the estimated coefficient of the electoral variable is virtually unchanged.

Particularly in small samples, one has to worry about the robustness of the results to possible outliers. In the OECD group, when we exclude one country at a time, the *p*-value on the estimated coefficient of the electoral variables in the transfer regression never falls below .05.[38] In Latin America the initial results are statistically less strong to begin with; a similar exercise confirms that no individual country is responsible for these weaker results.

One could also worry that the 1991–1994 period might not be representative, for instance because it was a period of widespread fiscal consolidations in many countries. We do not have a choice for Latin American countries, but for OECD countries we have

37. Alesina, Baqir, and Easterly [1999] find that in ethnically fragmented U. S. cities the provision of public goods is lower, while Ordeshook and Shvestova [1994] present cross-country evidence on the impact of ethnic fractionalization on the effective number of parties under different electoral systems.

38. In principle, two countries could have a nontrivial influence on the results: the Netherlands, with a very large average district magnitude (its proportional system consists of only one district electing 150 representatives) and France, the only non-English speaking country with a majority system, but at the same time with a very high share of transfers in GDP, close to 30 percent. Indeed, when we reestimate all our regressions dropping one country at a time, we typically find that the exclusion of France causes the estimated coefficients of electoral variables and their *t*-statistics to increase dramatically; the exclusion of the Netherlands causes them to fall somewhat, although they always remain significant at the 5 percent level. When we exclude both countries, point estimates and *t*-statistics rise considerably relative to the benchmark regressions of Table VI.

annual data over the whole 1960–1995 period. When we reestimate the regressions of Table VI using cross-sectional data based on 1960–1995 averages, we find even stronger results, with larger and more significant coefficients in the total spending and transfer regressions.

VIII. TIME-SERIES EVIDENCE: INTERACTIVE EFFECTS

In the OECD sample we can exploit the time dimension of the fiscal data to investigate the following question: do electoral institutions affect the response of fiscal variables to shocks? The spirit of the model suggests that the increase in government spending in response to a given shock should be higher in a more proportional system.[39] Except for RAE, the electoral measures we use in the previous regressions display limited or no time variation in the OECD sample;[40] hence, it does not make sense to run pure fixed effects panel regressions, because the fixed effects and the electoral variables would be highly collinear. We use two different methodologies, designed to estimate the responses to common shocks and to country-specific shocks, respectively.

VIII.1. Common Shocks

To study the response to common shocks, we borrow the methodology of Blanchard and Wolfers [2000]: we estimate regressions of the type,

$$(16) \quad G_{it} = c_i + d_t(1 + \beta X_i) + \gamma \text{POP65}_{it} + \delta \text{LogGDPPC}_{it} + \epsilon_{it},$$

where i indexes the country and t the period. c_i is a country-specific intercept, d_t is a time dummy, and the other variables have been defined previously. Thus, in this specification the time dummies capture the common shocks, and their effects depend on the value of the electoral variable. This dependence is captured by the coefficient β.

Without a richer dynamic specification (which would be difficult to estimate given the short time series) it would not be

39. Strictly speaking, this question is outside the model. However, it could easily be incorporated in a version of the model where the current policy acts as the status quo.
40. There is more time series variation in the Latin American sample, due to the frequent changes in electoral laws engendered by new administrations. However, it is extremely difficult to reconstruct precisely electoral laws further back than the early nineties, and in many countries meaningful democratic elections began only in the mid- or late eighties.

TABLE VIII
COMMON SHOCKS AND ELECTORAL SYSTEMS
PANEL REGRESSIONS, INDUSTRIAL COUNTRIES

Dep. var.	(1) EXP	(2) EXP	(3) EXP	(4) TRAN	(5) TRAN	(6) TRAN
Time	14.91	14.02	14.29	13.19	12.78	12.40
Log AM * time dummy	0.10 (2.08)**			0.13 (4.93)**		
Log SM * time dummy		0.07 (1.61)			0.11 (4.35)**	
RAE * time dummy			0.05 (1.84)*			0.06 (3.56)**
RAE			−2.95 (−1.43)			−2.93 (−2.79)**
Pop. share over 65	0.95 (2.22)**	1.01 (2.43)**	0.95 (2.28)**	0.21 (1.08)	0.21 (1.06)	0.25 (1.23)
Log GDP per cap.	−4.09 (−1.17)	−3.62 (−1.04)	−3.84 (−1.08)	−4.79 (−2.94)**	−4.46 (−2.68)	−4.43 (−2.53)**
Min	0.82	0.86	0.68	0.78	0.80	0.64
Max	1.34	1.22	1.12	1.43	1.32	1.14
Range	0.52	0.36	0.44	0.65	0.52	0.50
Observations	112	112	112	112	112	112
$\bar{R}^2$	0.92	0.92	0.91	0.96	0.96	0.96

Dependent variable: share of total primary spending in GDP (columns (1)–(3)) and share of transfers in GDP (columns (4)–(6)); five-year averages from 1960 (earliest available year) to 1995. See Appendix 3 for the definition of all variables. Estimation by nonlinear least squares (*t*-statistics are in parentheses). * (**) indicates statistical significance at the 10 percent (5 percent) level. Range is range of variation of dependent variable, associated with range of variation of electoral variable, holding constant all other variables (minimum and maximum values also reported).

reasonable to interpret this regression as capturing the effects of electoral institutions on year-to-year changes in fiscal policy: hence, all our variables are averages over a five-year period, and the time index t refers to five-year periods, beginning in 1960 or the earliest available year.

Table VIII reports estimates of equation (16) (by nonlinear least squares) on the sample of twenty OECD countries, with the spending/GDP ratio (columns (1)–(3)) and the transfer/GDP ratio (columns (4)–(6)) as the dependent variables.[41] In the case of RAE, which has meaningful time series variation, the regression also includes the variable by itself. The first row of Table VIII displays the effects of the "pure" time effects, i.e., the increase in the spending/GDP ratio that would have been experienced by a

41. The presentation of results also follows Blanchard and Wolfers [2000].

country with the average value of the electoral variable. Thus, the pure time effect is equal to the difference between the estimated time effects in 1990–1995 (the last one) and 1960–1964. The next row reports the estimate of β with its *t*-statistic. The rows labeled "Min" and "Max" answer the following question: suppose that a common shock causes the spending/GDP ratio to increase by 1 percentage point in the country with average values of the electoral variable: by how much does the spending/GDP ratio increase in the countries with the lowest and highest values of the electoral variable? The answer is given by $1 + \beta X_{\min}$ and $1 + \beta X_{\max}$, respectively. The row labeled "Range" displays the difference between the two.

Table VIII provides some support for the notion that in response to common shocks primary spending increases by more in more proportional systems than in other systems, and much stronger support for the notion that transfers increase by more in more proportional systems. In the primary spending regressions, all the estimates of β are positive, and significant in the case of LogAM (at the 5 percent level) and RAE (at the 10 percent level). According to the point estimates, the range of variation in the spending/GDP ratio in response to a shock that causes the same ratio to increase by 1 percentage point in the "average" country, is between .36 and .52 percentage points of GDP.

In the transfers regressions (columns (4)–(6)) the coefficients of the electoral variables are very close to those in the spending regressions, and the *t*-statistics are much higher—the *p*-values are all below .001. The implied range of variation in the transfer/GDP ratio in response to the "average" shock is even larger, from .5 to .65 percentage points of GDP. Note also that the "pure" time effect (first row) is similar across all columns.

VIII.2. *Country-Specific Shocks*

We now allow electoral institutions to interact with country-specific shocks. To do so, we need a macroeconomic shock whose effects on spending are a priori clear. An increase in unemployment will cause most types of government spending to increase relative to GDP, both because of the working of automatic stabilizers and because of the discretionary response by the government. Thus, we estimate regressions of the type,

(17)

$$G_{it} = c_i + d_t + \alpha U_{it} + \beta U_{it} X_i + \gamma \text{POP65}_{it} + \delta \text{LogGDPPC}_{it} + \epsilon_{it}.$$

TABLE IX
COUNTRY-SPECIFIC SHOCKS AND ELECTORAL SYSTEMS
PANEL REGRESSIONS, INDUSTRIAL COUNTRIES

Dep. var.	(1) EXP	(2) EXP	(3) EXP	(4) TRAN	(5) TRAN	(6) TRAN
Log AM * unempl. rate	0.14			0.15		
	(1.60)			(3.15)**		
Log SM * unempl. rate		0.09			0.11	
		(1.25)			(2.80)**	
RAE			−0.14			−0.39
			(−0.30)			(−1.53)
RAE * unempl. rate			0.05			0.06
			(1.01)			(2.09)**
Unempl. rate	0.42	0.48	0.8	0.27	0.30	0.68
	(2.04)**	(2.38)**	(4.44)**	(2.38)**	(2.74)**	(6.80)**
Pop. share over 65	1.68	1.68	1.77	1.05	1.04	1.15
	(4.38)**	(4.35)**	(4.58)**	(5.00)**	(4.91)**	(5.31)**
Log GDP per capita	4.59	4.46	3.94	2.69	2.62	2.17
	(1.90)*	(1.84)*	(1.62)	(2.04)**	(1.97)**	(1.60)
Range	0.72	0.47	0.46	0.77	0.57	0.53
Observations	112	112	112	112	112	112
$\bar{R}^2$	0.90	0.90	0.90	0.94	0.94	0.94

Dependent variable: share of total primary spending in GDP (columns (1)–(4)) and share of transfers in GDP (columns (5)–(8)); five-year averages from 1960 (earliest available year) to 1995. See Appendix 3 for the definition of all variables. Estimation by nonlinear least squares (*t*-statistics are in parentheses). * (**) indicates statistical significance at the 10 percent (5 percent) level. Range is range of variation of dependent variable, associated with range of variation of electoral variable, holding constant all other variables (minimum and maximum values also reported).

U_{it} is the unemployment rate in country i in period t. Thus, β captures the interaction of a shock to unemployment with the electoral system: if a country with a more proportional system responds to a shock to unemployment by increasing spending or transfers more, β is positive. As before, because RAE displays meaningful time series variation, we also include the variable by itself, in addition to its interaction with U.

Table IX displays the results. The estimated coefficient of U is indeed always positive and significant: over a five-year horizon, in a majority system (where LogAM and LogSM are equal to 0) an increase in unemployment by 1 percentage point is associated with an increase in the total primary spending/GDP ratio by between .42 and .48 percentage points, and an increase in the transfers/GDP ratio by between .27 and .31 percentage points.

The estimates of the interactive term coefficient, β, are always positive, but they are significant at the 5 percent level only when transfers/GDP is the dependent variable (columns (4)–(6)).

The implied economic significance is also considerable: from the row labeled "range," a 1 percentage point shock to unemployment causes the transfers/GDP ratio to increase by between .53 and .77 percentage points more in the most proportional electoral system than in the least proportional one.

Both types of panel regressions are robust to outliers. We reestimated all regressions in Tables VIII and IX dropping one country at a time, and both France and the Netherlands at the same time. The estimates of β change only minimally, and so do their *p*-values.

IX. Relation with the Literature

We now discuss the relationship between our contribution and the existing literature, in terms of both theory and empirics. In Persson and Tabellini [1999a, 2000, 2001] two candidates make binding promises on the provision of a "universal" type of spending, and on a "targetable" one (which is both district- and group-specific). The driving force is uncertainty by the policymakers over the distribution of voters' preferences, and therefore over the identity of the median voter. In a majoritarian system the candidates compete for "swing" districts, by directing the targetable instrument toward a narrower constituency, identified in their model with the "middle class." Hence, majoritarian systems have higher spending on the more targetable instrument, and a lower provision of the universal public good. By focusing on voters in a limited number of districts, politicians in a majoritarian system fail to internalize the overall distortions induced by taxation decisions, thus also leading to a larger government.

Thus, in terms of the *composition* of spending, these models predict that the universal type of spending will be higher in proportional systems, while the targetable type of spending will be higher in majoritarian systems; in terms of the *level* of spending, the prediction is that total government expenditure will be higher in majoritarian systems. In contrast, our model predicts that expenditure on transfers will be higher in proportional systems, while expenditure on purchases of goods and services will be higher in majoritarian systems; the effect of the electoral system on total government spending depends on the share of

transfers in total spending—and, more deeply, the underlying distribution of voters preferences.[42]

In estimating these models, Persson and Tabellini mostly capture the properties of the electoral system via a "majoritarian" dummy variable.[43] In Persson and Tabellini [1999a] public goods are the universal expenditure and transfers the targetable one. In the empirical application, the universal public good is defined more specifically as expenditure on order and safety, health, transportation, and education; in a cross section of 50 countries, there is evidence that expenditure on these universal public goods is indeed higher in proportional systems, and that total government expenditure is higher in majoritarian systems. In Persson and Tabellini [2000, 2001] welfare transfers are instead the universal expenditure, and local public goods are the targetable one. In the empirical application they find, based on a panel of 60 countries, that majoritarian systems tend to have lower overall expenditure and especially lower welfare spending.[44]

Another difference with our approach is that our theory and our empirical results underscore the importance of disaggregating the sample: the relation between degree of proportionality and size of transfers is positive and very robust among OECD countries, but not so for Latin American countries.

X. Concluding Remarks

In this paper we have studied the effects of electoral institutions on the size and composition of public expenditure in OECD and Latin American countries. We have emphasized the distinction between purchases of goods and services, which are easier to

42. In Lizzeri and Persico [2001] two candidates make binding promises on the level of spending on two types of government expenditure, a universal public good and transfers that can be targeted geographically or by groups. Even when the public good is more valuable to individuals, in a majoritarian system, where the spoils of office go to the winner, on average one could have lower provision of the universal public good.

43. For some regressions, Persson and Tabellini [1999a] also use the inverse of the average district magnitude, from Cox [1997]. However, the construction of this variable does not take into account the specific features of two-tier systems that we highlighted in Sections V and VI.

44. However, the main focus of these papers is on the dichotomy between presidential and parliamentary systems; in this case, Persson and Tabellini consistently find that presidential systems tend to have lower government expenditure. In an interesting study at a more disaggregated level, Baqir [2001] finds that in a cross section of U. S. cities larger district councils are associated with larger city governments, and that spending is higher when councils are elected "at large" than when they are elected by city district.

target geographically, and transfers, which are easier to target across social groups. We presented a theoretical model in which voters anticipating government policymaking under different electoral systems have an incentive to elect representatives more prone to transfer (public good) spending in proportional (majoritarian) systems. The model also predicts higher total primary spending in proportional (majoritarian) systems when the share of transfer spending is high (low).

To test our predictions, we have defined and constructed rigorous measures of proportionality that take into account the existence of different voting methods, multiple electoral tiers, and electoral thresholds. In the empirical investigation, we have found strong support for our predictions in OECD countries, and much weaker evidence for Latin American countries. Interestingly, the positive relation between transfers and the degree of proportionality in OECD countries holds even *within* proportional systems, highlighting the importance of constructing measures of proportionality that go beyond the majoritarian/proportional dichotomy. In future research it would be interesting to examine the relation between electoral systems and the distribution of expenditure *within* countries, since existing models (including ours) have strong implications in this regard.

APPENDIX 1

Given the assumption of uniform distribution of preferences (α, β) over the rectangle with vertices $\alpha_L, \alpha_H, \beta_L, \beta_H$, the voter with median preferences over α and β is the decisive voter in each electoral system. This result would still hold if we relaxed the assumption about uniform distribution of preferences, as long as these are nondegenerate and bounded, and allowed the representative to be selected by a sequential vote on α and β, regardless of the order of voting.

Consider the majoritarian system first, and suppose initially that the sequencing on votes is first on α and then on β. Consider the problem solved by individual i of group B in district k_1 (for brevity, we will omit the subscript B to indicate the group when this does not create any ambiguity). Starting from the second stage, let $\alpha^*_{k_1}$ denote the value of α that has prevailed by majority voting in the first stage. The problem of individual i in district k_1 is to find the optimal value of β for a representative who already has a value of α equal to $\alpha^*_{k_1}$. Denote this optimal value of β from

the perspective of individual i by $\beta^*_{ik_1}$. This is found by maximizing with respect to $\beta^*_{k_1}$ expression (5) (with the index i replacing the median voter index m), subject to t^M, $\bar{s}^M_B$, and g^M_1 being given by suitable modifications of expressions (4), and taking as given $\alpha^*_{k_1}$, $\alpha^*_{k_2}$, $\alpha^*_{k_3}$, $\beta^*_{k_2}$, and $\beta^*_{k_3}$. It is easy to see that one obtains $\beta^*_{ik_1} = \beta_{ik_1}$. Thus, in the second stage an individual with median value of β prevails in each district.

In the first stage, the optimal value of α for a representative from the point of view of individual i in district k_1, $\alpha^*_{ik_1}$, is found by maximizing the same expression above with respect to α_{ik_1}, with $\beta^*_{k_1} = \beta_m$. Again, it is easy to see that one obtains $\alpha^*_{ik_1} = \alpha_{ik_1}/(2 - \alpha_{ik_1})$. Hence, the individual with median value of α is decisive in the first stage.

A similar reasoning applies when voting first on β, then on α, and in the proportional system.

APPENDIX 2

As we mentioned in the text, in two-tier electoral systems there is a distinction between the upper bound on the number of representatives that can be elected in a district and the actual number of representatives that can be elected. We denote with an asterisk actual sizes: thus, S^*_{ik} denotes the *actual district size* of district k in tier i, and analogous definitions hold for S^*_i and $\bar{S}^*_i$: note that for T2 districts, $S_{2k} = S^*_{2k}$ always; i.e., they are always conditional on T1 results. Clearly, $S^*_2 = 0$ for one-tier systems.

In Remainder Seats systems, S_2 is variable: in principle, all or no seats could be attributed in T1 ($S_1 = S_{tot}$); but typically only some are ($S^*_1 \leq S_1$), and the remainder seats are filled in T2 ($S_2 = S^*_2 = S_{tot} - S^*_1$). In Adjustment Seats systems, S_2 is fixed; hence, $S^*_1 = S_1$, and $S_2 = S^*_2 = S_{tot} - S_1$.

2.1. Local Requirements

A first type of local requirement sets a minimum share of votes that a party must obtain in a given district in order to participate in the allocation of seats in that district; this is equivalent to a legal threshold of the same size applying to that tier. A second type of local requirement defines a fraction h of an upper quota that a party must win in at least one district in T1 in order to have access to the allocation of seats in T2. To translate this requirement into a legal threshold, note that the binding constraint is meeting the requirement in the largest district of T1.

Hence, the legal threshold in T2 is $THR_2 = hQ_1(S_{1\max})$. We have assembled information on the maximum district size in T1, and we use it in constructing THR_2 whenever the local requirement is of this type.

2.2. Upper Quotas

We now provide the formulas for the upper quota in the different voting methods and formulas. In all cases, we will refer to "party A" as the party whose share is equal to the upper quota. We will assume that there are P parties in each district.

Majority/Plurality Methods

<u>FPTP:</u> clearly $Q_i(S_{ik}) = .5$
<u>Alternative Vote:</u> $Q_i(S_{ik}) = .5$
<u>Two-Round:</u> $Q_i(S_{ik}) = .5$

Largest Remainder Methods

In LR methods in which "remainders" are transferred to an upper tier, the formulas for the upper quotas are clearly the same as the quotas themselves: any party needs to reach the full quota to be assured of a seat. The exception is the LR Imperiali method, where the number of quotas can exceed the number of seats. Hence,

<u>Hare:</u> $Q_i(S_{ik}) = 1/S_{ik}$
<u>Droop:</u> $Q_i(S_{ik}) = 1/(1 + S_{ik})^{45}$
<u>Imperiali:</u> $Q_i(S_{ik}) = 1/(1 + S_{ik})$.

In LR methods in which remainder seats are attributed within the same electoral tier, the formulas for the Droop and Imperiali quotas are unchanged. For the Hare quota, instead, they depend on the relation between the number of seats in the district and the number of parties P competing for the seats (see Lijphart and Gibberd [1977] and Gallagher [1991]). If $S_{ik} < P$, the upper quota is $1/(1 + S_{ik})$, as for the other methods. If $S_{ik} \geq P$, the upper quota is $(P - 1)/PS_{ik}$ for the Hare formula.

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45. In the Japanese SNTV method, the share that guarantees a candidate election without resorting to any second-round allocation of votes is defined by law as the Droop quota, hence $Q_i(S_{ik}) = 1/(1 + S_{ik})$. For the purpose of calculating upper quotas, we consider the Irish STV method as equivalent to a Droop formula. In fact, the Irish system establishes that the Droop quota guarantees election for a candidate. We assume that this is also the quota for a party. Hence, $Q_i(S_{ik}) = 1/(1 + S_{ik})$.

Highest Average Methods

d'Hondt. The least favorable distribution of votes for party A is when another party (say party P) gets all the remaining votes. Party A still gets one seat if party P gets a vote share V_P which is just short of $V_A S_{ik}$. Thus, when the vote share of the two parties are divided by $1, 2, \ldots, S_{ik} - 1$, party P gets a seat each time. The last quotient, V_P/S_{ik}, is (infinitesimally) smaller than V_A, hence party A gets the last representatives. Hence, $Q_i(S_{ik})$ is defined by the conditions

$$V_A + V_P = 1; \ V_A = V_P/S_{ik}; \ Q_i(S_{ik}) = V_A,$$

which gives $Q_i(S_{ik}) = 1/(1 + S_{ik})$. This formula is valid irrespective of the relation between number of parties and number of seats.

Modified St. Laguë. We present the conditions for the Modified St. Laguë formula, since this is always used instead of the pure St. Laguë formula. Under Modified St. Laguë, the party shares are divided by $1.4, 3, 5, \ldots$ instead than by $1, 3, 5, \ldots$ In this case we need to distinguish between the case in which the number of parties is larger than the number of seats ($S_{ik} < P$) and the opposite case. In the former case, the worst distribution of votes for party A obtains when S_{ik} other parties get a share of votes which is the same as the share of party A. This implies that the vote share to ensure election is implicitly given by $V_A/1.4 = (1 - V_A)/1.4 S_{ik}$, which in turn implies $Q_i(S_{ik}) = 1/(1 + S_{ik})$. If instead the number of parties is "intermediate" ($S_{ik} \geq P \geq S_{ik}/2 + 1$), then $Q_i(S_{ik}) = 1.4/(1.6 \ S_{ik} - 0.2P + 1.6)$ [Gallagher 1992]. Finally, if the number of parties is "small" ($P < (S_{ik}/2 + 1)$), then $Q_i(S_{ik}) = 1.4/(2S_{ik} - P + 2.4)$ [Lijphart and Gibberd 1977].

2.3. Calculation of Upper Marginal Share in Two-Tier RV Systems

In this Appendix we show the calculation for the case when a Largest Remainder method is used in T1. In our sample, only Norway after 1990 uses a Highest Average method to attribute T1 seats. The eight T2 seats are attributed to the T1 district lists with the eight highest averages after the averages that earned a seat. Unlike in a Largest Remainder method, in a Highest Average method a seat can be attributed in T1 even to a party that gets less than the upper quota. Therefore, it is more difficult to

approximate the share of votes that go to T2 as remainders, and to calculate UMS_2. However, because the number allocated in T2 seats is less than 5 percent of the assembly size, by the rule we set out above we do not consider T2 in this case. In any case, because T2 is so small, we know that UMS_2 must be very close to UMS_1. This leaves Austria and Italy 1960–1993 to represent two-tier RV systems. Seats are attributed in a T1 district only if the upper quota is met,[46] hence on average each seat attributed in T1 uses a fraction of district votes equal to $Q_1(\bar{S}_1)$, (assuming, as it is always the case in practice, that this is larger than THR_1; see subsection V.3), and a fraction of national votes equal to $Q_1(\bar{S}_1)/D_1$.[47] A total of S_1^* seats are attributed in T1 this way, thus leaving a fraction $1 - S_1^*Q_1(\bar{S}_1)/D_1$ of national votes to be used for the allocation of the remaining S_2 T2 seats.[48] Assuming that all T2 districts have the same size, and ignoring for the moment legal thresholds, to be guaranteed a seat in a T2 district a party needs a share $Q_2(\bar{S}_2)$ of all the average T2 district votes, hence the same fraction of all T2 votes, hence a fraction $Q_2(\bar{S}_2)(1 - S_1^*Q_1(\bar{S}_1)/D_1)$ of national votes. UMS_2 can then be computed as $UMS_2 = \max(Q_2(\bar{S}_2)(1 - S_1^*Q_1(\bar{S}_1)/D_1), THR_2)$.

APPENDIX 3

3.1. List of Countries

OECD countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, United States.

Latin American countries: (all variables are taken as averages over the 1991–1994 period, unless otherwise indicated): Argentina, Bolivia (1993–1994), Brazil (1991–1992), Chile, Colombia (1992–1993), Costa Rica, Dominican Republic, Ecuador, El Salvador, Gua-

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46. Recall that, when a Largest Remainder method is used in T1 districts of RV systems, $Q_1(S_{1k})$ is the actual share of district votes used for each seat allocated in district k of T1.

47. This is clearly an approximation because we replace the average of $Q_1(S_{1k})$ with $Q_1(\bar{S}_1)$.

48. We do not have information on S_1^* for each election; however, Taagepera and Shugart [1989] do provide information on the *average* value of S_1^*, where the average is taken across elections in a given country. In the empirical implementation of our variables, we use this average value as a proxy for the actual value of S_1^*. Throughout these calculations, we assume that there are no abstentions or invalid ballots.

temala, Honduras, Jamaica (1993–1994), Mexico, Nicaragua (1992–1994), Panama (1991–1993), Paraguay (1993–1994), Peru (1990–1991), Trinidad and Tobago (1992–1994), Uruguay (1991–1992), Venezuela.

3.2 Fiscal Variables

OECD Countries

All fiscal variables are from the OECD *Economic Outlook* Database, and refer to the general government.

TRAN   Transfers to households. Defined as SSPG + TRPG using the mnemonics of the *Economic Outlook* Database. SSPG: Social security benefits to households; TRPG: Other transfers to households.

PGOOD   Public goods, defined as the sum of government consumption and government investment, net of depreciation: CGW + CGNW + CAPEXP. CGW: Government consumption, wages; CGNW: Government consumption, excluding wages; CAPEXP: government investment, net of depreciation, plus net capital transfers paid.

EXP   Total primary government expenditure, defined as TRAN + PGOOD + residual item, where residual item ≡ TSUB + YPEPG − GNINTP. TSUB: Subsidies to firms; YPEPG: Property income paid by government; GNINTP: Net interest payments by government.

Latin American Countries

For Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, Mexico, Panama, Paraguay, Peru, Uruguay, Venezuela: Gavin and Perotti [1997], based on IMF data, World Bank data, and national data. For Dominican Republic, El Salvador, Guatemala, Honduras, Jamaica, Nicaragua, Trinidad and Tobago: IMF data.

All definitions are consistent, and follow the IMF *Government Financial Statistics* classification, which in turn is, for large aggregates, virtually identical to the OECD *Economic Outlook* classification.

3.3. Political Variables

Log AM   Logarithm of average district magnitude. AM is defined as the weighted average of the average district sizes of the two electoral tiers, with weights equal to the proportion of all representatives elected in the two tiers (see Section VI for details). Sources: for OECD countries authors' calculations based on Taagepera and Shugart [1989], Lijphart [1994], and national sources, for Latin American countries Inter-Parliamentary Union (various years), Political database of the Americas (http://www.georgetown.edu/pdba/english.html), and national sources (mostly constitutions and electoral laws in place at the times we take our cross-sectional observations).

Log SM   Logarithm of Standardized Average District Magnitude. *SM* is defined as $1/UMS - 1$, where *UMS* is the minimum share of national votes which guarantees a Parliamentary seat to a party (see Section VI for details). Sources: for OECD countries authors' calculations based on Taagepera and Shugart [1989], Lijphart [1994], and national sources, for Latin American countries Inter-Parliamentary Union (various years), Political database of the Americas, and national sources.

LogENPP   Logarithm of the effective number of Parliamentary parties. ENPP is defined as $\sum_p 1/s_p^2$, where s_p is the share of seats of party p. Source: for OECD countries Lijphart [1994] and unpublished data from Lijphart extended to the early 1990s using national sources; for Latin American countries Inter-Parliamentary Union (various years), Political database of the Americas, and national sources.

IDEOL   Ideological configuration of government. The variable takes values from 1 (dominant right-wing party) to 5 (dominant left-wing party). Source: Woldendorp, Keman, and Budge [1993] and updates from Perotti and Kontopoulos [1999] (available only for OECD countries).

MAJ   Dummy variable taking the value of one if the electoral system is majoritarian and zero otherwise. Source: Persson and Tabellini [1999a].

MAGN   Effective district magnitude. Source: Taagepera and Shugart [1989], Lijphart [1994] and authors' extensions (until 1995).

3.4. Other Variables

ETHNIC   Index of ethnolinguistic fractionalization for 1960. It measures the probability that two randomly selected people from a given country will not belong to the same ethnolinguistic group. Source: Atlas Narodov Mira [1964] as reported in Easterly and Levine [1997].

LogGDPPC Log of real GDP per capita in thousands of 1985 international dollars. Source: Summers and Heston [1991] and Penn World Tables 5.6 update; updated for the years after 1992 using World Bank data.

OPEN   Ratio of exports of goods and services plus imports of goods and services over two times GDP. Source: World Bank, World Development Indicators and Penn World Tables 5.6 update.

POP65   Ratio of population above 65 to total population. Source: World Bank, World Development Indicators.

U   Unemployment rate. Source: OECD *Economic Outlook* Database.

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