

# Why Countries Are Fiscally Decentralizing

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June, 2002

We thank Enrico Spolaore for early advice and Rajiv Vohra for helpful discussions on the topic. We are also grateful to James C. Davis for his help throughout the project, Christine Kearney for preparation of the federalism index, and Fumiko Tamura for her help as a research assistant.

# 1 Introduction

Over the last twenty-five years, there has been an international movement towards fiscal decentralization. The role of regional governments has expanded, whether it is measured by institutional changes or by the share of state/provincial and local governments in total government consumption. In this paper, we model economic forces that affect fiscal decentralization and test the implications of the model. We will argue that income and population growth and shifts in relative population across regions of countries, which occur during economic development, explain the move toward fiscal decentralization, both in theory and in our empirical results. We start by examining some of these patterns of change, as well as related changes in the extent of democratization and we review the literature on fiscal decentralization.

## **Patterns of Decentralization**

For a sample of 48 countries with populations over 10 million in 1990, we construct a federalism index every five years from 1960-1995. The index varies from zero to four, with higher values meaning a greater degree of regional fiscal autonomy. The description of the index is in the data Appendix, but it is based on official governmental structure (unitary versus federal) and the degree of autonomy and democratization of state/provincial and municipal governments. Figure 1 shows how the index varies worldwide and by regions of the world. After 1975 or 1980, both worldwide and in all regions the index rises. It rises from a world average of 1.03 in 1975 to 1.94 by 1995. There are significant differences among the regions. Developed countries tend to be more federalized. Latin American countries reached the same level of federalism as developed countries in 1995, with former Soviet bloc countries not far behind. Only countries in the Middle East and North Africa have little local fiscal autonomy, with minor changes over time.

Federalism and democratization seem to go hand-in-hand, as expected. First democratization involves representative government and a voice for regional interests. Arguably that leads to a greater call for regional autonomy. In addition one third of our federalism index reflects local and regional democratization, which may be correlated with national democratization. Indeed the simple correlation between our federalism index and a national democracy index is 0.63 for five years intervals over the period of 1960-1995. More interestingly,

the correlation between changes in those indices is 0.39 over the same time period. The democratization index is based on Jagers and Gar (1995), who used Polity III indicators on autocracy and democracy, and it ranges from -10 (least democratic and most autocratic) to +10. Figure 2 shows democratization trends for the world. The pattern is similar to that for federalism.

Indices of changes in formal government structures have two limitations. First, the “de facto” situation may effectively differ from the formal situation. Second and related, formal structure changes infrequently. For example between 1975 and 1985, federalism only changes in 9 of 48 countries; and between 1985 and 1995 it changes in 22 countries. More subtle changes are more likely to be reflected in a continuous measure, such as the share of state and local governments in government expenditures. Using IMF data, we constructed a variety of measures representing the degree of centralization. However, we tend to rely on one, which is the share of the central government in total government current consumption. This measure, as will be discussed below, excludes transfer payments (but includes defense for practical reasons of data issues).

The time coverage for these data is 1975, 1985, and 1995, involving respectively 39, 47 and 48 countries. The average central government share is graphed in Figure 3. The world average declines from 0.74 in 1975 to 0.64 in 1995. An average weighted by country population drops from 0.62 to 0.52. Again there are significant regional differences. Developed countries and countries in the former Soviet bloc and Latin America have the lowest centralization while Middle Eastern and Sub-Saharan African countries have the highest centralization. The share of the central government drops in all regions, with an exception of former Soviet bloc countries in the period of 1985 to 1995.

The overlap in country coverage between our centralization measure and the federalism measure is limited, a total of 65 country-years over 1975, 1985, and 1995. Overall the correlation in levels for those years is -0.75 and the correlation in changes is -0.60 for 1975-1985 and -0.11 for 1985-1995. We tried to examine whether correlations in leads and lags are greater – for example, do changes in federalism precede changes in shares (i.e., institutions change before outcomes) or vice versa (i.e., institutional changes simply formalize changes in outcomes that have already occurred). Given the limited samples, there is absolutely no clear pattern for

that<sup>1</sup> and, in general, contemporaneous correlations are more consistent over time.

### Literature

There is an enormous literature on normative issues of the role of regional governments (Tiebout (1956), Oates (1972), Musgrave (1959, 1969), Starrett (1980), Hochman, Pines, and Thisse (1995), Persson, Roland, and Tabellini (1996), Persson and Tabellini (1999)), which examines issues such as, (a) the efficiency gains from decentralization, (b) the responsibilities of the central versus regional governments, (c) the optimal number of tiers of government, and (d) better institutional arrangements between the center and regional governments. However, the positive issue of why and when decentralization occurs has received much less attention. Yet it would seem that there ought to be a relationship between economic growth and the evolution of political institutions.

Decentralization is a complex process and is a product of many factors including cultural heritage and geography. De Tocqueville wrote “As impossible to determine beforehand, with any degree of accuracy, the share of authority which each of two governments to enjoy, as to foresee all incident[s] in the existence of a nation.”<sup>2</sup> However, the positive literature on decentralization does suggest that there appear to be certain empirical regularities concerning forces that promote decentralization (Oates (1972), Oates and Wallis (1988)). And there is now a start on theoretical modeling of the decentralization process (Panizza (1999)). We review these key works.

In his 1972 book, Oates, before turning to empirical evidence, argues that there are fundamental considerations that exert predictable and important effects on fiscal structures, from an economic perspective. In particular, he suggests:

1. As per capita income rises, public expenditures rise disproportionately, so government plays a more dominant role in more developed countries. Oates and Wallis (1988) argue that relative public sector

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<sup>1</sup>For example the correlation between changes in shares and lagged changes in federalism are -0.39 for 85-95 and 0.24 for 75-85. The correlation between changes in federalism (85-95) and lagged shares (75-85) is -0.22. Correlations of contemporaneous changes are -0.60 (75-85) and -0.11 (85-95). But all of these correlations are affected by many zero values for changes in the federalism index.

<sup>2</sup>Democracy in America, Chapter VIII.

expansion allows better exploitation of scale economies in local public good provision, making local provision more feasible. Second, working in the opposite direction, is that centralized income redistribution policies take on greater relative importance with development. Given this, as noted earlier, we separate out government consumption from redistribution, in order to focus on fiscal decentralization of government provision of actual goods and services.

2. Country size plays an important role. In larger countries again scale economies may be more properly exploited in local public provision. Additionally, more distant hinterland regions may be poorly served by the center, due to higher transportation costs, poor information (about how to supply services in those regions), and inattention of the center to demands of hinterland regions with different ethnic backgrounds and preferences. Differences in preferences across regions may generally bring pressures to fiscally decentralize, as modeled in normative contexts dating from Tiebout (1956).

Oates (1972) examines four measures of fiscal centralization: share of total public revenue collected by the central government, share of the central government in all public expenditures (including transfer payments), share of the central government in current government consumption expenditures, and share of the central government in civil consumption expenditures (excludes defense). We tend to rely on the third – the share of the central government in consumption expenditures – for the following reasons. Looking at revenue collection raises the issue that even in very federalized countries, the center may collect substantial portions of revenue for regions because of collection efficiency reasons, either directly (regions set tax rates for their portion of central revenue) or indirectly (center sets rates and redistributes by a formula to regions for intra-marginal regional revenues). In terms of transfer payments, one role of almost all central governments regardless of how federalized a country is, remains income redistribution. Thus, decentralization tends to be reflected better by government consumption. While excluding national defense, the other uniformly centrally provided good, is desirable in measuring fiscal decentralization, data limitations rule this out. We simply don't have separate defense expenditures for enough countries.

In his cross-sectional analysis, Oates (1972) finds that for all four measures, larger and richer countries are more decentralized, but his diversity measure has little effect. Oates and Wallis (1988) for 48 USA states do the analysis in a panel context, allowing for better control of inter-regional geographic and cultural differences. They find that the share of the center in total government expenditures (including transfers) rises with income. And they find that diversity as measured by urbanization increases decentralization.

In an important recent study, Panizza (1999) constructs a formal model of decentralization. He has a linear country with a uniform distribution of population. The level of all public goods and services are determined at the national level and based on majority rule (median voter). The national government provides part of the goods and services to the people, which only reach them after spatial decay. The rest are provided by nearby local governments and are subject to much smaller spatial decay. The national government which wants to maximize its own size decides its share in provision of public goods and services, accounting for how that share influences voters' demands for the overall level of public goods. Since voters benefit more from local provision, which avoids higher spatial decay, too high a national share reduces overall voter demand for public services. Thus the degree of decentralization is a choice made by the national government, and local governments are passive. Using similar indices as Oates (1972), Panizza finds that fiscal centralization is negatively correlated with country size, income per capita, level of democracy, and ethnic fractionalization, using cross-sectional methods of data analysis.

We will borrow aspects of Panizza's model, but will focus on regional demands for fiscal decentralization drawing on the literature on secession (Buchanan and Faith (1987), Bolton and Roland (1997), Alesina and Spolaore (1997)). In essence we will view fiscal decentralization as a response to rising demands of hinterlands for greater autonomy<sup>3</sup>.

Section 2 contains a theoretical model, which captures the different aspects of decentralization. In section 3, we will summarize testable hypotheses that are direct implications of the model in section 2 and

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<sup>3</sup>Besley and Coate (1999) compare the operations of representative centralized democracy in providing local goods at a national level with that of decentralized provision where local legislatures choose their own goods. This is more in the normative tradition of what works best.

we will choose an empirical specification to test them. Section 4 includes the results of different econometric approaches to the empirical specification. Section 5 concludes. In the appendix, we provide a detailed description of the variables.

## 2 The Model

In this section, we present a simple model of “separation”, or “internal exit”. By separation we mean the establishment of new political units within a country that has been governed under a strong unitary system. These new units are local and autonomous and they provide local public goods to their constituents, rather than relying on a unitary government to provide these goods. In other words, separation is the move from a strong unitary system to a strong federal system. As an example of strong unitary system we think of many Middle Eastern countries, while an example of a strong federal system is Canada. A full formal move to a strong federal system where federalism in Figure 1 takes a value of four is unusual, only occurring twice in the period 1960 to 1995 in our data. However, by modelling that process, we identify the forces that underlie a desire for separation. Such forces, even without formal separation, may affect the stance of central and local governments beyond the current political structure and may cause a shift in the relative power among them. In other words, a more credible threat of separation might cause an increased willingness of the central government to share power and responsibility with regional governments.

In our model we consider a country that comprises two regions. We name region 1, the coastal region, and region 2, the hinterland region. The country has a unitary government, which is located in the coastal region. The unitary government provides local public goods to both regions. In the spirit of Buchanan and Faith (1978), we ask under what conditions the hinterland region would want to separate<sup>4</sup>. By separation,

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<sup>4</sup>Our model crucially deviates from the one in Buchanan and Faith (1987). They look at internal exit threat as a powerful tool to limit ability of the central government to exploit peripheral communities (minorities) for the sake of the majority of the population. However, we will view the threat of internal exit as a limit on the ability of a partially democratic unitary government to ignore voters’ tastes in general and, in particular, in the hinterland region. That is to say, the unitary government is willing to devolve more power and responsibility when the threat of internal exit is more credible. Another difference is that they model the conflict between classes and we will model the conflict between geographical regions.

we mean that the hinterland region is willing to set up and finance a regional government in order to provide its own local public goods. That does not preclude the national government from providing a set of national public goods to both regions, although, we formally ignore this possibility for the sake of simplicity.

In modeling separation, we consider three scenarios. In the base scenario, the population and individual incomes are fixed in each region and governmental institutions are perfectly democratic. As the first extension, we deviate from the base scenario by considering limited or partial democracy. The officials in the central or local governments are elected by majority rule but they carry some leverage over the magnitude of publicly provided goods. Further, as the second extension, we consider a case with a mobile population. In this case both population and income in the two regions are endogenous.

## 2.1 The Base Scenario: Immobile Population and Exogenous Income under Perfect Democracy

We start by introducing the building blocks of the model and characteristics of the players. Then, we explain the structure of the game and derive outcomes. Finally, we draw some testable implications of the outcomes in a set of comparative statics results.

### Regions

There are two regions. The population of region 1 is  $L_1$  and region 2 is  $L_2$ , and therefore the national population is  $L = L_1 + L_2$ . We assume  $L_1 > L_2$ , which means that the coastal region is the dominant region in the union<sup>5</sup>. Individuals receive the same income within each region, but incomes generally differ across regions. We indicate individual incomes in region 1 and region 2 with  $y_1$  and  $y_2$ , respectively. Preferences of all individuals have the same functional form

$$u = x^\alpha g^\beta$$

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<sup>5</sup>This assumption does not play any role in the first scenario and the analysis and the results are the same for  $L_1 \leq L_2$ . However, this assumption is fundamental to the specific results in the second scenario.



where  $x$  is a private good produced and sold at price 1 (normalized) and  $g$  is a local public good. We could allow preferences to differ across regions, and that is an obvious force for “separation”. However, we choose to simply focus just on pure economic factors promoting separation<sup>6</sup>, rather than relying on differences in preferences.

In the public sector, local public goods are financed by a proportional tax on income. Therefore, utility of an individual in region  $i$  is

$$u_i = y_i^\alpha (1 - t_i)^\alpha g_i^\beta \quad (1)$$

where  $t_i$  and  $g_i$  are the tax rate and level of public services, respectively, faced by people in region  $i$ .

### Unitary Government

There is a fixed cost  $F$  of maintaining a government. The government is located in the coastal region and only accounts for the preferences of the people in the coastal region, since they are the majority in the voting process. The national constitution requires that:

1. All the individuals face the same tax rate  $t$
2. Public expenditure per capita  $g$  is the same in the two regions

Thus, the central government budget constraint for provision of public goods is

$$(L_1 y_1 + L_2 y_2) t = F + (L_1 + L_2) g$$

assuming the cost per unit of public goods is 1. Using the fact that  $L_1 + L_2 = L$ , we rewrite the budget constraint as

$$\begin{aligned} t &= \frac{F}{b} + \frac{gL}{b} \\ b &\equiv L_1 y_1 + L_2 y_2 \end{aligned} \quad (2)$$

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<sup>6</sup>Having the same preferences also facilitates the last scenario where the population is mobile across regions and there is no clear way to classify preferences by regions. We will revisit this issue later in the paper.

where  $b$  is the tax base. Note that we model local public goods as Samuelson private goods (or fully congestible goods). Consequently, the only source of scale effects in governance arises from the presence of  $F$ . Under the national constitution, fiscal discrimination of the center against a peripheral region is ruled out, since again that is an obvious force promoting separation. However this also rules out voluntary inter-regional transfer payments, where region 1 residents might want to transfer monies to region 2. We comment on this possibility later.

Under a unitary government, a dollar spent on public goods in the coastal region provides a unit of local public goods. But a dollar spent by the central government on local public goods in the hinterland region only results in  $(1 - \delta)$  effective units of public goods. So following Panizza (1999), there is “spatial decay”, which could represent political or economic costs of providing  $g$  in a more distant region. These costs could include issues of monitoring corruption or inefficiency in the provision and delivery of local public goods as well as transportation costs. In a sense “spatial decay” could also represent differences of taste or production technology. These exist because a unitary government tailors the features of the local public goods to the needs of the people in the coastal region (national median voter), but those features might not appeal to hinterland voters or suit their needs given geographical differences between the regions and appropriate type of service delivery for that geography. For example, the organization of school systems in congested urban areas may not fit the needs of sparsely populated rural areas.<sup>7</sup>

Therefore, under a unitary government by using (1) and (2), the utility of people in region 1 is

$$u_1 = y_1^\alpha \left(1 - \frac{F}{b} - \frac{gL}{b}\right)^\alpha g^\beta \quad (3a)$$

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<sup>7</sup>Note that we model spatial decay as a depreciation factor applied to local public goods provided to region 2 under a unitary system. So, there is no real heterogeneity in tastes between two regions. They both value the public good the same way, but because of decay individuals in the hinterland receive an effective lower level of public goods. Therefore, there is no possible way to effectively deter the secession, since the optimal level of public goods (under a unitary government) is the same in two regions. An alternative way is to introduce real taste differences between the regions, for example

$$u_2 = x_2^\alpha g^{\beta\delta}$$

which  $\delta$  represents the level of heterogeneity ( $0 \leq \delta \leq 1$ ). Then an optimal level of local public goods is different among the two region even when the two regions face the same budget constraint. In other words, the optimal level of local public goods would be different in new (3a) and (3b).

while the utility of an individual in region 2 has similar form except that the effective level of local public goods that they receive is only  $g_2 = (1 - \delta)g$ .

$$u_2 = y_2^\alpha \left(1 - \frac{F}{b} - \frac{gL}{b}\right)^\alpha g^\beta (1 - \delta)^\beta \quad (3b)$$

Under a unitary government and a perfect democracy scenario, we know that  $g$  is chosen to maximize the preferences of the median voter. We assume  $L_1 > L_2$ , so the median voter is from the coastal region. However given the specification of preferences in this section, under perfect democracy voters in both regions want the same level of public goods regardless of their region. Thus, the optimal choice of  $g$ , which maximizes (3a) and (3b) is

$$g^* = \frac{\beta}{\beta + \alpha} \left(\frac{b - F}{L}\right) \quad (4)$$

and utilities under a unitary government in region 1 and region 2 respectively are

$$u_1^* = C_0 \left(y_1 - \frac{F}{L_1 + L_2 \frac{y_2}{y_1}}\right)^{\alpha + \beta} \left(\frac{L_1 + L_2 \frac{y_2}{y_1}}{L}\right)^\beta \quad (5a)$$

$$u_2^* = C_0 \left(y_2 - \frac{F}{L_2 + L_1 \frac{y_1}{y_2}}\right)^{\alpha + \beta} \left(\frac{L_2 + L_1 \frac{y_1}{y_2}}{L}\right)^\beta (1 - \delta)^\beta \quad (5b)$$

where

$$C_0 = \left(\frac{\alpha}{\alpha + \beta}\right)^\alpha \left(\frac{\beta}{\alpha + \beta}\right)^\beta \quad (5c)$$

### **Federal Structure**

Under a federal structure, each region operates independently in providing local public goods, given its own public budget constraint and its own democratic voting process. Now, each region  $i$  must separately bear a fixed cost of running a government  $F_i$ . In general, we will consider  $F_1 = F_2 = F$ , but a difference could be useful for introducing an additional cost to separation by assuming  $F_2 > F$ . Under separation, each regional government provides its own level of local public goods. Therefore, the regional budget constraints

are

$$t_i L_i y_i = F_i + g_i L_i \quad i = 1, 2$$

In other words, the required tax rate to provide  $g_i$  level of local public goods in region  $i$  is

$$t_i = \frac{F_i}{L_i y_i} + \frac{g_i}{y_i} \quad i = 1, 2 \quad (6)$$

By substituting the tax rate from (6) into (1), we rewrite the utility of individuals in region  $i$  as

$$u_i = \left( y_i - \frac{F_i}{L_i} - g_i \right)^\alpha g_i^\beta \quad i = 1, 2$$

Note that since each region provides its own local public goods now, there is no spatial decay of  $g_2$ . It is a clear benefit of separation to individuals in region 2.

The optimum choice of  $g_i$  and maximum utility are as follow

$$g_i^* = \frac{\beta}{\alpha + \beta} \left( y_i - \frac{F_i}{L_i} \right) \quad (7)$$

$$u_i^* = C_0 \left( y_i - \frac{F_i}{L_i} \right)^{\alpha + \beta} \quad i = 1, 2 \quad (8)$$

where  $C_0$  is defined in (5c).

### **The Separation Process**

We evaluate the costs and the benefits of separation to the hinterland region to indicate the economic forces favoring separation and federalism compared to a unitary structure. In so doing, we posit a separation game, where separation is decided by referendum among the voters in hinterland region. While a referendum is a simple and perhaps unrealistic separation device given the complex political structures of most countries, for practical purposes it suffices to identify the forces behind separation.

In general, because region 1 has the majority, it can impose its best choice of local public goods on the

nation subject to two fundamental conditions of unitary government: uniform tax, i.e.  $t_1 = t_2 = t$  and equal provision of local public goods, i.e.  $g_1 = g_2 = g$ . These two conditions may be interpreted as stating that there is no federal structure in place, since the ability for setting different tax rates or different local public goods in two regions requires the existence of some local decision making units (governments) with partial autonomy from the central government, which undermines the assumption of a unitary structure. The fact that the regions may be better off by setting their own tax rates and local public goods provisions is a reason for separation.

Before starting our analysis, we must consider the possibility of separation by region 1. Despite the fact that the choice of local public goods in the nation is the one that maximizes the utility of individuals in region 1 under the unitary structure, there is a possibility that people in region 1 may be able to do better under separation. In this case, region 1 does not have any incentive to stay in the union. Therefore, there would not be a unitary government at the beginning. To avoid this possibility, we assume the following condition is satisfied within a unitary structure:

$$y_1 - \frac{F_1}{L_1} < \left( y_1 - \frac{F}{L_1 + L_2 \frac{y_2}{y_1}} \right) \left( \frac{L_1 + L_2 \frac{y_2}{y_1}}{L} \right)^{\frac{\beta}{\alpha + \beta}} \quad (9)$$

This inequality compares utility under federation, i.e. equation (8), with that under a unitary structure, i.e. equation (5a) for region 1.

We can see that the wealthier region 1 is, the less likely it wants to stay in a unitary structure. To show this point let us assume for a moment that  $F_1 = F$ , then as  $\frac{y_2}{y_1} \rightarrow 0$  (which means that the contribution of region 2 in the tax base is negligible relative to region 1) the inequality (9) will not hold<sup>8</sup>. That is to say, if most of the tax burden is shouldered by people in region 1 (since they are wealthier) then they may be better off setting up their own local government than staying in a unitary structure and subsidizing the

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<sup>8</sup>Note that for any value of  $\frac{y_2}{y_1} < 1$ , we know  $\frac{L_1 + L_2 \frac{y_2}{y_1}}{L} < 1$ , and if the value of  $\frac{F}{L_1 + L_2 \frac{y_2}{y_1}}$  is not a lot smaller than  $\frac{F_1}{L_1}$ , the inequality will not hold.

poorer region.

Under the assumption that region 1 prefers a unitary system, we posit a staged game to evaluate whether region 2 separates or not<sup>9</sup>. In the first stage, the government announces a level of  $\hat{g}$  that will be provided under a unitary structure. In the second stage, voters in region 2 vote whether to remain in the union (and "accept"  $\hat{g}$ ) or to separate (and have a federal structure). In the third stage, after the matter of separation has been resolved and the post-referendum political structure has been realized, the political process operates to determine the level of local public goods. If a unitary structure prevails, sequential rationality requires the political process in fact delivers the  $\hat{g}$  promised in stage 1. If a federal structure prevails, regions 1 and 2 form local governments and the local governments provide local public goods  $g_1^*$  and  $g_2^*$  as in (7).

The only equilibrium strategy to deter separation for a unitary government is to announce  $\hat{g} = g^*$  in the first stage. We know from (4) that this level of local public goods maximizes the utility of people in the region 1 under a unitary structure. So it is the best choice for a unitary government, since it is what the majority wants. In this scenario, it also maximizes the utility of region 2 people under a unitary structure. In short, a unitary government cannot make anybody better off by deviating from  $g^*$ . So, the only viable strategy for a unitary government is to offer  $g^*$ . However, there are circumstances where the unitary government may promise a  $\hat{g}$  different from  $g^*$  in order to deter separation by region 2, as we will see in the next scenario.

In this context, the decision regarding separation comes down to comparing the utility of people in region 2 in (5a) under a unitary government with their utility in (8) under a federal structure. A unitary structure will prevail if

$$y_2 - \frac{F_2}{L_2} \leq \left( y_2 - \frac{F}{L_1 \frac{y_1}{y_2} + L_2} \right) \left( \frac{L_1 \frac{y_1}{y_2} + L_2}{L} \right)^{\frac{\beta}{\alpha+\beta}} (1 - \delta)^{\frac{\beta}{\alpha+\beta}} \quad (10)$$

or otherwise separation will occur. If (10) holds there will be a unitary government where  $g^*$  of local public goods in (4) is provided to people in both regions. Otherwise, region 2 will separate and each regional

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<sup>9</sup>One might ask that why and how we rule out the possibility of separation by region 1, but construct our game on the possibility of separation by region 2. We need to emphasize that a unitary government is controlled by region 1 voters, therefore it would be less likely for them to file for separation compared to region 2 voters, who have no control on provision of local public goods and only receive local public goods after "spatial decay" under a unitary structure.

government will provide local public goods of  $g_i^*$  in (7). In deciding whether to separate, region 2 is comparing the benefits (no spatial decay in public good provision and uniform local demand for public goods) with the costs (fixed costs of a separate local government), accounting for the degree of fiscal subsidization it receives under a unitary structure if  $y_1 > y_2$  and hence region 2 residents contribute less than average taxes.

The evaluation has excluded transfer payments. That would be an important extension. For example, if the inequality in (10) is not satisfied, but region 1 voters want a unitary structure (inequality (9) is satisfied), in theory there is room for region 1 residents to bribe region 2 voters to remain in the union, through transfer payments. For credibility, either transfer formulas would need to be part of the constitution or the game structured so that a unitary structure is only maintained as long as promised transfers are actually carried out. While transfer payments would enhance the RHS of (10), generally the same forces promoting separation are at work. It is the forces we are interested in, not the quantitative point at which they dominate. For example, an increase in  $\delta$  or decline in  $F_2$  increases the benefits of separation, and at some point the transfer payments that region 1 would be willing to make wouldn't be enough to deter separation.

### Comparative Statics

The following hypotheses emerge from inequality (10):

1. If the degree of “spatial decay” increases, then by inspection, the RHS of (10) falls and the relative gain from separation rises. So, there should be a greater tendency toward internal exit in countries with higher geographic or ethnic diversity, larger area, or other potential forces for spatial decay.
2. If the cost of separation rises (an increase in  $F_2$ ), the tendency toward it decreases. Even if  $F = F_2$  and they rise together, the relative gain from separation falls as the per capita fixed cost of an additional government rises <sup>10</sup>.
3. Holding  $\frac{y_1}{y_2}$  fixed (the degree of income inequality), if  $y_1$  and  $y_2$  rise (due to economic growth) the relative gain from separation rises. To see this in (10), bring the first term on the RHS to the LHS.

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<sup>10</sup>This is true simply because  $1 + \frac{L_1 y_1}{L_2 y_2} \geq 1$ .

Then the new RHS does not vary with income growth and the new LHS is

$$LHS = \frac{y_2 - F_2/L_2}{y_2 - F / \left( L_2 + L_1 \frac{y_1}{y_2} \right)}$$

and its derivative with respect to  $y_2$  holding  $\frac{y_1}{y_2}$  fixed is

$$\begin{aligned} \left. \frac{\partial LHS}{\partial y_2} \right|_{\frac{y_1}{y_2}} &= \frac{F_2/L_2 - F / \left( L_2 + L_1 \frac{y_1}{y_2} \right)}{\left( y_2 - F / \left( L_2 + L_1 \frac{y_1}{y_2} \right) \right)^2} \\ &= \frac{L_2 (F_2 - F) + F_2 L_1 \frac{y_1}{y_2}}{L_2 \left( L_2 + L_1 \frac{y_1}{y_2} \right) \left( y_2 - F / \left( L_2 + L_1 \frac{y_1}{y_2} \right) \right)^2} > 0 \end{aligned}$$

It is sufficient for this to be positive that  $F_2 \geq F$ . Thus as the overall income rises, the tendency toward separation increases, since the fixed cost of a separate government is a smaller fraction of income.

4. Holding  $y_2$  constant, if  $\frac{y_1}{y_2}$  increases then the gain from staying in a unitary structure increases for the hinterland region. An increase in the income per capita of the coastal region raises their share in the tax base so they bear a larger portion of the cost of local public goods. This can be shown by observing that the RHS of (10) is an increasing function of  $\frac{y_1}{y_2}$ .
5. Holding  $\frac{L_2}{L_1}$  constant, if  $L$  (and hence  $L_2$ ) increases then the cost of separation is divided among more people and therefore the per capita cost of separation declines. In the inequality (10), if we bring again the first term from the RHS to the LHS then the new RHS is constant with respect to growth in population. The derivative of the new LHS with respect to  $L_2$  is positive as long as  $F_2 \geq \frac{1}{1 + \frac{L_1}{L_2} \frac{y_1}{y_2}} F$ . Again, a sufficient condition is  $F_2 \geq F$  for a larger population to increase the tendency toward separation.
6. Finally, holding  $L$  constant, if  $\frac{L_2}{L}$  increases (and hence  $\frac{L_1}{L}$  falls), the effect can be ambiguous, although it appears to favor separation. The LHS of (10), which represents the benefits of separation, rises as a result of the increase in  $\frac{L_2}{L}$  because separation becomes less costly ( $F_2$  is divided among more



residents). However, what happens to the RHS depends on the relative incomes of two regions. If  $\frac{y_1}{y_2} > 1$  then with an increase in  $\frac{L_2}{L}$ , more of the tax burden transfers to region 2 people since there are fewer wealthier people in the union. This makes separation more appealing to the hinterland region. Conversely, if  $\frac{y_1}{y_2} < 1$  (which is the improbable case) then the separation becomes less attractive to the hinterland region as  $\frac{L_2}{L}$  increases.

In short, separation is promoted by: (1) income growth, (2) population growth, (3) higher spatial decay of local public services provided to the hinterland by the central government, (4) relative income growth in the hinterland region, (5) relative population growth in the hinterland at least when  $y_1 > y_2$ , (6) and lower costs of government, i.e.  $F_2$ , for the hinterland region. In section 3, we will examine these hypotheses empirically.

## **2.2 Scenario 2: Partial Democracy with Immobile Population and Exogenous Income**

By replacing perfect democracy with partial democracy, there are two additional issues that must be addressed. First, we need to redefine the objective function of governments. Under perfectly democratic institutions, the objective function of the government was simply the utility of the median voter. But with partial democracy, under the Leviathan assumption of Buchanan and Faith (1987), politicians who enjoy having a bigger government, also may have some leverage to alter the choice of local public goods to partially achieve that goal. Thus, the new objective function of the government must capture the desires of both politicians and voters. Second, changing to partial democracy increases the complexity of the separation game. In the previous subsection, a specific deterrence strategy was not biting for the unitary government since it could not offer anything better to region 2 than what the political process would ordinarily provide in a unitary system in the third stage of the game. But now, the unitary government may have a biting strategy to deter separation. We are going to address these issues in detail, in the following two subsections.

### **Modeling Partial Democracy**

How can we model partially democratic governments in a fashion that is reasonable but at the same time will not distract us from the examination of decentralization? Perfectly democratic institutions pass all the power to the median voter. However, under imperfect democracy, politicians are able to exercise some power to accommodate their own desires. The political struggle between politicians and voters is a subject of a vast literature in political economy. There are micro-foundation models with asymmetric information on both sides (Persson, Roland, and Tabellini (1996), Polo (1998)), where governments have some degree of power regardless of the pure democratic voting process<sup>11</sup>. In thinking about partial democracy we want a simple way to represent how politicians might alter public good provision away from the choice of the median voter. Similar to Panizza (1999), one approach to model partial democracy is to assign an objective function to the political process, which weighs the utility of median voters against the utility of politicians, where the weights represent the relative bargaining power of each party<sup>12</sup>.

Here we assume that the objective function of a government is

$$W = \left[ y_m^\alpha \left( 1 - \frac{F}{b} - \frac{gL}{b} \right)^\alpha g^\beta \right]^\theta (gL)^{1-\theta} \quad (11)$$

where the expression in the brackets is the utility of the median voter with income  $y_m$ ,  $g$  is the level of per capita local public goods,  $b$  the tax base as it is defined in (2), and  $L$  is the population to be served. We have already substituted in for the tax rate, using the government budget constraint in (2). The second term is the size of government measured by total expenditures on local public goods. This represents the utility of politicians. The weight  $\theta$  represents the degree of democracy. As  $\theta \rightarrow 1$ , we move toward the perfect

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<sup>11</sup>The ability of politicians to collect rents is a direct result of lack of perfect commitment (moral hazard) on the politicians side. Politicians can promise something but can deviate from their promises when they take the office. As Polo argues, the usual intuition that an increase in competition among politicians could drive their benefits from holding office to zero is not applicable here.

<sup>12</sup>The outcome of political process should be a Nash bargaining solution to an cooperative game between voters and politicians. The fact that both parties realize that lack of cooperation might result in very undesirable outcome, i.e. anarchy, persuades both to recognize the power of other party and leads them to an efficient outcome (Wittman (1990)). The outcome of such a cooperative game is formulated in axiomatic way by the Nash bargaining solution. The Nash solution carries all the desirable properties that we expect from the outcome of such game (Pareto efficiency, IUO, IUU, Symmetry, IR, IIA). The generalized Nash solution is characterized by maximization of an geometric weighted average of utility of voters and politicians. The weights come out of a bargaining game with alternating offers with impatience. Here, the voters' bargaining power might depend on their ability to protest and control excessively large government.

democracy case (first scenario), where the only thing that matters is the utility of voters. As  $\theta \rightarrow 0$ , we approach social breakdown with a pure Leviathan outcome where politicians take all social resources (except perhaps what is needed for subsistence or to deter revolution, as in Alesina and Spoloare (2003)). Equation (11) can be interpreted as the Nash bargaining solution criterion function. The relevant part of the utility possibility frontier for this bargaining game is limited to the declining part of the function in the brackets<sup>13</sup>. This part is concave and decreasing and therefore it satisfies all the properties of well behaved utility frontier and will result in an unique Nash solution for the above objective function, where the threat points are for no government to form and no local public goods to be provided.

As  $\theta$  increases (the bargaining power of voters) the optimal level of  $g$  in (11) moves towards the level that maximizes the function inside the brackets. An equilibrium level of local public goods is a point on the utility possibility frontier of the median voter and the politician that maximizes (11), given the bargaining power of each group.

### Optimal Choices Under Different Outcomes

Let us first to look at the optimal level of public good in different cases. Under a unitary structure, where the coastal region has the majority, the objective function of the unitary government is

$$W = \left[ y_1^\alpha \left( 1 - \frac{F}{b} - \frac{gL}{b} \right)^\alpha g^\beta \right]^\theta (gL)^{1-\theta} \quad (12)$$

where  $F$  and  $L$  are the fixed cost of the central government and total population, respectively. The level of  $g$  that maximizes government's objective function in (12) is

$$g^* = \frac{1 - \theta(1 - \beta)}{1 - \theta(1 - \beta - \alpha)} \left( \frac{b - F}{L} \right) \quad (13)$$

and the corresponding utilities for the individuals in region 1 and 2 under a unitary structure at  $g^*$  are

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<sup>13</sup>If we show the utility of the politician (which is monotone on  $g$ ) on the x-axis and of median voter on the y-axis, the utility possibility frontier is a bell shape curve. It rises from zero at  $g = 0$  and peaks at  $g = g_m^*$  below in (14) and then declines to zero at  $\bar{g} = y - \frac{F}{L}$ .

$$u_1^* = C_1 \left( y_1 - \frac{F}{L_1 + L_2 \frac{y_2}{y_1}} \right)^{\alpha+\beta} \left( \frac{L_1 + L_2 \frac{y_2}{y_1}}{L} \right)^\beta \quad (14a)$$

$$u_2^* = C_1 \left( y_2 - \frac{F}{L_2 + L_1 \frac{y_1}{y_2}} \right)^{\alpha+\beta} \left( \frac{L_2 + L_1 \frac{y_1}{y_2}}{L} \right)^\beta (1-\delta)^\beta \quad (14b)$$

where

$$C_1 = \left( \frac{1 - \theta(1 - \beta)}{1 - \theta(1 - \beta - \alpha)} \right)^\beta \left( \frac{\alpha\theta}{1 - \theta(1 - \beta - \alpha)} \right)^\alpha$$

Note that if  $g^*$  is provided then utilities of residents have exactly the same form as (5a) and (5b), except for the constant term. The constant term under partial democracy  $C_1$  is smaller than the constant term  $C_0$  under perfect democracy.

The most desired value of local public good for voters is  $g_m^*$  that maximizes the term in the bracket in (12). As we recall from (4), it is given by

$$g_m^* = \frac{\beta}{\beta + \alpha} \left( \frac{b - F}{L} \right) \quad (15)$$

and using (5a) and (5b), we define  $u_{m1}^*$  and  $u_{m2}^*$  as the maximum utility of voters in region 1 and 2, respectively, under a unitary system. The fact that the median voter cannot achieve his best choice is a direct consequence of having a partial democracy rather than perfect democracy.

Under a federal structure (post-separation) each region has its own government and provides its own local public goods. The objective function of region  $i$ 's government is

$$W_i = \left[ \left( y_i - \frac{F_i}{L_i} - g_i \right) g_i^\beta \right]^{\theta_i} (g_i L_i)^{1-\theta_i} \quad i = 1, 2$$

where  $\theta_i$  is the level of democracy in region  $i$ . The optimal level of local public goods for the region  $i$  is

$$g_i^* = \frac{1 - \theta_i(1 - \beta)}{1 - \theta_i(1 - \beta - \alpha)} \left( y_i - \frac{F_i}{L_i} \right) \quad (16)$$

and the utility of individuals in region  $i$  at  $g_i^*$  is

$$\begin{aligned} u_i &= C_{1i} \left( y_i - \frac{F_i}{L_i} \right)^{(\alpha+\beta)} & i = 1, 2 \\ C_{1i} &= \left( \frac{1 - \theta_i(1 - \beta)}{1 - \theta_i(1 - \beta - \alpha)} \right)^\beta \left( \frac{\alpha\theta_i}{1 - \theta_i(1 - \beta - \alpha)} \right)^\alpha \end{aligned} \quad (17)$$

Again, note that these equations are exactly the same as (8) except for the smaller constant terms. In general, in terms of preference structure, we assume a region 1 government involves the same politicians as a unitary government, while a region 2 government is a new set of politicians. Thus a region 1 regional government is simply a downsizing of the scope of the old unitary government.

### The Separation Process

We consider a game similar to the one in the previous scenario. The main difference is that now there may exist a viable strategy for the central government to offer a  $g$  different from  $g^*$  in order to deter separation. As before, the central government announces a level of local public goods  $\hat{g}$  in the first stage, then the region 2 decides whether to separate or not, and at the end, the political process delivers local public goods. Either  $\hat{g}$  is provided to both regions under a unitary structure or  $g_1^*$  and  $g_2^*$  are provided under separation. Sequential rationality requires that any  $\hat{g}$  promised in the first stage of the game will be delivered by the political process in the third stage. Again, we assume that region 1 does not desire separation in the first place. In other words, the utility of individuals in region 1 under a unitary system is higher than under a

federal system, or the following inequality holds<sup>14</sup>

$$C_{11} \left( y_1 - \frac{F_1}{L_1} \right)^{\alpha+\beta} < y_1^\alpha \left( 1 - \frac{F}{b} - \frac{\widehat{g}L}{b} \right)^\alpha \widehat{g}^\beta \quad (18)$$

Separation only happens if individuals in region 2 vote for separation. Voters in region 2 compare their utility under a federal structure and under a unitary government. So, an unitary structure prevails if the following inequality holds

$$C_{12} \left( y_2 - \frac{F_2}{L_2} \right)^{\alpha+\beta} \leq y_2^\alpha \left( 1 - \frac{F}{b} - \frac{\widehat{g}L}{b} \right)^\alpha \widehat{g}^\beta (1 - \delta)^\beta \quad (19)$$

**Case 1.** Let's start with the case where the central government announces  $\widehat{g} = g^*$  the level of local public goods in (13). If it is adequate to satisfy in (19); it satisfies sequential rationality, since it maximizes the political process objective function in a unitary system. In that case (19) reduces to

$$y_2 - \frac{F_2}{L_2} \leq \left( \frac{C_1}{C_{12}} \right)^{\frac{1}{\alpha+\beta}} \left( y_2 - \frac{F}{L_1 \frac{y_1}{y_2} + L_2} \right) \left( \frac{L_1 \frac{y_1}{y_2} + L_2}{L} \right)^{\frac{\beta}{\alpha+\beta}} (1 - \delta)^{\frac{\beta}{\alpha+\beta}} \quad (20)$$

This simplifies further to the inequality in (10), if we assume that  $\theta_2 = \theta$ , so  $C_1 = C_{12}$ .

Therefore, the same set of comparative statics apply as in section 2.1, when  $\theta = \theta_2$ . In addition, we may be able to draw some hypotheses about changes in the level of democracy if  $\theta \neq \theta_2$ . If  $\theta_2$  is fixed and  $\theta$  increases then the tendency toward separation decreases because  $\frac{\partial C_1}{\partial \theta} = (1 - \theta) \alpha > 0$ . By the same argument if  $\theta_2$  increases (more democratic structure at local governments) then that increases the possibility of separation.

**Case 2.** Now suppose that  $g^*$  does not deter separation by region 2. That is to say, the inequality (20) does not hold. However, in theory there could be room for the central government to maneuver, by moving  $\widehat{g}$  away from  $g^*$  and toward  $g_m^*$  in (15), where  $g_m^* < g^*$ . Reducing public goods from  $g^*$  towards  $g_m^*$  increases the utility of voters (in both regions) up until  $g_m^*$  is reached. The utility of politicians in the central

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<sup>14</sup>If the inequality does not hold then separation happens because region 1 demands it.

government decreases as the level of local public goods falls. Therefore, the government only is interested in lowering public goods below  $g^*$  just enough to deter separation. In other words, it sets  $\hat{g} = g_d^{**}$  ( $g_d^{**} \leq g^*$ ) such that the (19) holds with equality

$$C_{12} \left( y_2 - \frac{F_2}{L_2} \right)^{\alpha+\beta} = \left( y_2 - \frac{F}{b/y_2} - \frac{g_d^{**} L}{b/y_2} \right)^{\alpha} (g_d^{**})^{\beta} (1 - \delta)^{\beta} \quad (21)$$

The deterrence strategy in theory works if equation (21) has a solution  $g_d^{**}$  and its solution satisfies in  $g_m^* \leq g_d^{**} \leq g^*$ . However, it may be that even at  $\hat{g} = g_m^*$  the inequality (19) does not hold and deterrence is not a viable strategy. In other words, if

$$C_{12} \left( y_2 - \frac{F_2}{L_2} \right)^{\alpha+\beta} > C_0 \left( y_2 - \frac{F}{L_2 + L_1 \frac{y_1}{y_2}} \right)^{\alpha+\beta} \left( \frac{L_2 + L_1 \frac{y_1}{y_2}}{L} \right)^{\beta} (1 - \delta)^{\beta} \quad (22)$$

separation is inevitable and the central government cannot deter it. It is also clear from (22) that an increase in local democracy, which raises the LHS but leaves the RHS constant, will increase the possibility of separation as in equation (20).

There are a number of issues with this idea. First, is a promise of  $\hat{g} = g_d^{**} < g^*$  credible? In a sense it satisfies sequential rationality: voters are happy to have public goods reduced below  $g^*$  (down to  $g_m^*$ ) and the government is happy to deter separation. However, it is still the case that the political process in stage 2 is still set to deliver  $g^*$ . So region 2 voters would need "guarantees", if  $\hat{g}$  is set less than  $g^*$  such as, if the promised level of public goods are not delivered, they can revote and exit. Such a guarantee mechanism could also come out of a repeated (reputational) process. Second, setting  $\hat{g} < g^*$  violates the current Nash bargaining criterion per se. In essence by mutual agreement, that rule is being suspended or amended. But that cries out for a reformulation of the bargaining game with new threat points or altered bargaining powers, but such reformulation isn't straightforward.<sup>15</sup>

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<sup>15</sup>For example, new threat points could involve what happens under separation to the median voter versus the unitary government. But those threat points in turn involve threat points about what happens under political breakdown in determining the level of public goods under separation. How to set this up is not obvious. Nor is it obvious how to model how  $\theta$  increases,

Second, if the unitary government can amend  $g^*$  to survive, then consider the "shadow" as-yet-to-exist government in region 2. It could promise a lot just to exist, perhaps even credibly. For example, in the separation process, a shadow region 2 government could specify a more democratic constitution, competing with the unitary government over rules to ensure greater democracy. That is an interesting idea, where potential separation would induce greater political competition among levels of government to promote democracy at the national level.

Finally there is an issue of whether or not politicians in a unitary government want to deter separation, even assuming region 1 people prefer a unitary government to a federal system. Under a federal structure the politicians in the coastal region receive utility of  $L_1 g_1^*$  for  $g_1^*$  defined in (16). Alternatively, under a unitary structure when setting  $\hat{g} = g_d^{**} < g^*$  to deter entry, they receive utility of  $L g_d^{**}$ . While at  $\hat{g} = g^*$ , politicians always prefer a unitary structure, for  $\hat{g} = g_d^{**} < g^*$  it may not be the case. From (15), (16), and (21), it can be that  $g_1^* \gg g_m^*$ , as  $g_d^{**}$  approaches  $g_m^*$  (especially if  $\theta$  is small and  $\frac{y_1}{y_2}$  is large) and it can also be that  $L_1 \rightarrow L$ , so  $L_1 g_1^* > L g_d^{**}$ . That is, if region 2 has little population and low relative income, then the coastal region government under a federal structure may be larger than a unitary government when  $\hat{g} = g_d^{**} < g^*$ . If the  $g_d^{**}$  in (21) that deters separation leaves coastal politicians worse off, given they have an advantage of moving first in the game, they can announce  $\hat{g}$  equal to  $g^*$ , and let separation occur, although the coastal voters would prefer a unitary system.

### 2.3 Scenario 3: Mobile Population and Endogenous Income Under Perfect Democracy

Now, we assume that the population is perfectly mobile across regions. An equilibrium exists only when the utilities of individuals in the two regions are equalized. To incorporate perfect mobility into the model we need to answer three new questions:

- How does income in a region vary with population, in order to equalize utility across regions?

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for example, as another way of trying to reformulate the bargaining process.



- What are conditions for both regions to be occupied?
- How does population mobility affect the choice of public services?

In term of income, we assume

$$y_i = A_i L_i^{-\gamma} \quad i = 1, 2 \quad (23)$$

That is to say, per capita income declines with population. This could be due to “congestion”, or other external diseconomies. It could also be due to diminishing returns to a fixed factor, such as land, where  $y_i$  is then the average product of labor, assuming land rents are distributed equally among regional residents.

Moreover, we assume that net income per capita after the fixed governance costs also declines with population

$$\frac{\partial \left( y_i - \frac{F_i}{L_i} \right)}{\partial L_i} = -\gamma A_i L_i^{-\gamma-1} + \frac{F_i}{L_i^2} < 0$$

or

$$\frac{F_i}{L_i} < \gamma A_i L_i^{-\gamma} \quad i = 1, 2 \quad (24)$$

for the relevant range of interior equilibrium values of  $L_i$ . This assumption will be utilized below to help ensure stability of an interior solution of population division.

Regional governments must consider now the impact of their choice of  $g$  on regional incomes and populations. That is region  $i$  takes into consideration the impact of  $g_i$  on  $y_i$  and  $L_i$ , when it strategically chooses  $g_i$  (given  $g_j$ ). However, under nondiscretionary tax system, while there is an impact of  $g_i$  on  $y_i$  and  $L_i$ , the optimal level of local public goods is still  $g_i^*$  in (7) for region  $i$ , given region  $j$  choice (Henderson (1994)). For example, under the federal structure, region 2 government chooses  $g_2$  to maximize

$$u_2 = \left( y_2 - \frac{F_2}{L_2} - g_2 \right)^\alpha g_2^\beta$$

given the value of  $g_1$ , production functions in (23), and the following constraints

$$\begin{aligned} \left(y_2 - \frac{F_2}{L_2} - g_2\right)^\alpha g_2^\beta &= \left(y_1 - \frac{F_1}{L_1} - g_1\right)^\alpha g_1^\beta \\ L_1 + L_2 &= L \end{aligned}$$

The first constraint reflects the free mobility assumption.

We maximize  $u_2$  with respect to  $g_2$ . The total derivative is

$$\frac{du_2}{dg_2} = \frac{\partial u_2}{\partial g_2} + \frac{\partial u_2}{\partial L_2} \frac{\partial L_2}{\partial g_2} + \frac{\partial u_2}{\partial y_2} \frac{\partial y_2}{\partial L_2} \frac{\partial L_2}{\partial g_2}$$

and the first order condition is  $\frac{du_2}{dg_2} = 0$ . We solve for  $\frac{\partial L_2}{\partial g_2}$  by differentiating the constraints and substituting the result in the first order condition. The first order condition is identical to the one that we obtain for  $g_2^*$  in (7), except that the right hand side is multiplied by a non-zero term. We can repeat the same for region 1. Therefore,  $g_i^*$  is given by (7) for both regions as before. Similarly, the optimal  $g$  is given by (4) under a unitary structure.

Thus, utilities under a unitary and a federal structures are still defined by (5a), and (8), respectively. Nevertheless, the free mobility assumption imposes more structure—namely under any given regime utilities in the two regions must be equalized. Therefore, under a unitary government and for any level of  $g$ , we know that equating (3a) and (3b) results in  $y_1^\alpha = y_2^\alpha (1 - \delta)^\beta$  or an allocation of population of

$$L_1 = \frac{A_1^{1/\gamma} L}{A_1^{1/\gamma} + A_2^{1/\gamma} (1 - \delta)^{\frac{\beta}{\gamma\alpha}}} \quad (25)$$

between the two regions. And for a federal system when  $F_2 = F$  with the free mobility, equating utilities in (8),  $L_1$  satisfies

$$A_2 (L - L_1)^{1-\gamma} L_1 - A_1 (L - L_1) L_1^{1-\gamma} = F (2L_1 - L) \quad (26)$$

Equations (25) and (26) represent population allocations under unitary and federal regimes. We only consider cases where such solutions are unique and interior.

For example, if the two regions have the same production functions, i.e.  $A_1 = A_2$ , then  $L_1 = L_2 = \frac{1}{2}$  is an interior unique equilibrium under a federal structure. Stability of the allocation follows from the assumption in (24). For stability, we need  $\frac{\partial u_i}{\partial L_i} < 0$  in the neighborhood of an interior solution. Given that (7) holds,  $\frac{\partial u_i}{\partial L_i} < 0$  reduces to (24). The very same equal population allocation emerges as an equilibrium under a unitary structure, if  $\delta = 0$ <sup>16</sup>. However, under a unitary structure, if  $\delta > 0$  then  $L_1 > \frac{1}{2}L$  satisfies (25), which in turn means higher income in region 2 or  $y_2 > y_1$  that compensates residents of region 2 for spatial decay.

For this example, the issue is whether the allocations in (25) and (26) are unique interior solutions. This general problem is beyond the scope of this paper, but it has been covered in the literature (e.g. Pines (1991)). Here we will work through an example, where  $\alpha + \beta = 1$  in (8) and  $C_0$  is normalized to 1, so  $u_i = A_i L_i^{-\gamma} - \frac{F_i}{L_i}$ . If  $\gamma \geq 1$  then as  $L_i \rightarrow 0$ ,  $u_i > 0$  and  $\frac{\partial u_i}{\partial L_i} < 0$ . This is enough to produce an unique interior equilibrium since in both regions utility declines by size (and (26) is satisfied)<sup>17</sup>. If  $\gamma < 1$  then as  $L_i \rightarrow 0$ ,  $u_i < 0$  and  $\frac{\partial u_i}{\partial L_i} > 0$ . Then, for  $A_1 = A_2$ , a well behaved unique interior solution occurs if  $\frac{\partial u_i}{\partial L_i} = 0$  at an  $L_i < \frac{1}{2} L$ .

With free mobility, the evaluation of a federal versus a unitary structure changes, since within a regime all citizens have equal utility ex-post. So the question reduces to whether the country, as a whole, is better off under what regime. A unitary system prevails if

$$A_2 L_2^{-\gamma} - \frac{F_2}{L_2} < \left( A_2 (L_2^*)^{-\gamma} - \frac{F}{L_2^* + L_1^* \frac{A_1}{A_2} \left( \frac{L_1^*}{L_2^*} \right)^{-\gamma}} \right) \left( L_2^* + L_1^* \frac{A_1}{A_2} \left( \frac{L_1^*}{L_2^*} \right)^{-\gamma} \right)^{\frac{\beta}{\beta+\alpha}} (1 - \delta)^{\frac{\beta}{\beta+\alpha}} \quad (27)$$

where  $L_2$  and  $L_2^*$  are the population levels that respectively satisfy in (26) and (25)<sup>18</sup>.

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<sup>16</sup>In fact, if  $\delta = 0$  there is no reason to have a federal system since it involves an extra costs for additional government when there is no benefits from such government.

<sup>17</sup>However, in this case  $u_2$  is a convex function of scale, which raises the possibility that a symmetric interior solution is not optimal since utility in a gaining region declines more slowly than it rises in a losing region. That is by reducing population in one region at the margin the gain in real income per capita to that region exceeds the loss in real income per capita in the expanding region.

<sup>18</sup>Recall that  $L_2 = L - L_1$ .

It is easy to see that if  $A_1 = A_2$  and  $F = F_2 > 0$  and  $\delta = 0$ , a unitary structure dominates. Then as we showed before,  $L_1 = L_2$  in an stable equilibrium and  $y_1 = y_2$ . Since the incomes are the same the demand for local public goods are the same in the two regions. So, a unitary regime dominates because people need only to pay for one government instead of two regional governments in a federation. Similarly, if  $\delta > 0$  and  $F_2 = 0$  then a federal structure dominates since it is costless to form a second government which then eliminates spatial decay of public goods in region 2.

### 3 Empirical Formulation

The modeling section suggested the following. A country is more likely to experience a move toward a federal structure if

1. it has higher income
2. it has a larger population
3. it is larger spatially, creating enhanced opportunities for spatial decay
4. it has a greater degree of local democratic "culture" relative to national democratic culture, or
5. the population concentrates more in the hinterland.

As we saw in the introduction, federalism is not an all or nothing concept, but rather a spectrum of possibilities. Empirically, we view the tendency towards separation that is analyzed in the theory section as a force moving a country across that spectrum. As the centralization measure, we will focus on the continuous variable which changes for almost all countries over time – the share of the central government in current consumption expenditures. We will also look at the federalism index, but as a dependent variable it is troubling. While it can take on a number of possible values, countries also tend to mass at low values (zero in 1975 and 1985, but not in 1995) and many countries (17 of 48) have no changes over time.<sup>19</sup>

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<sup>19</sup>One could model the variable as a discrete choice variable, such as an ordered probit. Given the limited sample sizes and given we have an alternative – the share variable – we decided not to do this. Instead we treat it as a continuous variable, for

The outcome,  $S_{it}$ , which is the share of the central government in government consumption in country  $i$  in time  $t$ , is hypothesized to be

$$S_{it} = \beta X_{it} + \delta_t + u_i + \varepsilon_{it} \quad (28)$$

In (28)  $X_{it}$  are covariates detailed below, which affect  $S_{it}$ .  $\delta_t$  is a time dummy representing any worldwide shocks/trends; we do not expect and we do not find any significant time effects.  $u_i$  is a country specific effect, representing time invariant cultural and historical aspects of the country determining “political traditions”, which affect political outcomes such as  $S_{it}$  or affect democratization, but not necessarily economic variables. We experiment with controls for certain cultural variables noted below. Finally there are contemporaneous shocks  $\varepsilon_{it}$  which potentially affect both political and economic variables – such shocks include civil unrest, election of a charismatic leader or an ineffectual assembly, a huge drop in export prices and resulting large scale unemployment, natural disasters, and so on.

In estimation we rely on

- (1) random effects estimation and
- (2) instrumental variables estimation in levels.

For the second, we use variables from in 1965 as instruments for 1975, 1985, and 1995 values of economic, demographic, and geographic variables listed in Table 1. Use of such instruments which are predetermined values of potential covariates helps with issues of measurement error, and simultaneity bias created by  $\varepsilon_{it}$  shocks affecting the  $X_{it}$ , as well as  $S_{it}$ . The issue is whether instruments are orthogonal to the  $u_i$ . We exclude historical measures of democracy as instruments. We start with a base set of instruments that represent just geographic and demographic variables in 1965, such as population, land, population of largest metro area, life expectancy, latitude, and percent Muslim. We find that adding in economic variables such as GDP per capita and average years of high school of women improved first stage results dramatically, had little effect on final coefficients, and actually improved specification test outcomes. Therefore we proceed

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illustration purposes.

with a full set of instruments, viewing the  $u_i$  as representing cultural aspects of the country influencing political outcomes on the LHS of (28), but not economic outcomes on the RHS of (28). Why are historical values of economic, demographic and geographic variables strong instruments? As part of the economic growth process, past values of income investment, education, life expectancy and the like are significant determinants of future income and population.  $F$  statistics of first stage regressions for our basic economic and demographic covariates are all over 150. Using instrument variables, we do 2SLS, 3SLS, and GMM, with modest differences in results. GMM estimators adjust 3SLS coefficients for within period heteroskedasticity.<sup>20</sup> We tend to rely on GMM estimates, but report 2SLS results for the key equation.

We also tried fixed effects estimation. Such estimates are plagued by measurement error and all coefficients are insignificant and, as such, a random effects formulation (Hausman test) can't be rejected in favor of fixed effects. One could also time difference the data (to remove the fixed effect), and instrument with predetermined values of variables. It seems that the first differences are heavily dominated by measurement errors. Instruments turn out to be very weak and we don't pursue this approach.

The details of data are discussed in the Appendix. Country geographic size and the possibility of spatial decay are measured by land area. To quantify the population concentration in the political center of power in a country, we consider two measures. One is urban primacy, which is the share of the urban population in the largest metro area (generally the national capital); another is simply the absolute population size of the same metro area. For democracy it is not clear that we can measure the extent of local versus national democratic "culture". All we have are the observed processes, and below we discuss their use as covariates. We tried controls for cultural-historical variables such as colonial history (including use of a French legal system, whether a country was, say, an English versus Spanish colony); but we settled on the only one with consistent robust effects, which is the percent of Muslims in the population. We will also discuss results, using Easterly and Levin's (1977) ethnolinguistic fractionalization variable.

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<sup>20</sup>We use the Arellano and Bond (1991) estimator, utilizing their Gauss program (DPD98).

## 4 Results

In estimation, our basic results have as covariates just economic and demographic variables. Democracy variables are certainly strongly correlated with outcomes on the degree of fiscal decentralization, but trying to infer causality is difficult. So we start with basic results on economic and demographic variables and then turn to results when democracy variables are added on. Results are reported in Tables 1 and 2, where  $\ln(\text{real GDP per capita})$ ,  $\ln(\text{total national population})$ ,  $\ln(\text{land area})$ , and percent of Muslims in the population appear in all specifications. Table 1 gives random effect estimates and Table 2 instrumental variable estimates. An issue in estimation concerns truncation. Six countries out of 52 in the estimating sample have 100% centralization. We tend to rely on estimations excluding these countries; but we report results including them in regular random effects and GMM, and including them in a random effects Tobit. We tend to rely in discussion on results excluding these six countries but will comment on differences in results across the specifications. We start with an overview of the effects of specifications, samples, and econometric results on results and then turn to a detailed analysis of our main results.

In Tables 1 and 2, column (1) gives results where the measure of population concentration is primacy – the share of the largest metro area in national urban population. In columns (2) and beyond primacy is replaced by the absolute population size of the largest metro area. In both tables, column (2) gives our main results and column (5) gives results with a democratization measure added on. In Tables 1 and 2 column (3) repeats the column (2) specification adding in the 6 countries (just 3 countries in Table 2) where centralization is always 100%. Results in columns (2) and (3) are very close in both cases, and we only discuss column (2) results. In Table 1 random effects, column (4) gives a Tobit version of column (3) results, which does have some impact on population coefficients. In Table 2, only 3 countries have truncated values and we ignore the issue of truncation. Instead in Table 2, in column (4) we report 2SLS results, which are very close to the GMM results in column (2). Finally we note that comparing, say, column (2) results in Tables 1 and 2, except for Muslim, instrumental variable estimation increases values of all coefficients, sharpening results; but qualitatively results are the same. However that will not be the case when we turn

to democratization variables. Sargan tests on overidentifying restrictions in GMM are satisfactory (p-values exceeding .05), allaying concerns about endogeneity issues.

We now turn to the specific results, first discussing our main results, those in column (2) of Table 2, with reference to the alternative measure of population concentration in column (1). In Table 2, column (2), a one-standard deviation increase in income (.09) reduces centralization by 0.18. A one-standard deviation in national (i.e., hinterland) population (1.4) holding the size of the largest metro area fixed reduces centralization by .20. Both of these could be interpreted from Section 2, as scale economy effects. A one-standard deviation increase (1.0) in main city size increases centralization by .18. The extent of population centralization can also be measured by primacy, as in column (1) of Table 2. In column (1) since primacy is a share, national population no longer has a significant coefficient. For primacy itself, a one-standard deviation increase in primacy (0.15) increases centralization by .09. We prefer the column (2) results which identify separate national population size effects from effects of centralization in the largest (typically capital) city; in Table 1 column (2) results have higher  $R^2$ 's and in Table 2 they have better Sargan values. Finally a one-standard deviation increase in land (1.72) area reduces centralization by .10, representing the effect of spatial decay. Note only do the direction of effects correspond to what was hypothesized in the modeling section, effects are very large. The mean of centralization in the sample is .61, so these one-standard deviation changes in covariates are leading to 15-30% changes each in the dependent variable. Moreover the explanatory power of the model is high. About 60% of the variation in centralization – a ratio – is explained by these simple covariates under random effects.

For cultural variables we tried a variety of controls and have the only significant, robust one in all formulations – the percent of the population which is Muslim. That also has a strong effect in column (2), Table 2. A one-standard deviation increase in percent Muslim (15.9) increases centralization by .066. As noted earlier we also experimented with the ethnolinguistic fractionalization measure of Easterly and Levin (1997), which measures the extent to which the populations in a country have different ethnicities and especially speak different languages (see Appendix). While this is a variable which is emphasized by those studying



country breakups, for decentralization within existing countries, its effects are ambiguous. Consistent with the results in Easterly and Levin (1997) and La Porta et al. (1998), increases in fractionalization have a positive effect on centralization. Fractionalization within countries may cause the national government to try to exert more control. However in neither random effects nor instrument variables estimation in any formulation is the coefficient significant and thus we don't report it.

The remaining topic in Tables 1 and 2 concerns democratization. We have three measure: the national democratization index, a 0-1 dummy for state elections, and a 0-1 dummy for location elections. Under random effects or GMM estimation, in any pairing with state elections (or all three together), only state elections ever has a significant coefficient and we focus on it. In Table 1 column (5) under random effects state elections has a significant negative coefficient, where the move from 0-1 reduces centralization by .13 (relative to a mean of .61). However it isn't clear what causes what. Decentralization per se could lead to state elections, as part of the conditions surrounding decentralization, rather than state elections representing local democratic culture per se. Indeed under instrumental variables estimation, in column (5) of Table 2, the coefficient of the variable reverses sign and becomes completely insignificant (under any specification we tried).<sup>21</sup> Hence our focus is on economic-demographic variables.

Finally in Table 3, we report results for similar models where the dependent variable is now our federalism index. This variable is treated as continuous (from 0 to 4) although it generally only takes about 10 different values. As in Tables 1 and 2, increases in income and land area reduce political centralization (increase federalism) while percent Muslim increases political centralization. But now population concentration has an insignificant effect on political centralization. The dependent variable (federalism) has a mean of 1.44. In the GMM estimation in column (3), a one-standard deviation increase in (a) income increases federalism by 0.96 (a 71 percent increase), (b) land increases federalism by 0.31, and (c) percent Muslim decreases

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<sup>21</sup>In IV estimation, there is the issue that in the first stage (or really, moment condition) we are treating the 0-1 democracy variable as a continuous (linear probability) measure which is inefficient. A probit for state elections with instrumental variables as covariates in fact has very similar results to a linear probability formulation. The only issue is that while probit predictions are truncated at 0 and 1, linear predictions are unconstrained. Except at these tails, the predicted probabilities for the two models are closely correlated.

federalism by 0.34.

## 5 Conclusion

In this paper we develop and test a simple model of fiscal decentralization within a country. We hypothesize that basic economic and demographic variables explain most of the observed variation in the degree of centralization across countries. We find that income per capita, population, land area, and the degree of population centralization in the largest (typically capital) city in a country, as well as percent Muslim, have large effects on the degree of centralization. Income and population growth lead to decentralization, as does population decentralization. The degree of centralization in countries is largely explained by simple economic and demographic growth processes.

## 6 Data Appendix

Here we discuss the key variables that we used in the introduction and in our empirical work. The measures of fiscal centralization and of federalism were constructed for this paper. We pay more attention to those variables in this appendix since their construction is not routine in the literature. We also will provide a brief description of other variables, such as the land area, regional dummies, and GDP per capita, which have standard definitions and come from standard sources, and are routinely used in literature.

The data<sup>22</sup> that are used in this study are a collection of all the important socioeconomic characteristics of about 190<sup>23</sup> countries around the world. The data are from a variety of sources.<sup>24</sup> The data cover 40 years time span from 1960 to 1995 in five years intervals; however, many of the variables are only available since 1970.

### General variables

- GDP per capita: Real GDP per capita is in constant 1985 dollars from Penn World Tables Mark 5.6. The Penn World Tables coverage ends on 1992. The figures for 1995 are extrapolated from 1992 values using World Bank WDI real GDP per capita growth figures for 1992-1995. Values are missing for West Germany, Czechoslovakia, Yugoslavia and USSR in 1995.
- Land: Land area is in square kilometers from World Bank WDI. Values for West Germany, Czechoslovakia, Yugoslavia and USSR are taken from the Columbia Encyclopedia.

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<sup>22</sup>The dataset has been put together during the past 5 years by Jim Davis, under provision of Vernon Henderson at the Department of Economics of Brown University. It is available on Vernon Henderson's website at the Department of Economics' webpage.

<sup>23</sup>While some of the variables, such as land area and population, are available for all 190 countries since 1960, other more important variables, such as GDP per capita, are only available for the subset of the data. For example, only 150 countries have GDP figures for at least one year. The detail of data availability will be discussed for important variables separately.

<sup>24</sup>Barro, Robert J. and J. W. Lee, International Measures of Schooling Years and Schooling Quality on-line data, World Bank Economic Growth Research Group, Washington D.C.: World Bank, 1996.

Freedom House, Freedom in the World, New York: Freedom House, various years.

International Monetary Fund (IMF), Government Finance Statistics (GFS), Washington D.C.: International Monetary Fund, various years.

Summers, R., and A. Heston, Penn World Table Mark 5.6 version of Summers and Heston (1991) on-line data, Computing in the Humanities and Social Sciences (CHASS), Toronto: University of Toronto, 1995.

United Nations, World Urbanization Prospects: The 1998 Revision, United Nations Population Division, Department of Economics and Social Information and Policy Analysis, New York, 1998.

World Bank, World Development Indicators (WDI) on CD-ROM, Washington D.C.: World Bank, 1998.

- Population: Total national and urban populations are from United Nations World Urbanization Prospects: The 1998 Revision, Table A.12 and Table A.5, respectively. Values for West Germany, Czechoslovakia, Yugoslavia and USSR are taken from the Penn World tables 5.6.
- Population of largest metro area: Population of largest city is from United Nations World Urbanization Prospects: The 1998 Revision, Table A.3.
- Investment: It is the percentage share of real investment in GDP from Penn World Tables Mark 5.6. We use a five year average of the shares, e.g. the value for 1965 is an average over 1960-1964.
- Life expectancy: Life expectancy at birth in years is from World Bank WDI. Czechoslovakia, Yugoslavia and USSR are averages over the constituent republics weighted by population share. The values for united Germany are substituted for West Germany. We use a five year average values, e.g. the value for 1965 is an average over 1960-1964.
- Schooling attainment of women: It is the average years of high school and collage in the female population aged 25 and over from Barro and Lee (1996). Census and survey figures primarily from UNESCO Statistical Yearbooks and UN Demographic Yearbooks fill two fifths of the observations. The remaining values are estimated using UNESCO school enrollment data and a perpetual inventory method. The data are not adjusted for quality of education or length of school day or year.
- Latitude: This variable is from La Porta et. al. (1998).
- Muslim: This variable indicates the percentage of population that are Muslim. This variable is from La Porta et. al. (1998).
- We tried some other variables from La Porta et. al. (1998) to control for cultural and legislative differences, such as a French law, colonial background, and so on. None of them have significant effects. We do discuss ethnolinguistic fractionalization which is an index from Easterly and Levin (1997) averaging five indices representing (a) the probabilities that any two randomly chosen people in

a country (1) come from a different ethnic group, (2) speak different languages, and (3) do not speak the same language, and (b) the percent of the population not speaking (1) the official language, and (2) the mostly widely used language.

**Fiscal centralization measures** Three different measures of fiscal centralization are constructed. The variables are based on the Government Finance Statistics Yearbook (GFS) figures for national, state, and local governments consolidated expenditures. The first measure ( $me_1$ ) is the share of the central government in general government (all levels of government together) total expenditures plus net lending. It includes all kind of expenditures, such as capital investment, and inter-governmental transfers. In the older volumes of GFS (before 1986), the total expenditure for the central government and general government<sup>25</sup> were readily available for countries around the world<sup>26</sup> in the summary tables. So, values of  $me_1$  are available for 1975 and 1985 after simple calculation. This variable is widely used in previous empirical studies<sup>27</sup> and we extend it to include 1995. We use a following formula to calculate this measure consistently for 1975, 1985, and 1995.

$$\begin{aligned}
 me_1 &= \frac{C_1}{G_1} \\
 C_1 &= \text{Central}(C.I) \\
 G_1 &= \text{Central}(C.I) - \text{Central}(C.III.3.2) - \text{Central}(C.IV.7.1.1) - \text{Central}(C.V.8.1) \\
 &\quad + \text{St}(C.I) - \text{St}(C.III.3.2) - \text{St}(C.IV.7.1.1) - \text{St}(C.V.8.1) \\
 &\quad + L(C.I) - L(C.III.3.2) - L(C.IV.7.1.1) - L(C.V.8.1)
 \end{aligned}$$

The  $C.I$ ,  $C.III.3.2$ , and so on refer to different items of Table C of GFS.  $St$  and  $L$  stand for state/provincial and local government, respectively. We compared the measures for 1975 and 1985 with the one calculated

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<sup>25</sup>General government expenditures are a consolidated sum of expenditures for all the government tiers. Consolidation is important since it prevents double counting of inter-governmental grants and transfers.

<sup>26</sup>The data cover more than 100 countries, however not all of them have information for all the years.

<sup>27</sup>Both Panizza and Oates use this variable. They, however, look at revenue side of government accounts, too. They show that there is a little difference in results using revenue measures.

from the summary tables and the results were indistinguishable.

The second measure is the share of the central government in general government consumption expenditures. It emphasizes current expenditures on goods and services by governments. So, investment, interest payments, and social security expenditures are excluded. It is calculated using item *C.III.1* in Table C for different levels of government for each country.

$$\begin{aligned} me_2 &= \frac{C_2}{G_2} \\ C_2 &= \text{Central } (C.III.1) \\ G_2 &= \text{Central } (C.III.1) + \text{St } (C.III.1) + L(C.III.1) \end{aligned}$$

In a sense, it is the most direct measure that we have and we rely on this measure in our empirical work.

The third measure is the same as the second measure except that capital expenditures are included. So, we use *C.III.1 + C.IV.4-6* as an expenditure measure.

The number of countries with enough information to calculate each measure varies over the years. The first measure can be calculated for more countries than the two other measures, but it also is prone to more error caused by missing values of minor items in the calculation of  $G_1$ . It is available for 62, 53, and 53 countries in 1975, 1985, and 1995, respectively. The second and third measures are available for 39, 47, and 49 countries in those years. The second and third measures are profoundly correlated, with correlation of 0.99 in levels and 0.97 in first differences. The correlation between the first and second measure is also high at about 0.74. However, this correlation drops to 0.22 when we look at the first differences.

**Democracy variable** The democracy variable is from Polity III (ICPSR 6695 data set). It comprises two main indicators: autocracy and democracy, which capture different aspects of political authority and regime type. Polity III covers 177 nations; among them 20 have historical data that go back to 1800. However, we are only interested in data since 1960. Annual indicators of institutional autocracy and democracy are available

for 122, 135, 135, and 151 states in 1965, 1975, 1985, and 1994, respectively. It covers all of the countries in our database with available federalism or centralization measures. Each indicator is a value from 0 to 10. The value of each indicator for a country is the sum of the score of that country in the following five categories: (1) Competitiveness of Political Participation, (2) Regulation of Political Participation, (3) Competitiveness of Executive, (4) Openness of Executive Recruitment, (5) Constraints on Chief Executive. Most of the literature relies on a single measure of democracy, which is defined as  $OVERALL\ DEMOC = DEMOC - AUTOC$ , as a reasonable measure of overall democracy. We construct and use a five year average of the annual data, e.g. the value use for 1985 is an average of 1981-1985 values. The correlation between the overall measure and the institutional democracy indicator is as high as 0.98 for our five years average in our sample. For more information we refer the reader to Jagers and Gurr (1996), which includes a detailed description of data and its code book, and to Jagers and Gurr (1995), which defines components of the Polity III indicators and provides a detailed descriptive analysis of them and their trends.

**Federalism variable** The federalism variable is constructed based on an assignment of fiscal, political, and administrative responsibilities of subnational governments. It is calculated for 49 countries with population above 10 million in 1990 at five year intervals from 1960 to 1995. However, we use only 48 countries since the measure for Peru only exists for 1990 and 1995. It includes six aspects of federalism: (1) official federal versus unitary government structure, (2) election of a regional executive, (3) election of a local executive, (4) ability of the center to suspend lower levels of government or to override their decisions, (5) no, limited, or full revenue raising authority of lower levels governments, and (6) revenue sharing. Items (1) - (4) take a value of other 0 on 4; items (5) and (6) take values of 0, 2, or 4. Five has a zero if neither state nor local governments have revenue raising authority, a two if one or the other does, and a four if both do. Six has a value four if both lower levels of government regularly and unconditionally receive a share of national revenues, a two if only one level receives such monies or if one or both have no discretion over how monies are spent, and a zero if neither receive monies or neither have discretion over how transfers are spent. The federalism index

is a simple average of the scores. Comparing the components of the federalism and democracy measures indicates that there must be some degree of interdependence between the variables by construction. As we mentioned in the introduction, the correlation is 0.63 and the correlation between the first differences is 0.39. There is some problem with truncation specially at 0 (lower bound). Out of 48 countries, 5 countries stay at zero for the whole time period. And 19 countries (including the one at 0) do not change their level of federalism during 1960-1995 period. The countries tend to stay at same level for long time. There is no change in the level of federalism over 5 year intervals for about 81 percent of the sample. The data were constructed by Christine Kearney under supervision of Vernon Henderson in 1999. The data are available on request.

**Regional Democracy.** This variable indicates whether the state/provincial government is elected or not. For the 49 countries, it is the second component of the federalism variable. For 30 other countries for 1975, 1985, and 1995, we also collected data on this one component, using the Europa World Year Book, 2001, The Stateman's Yearbook 2002, Freedom in the World 1978 by R. Gastil, and Freedom in the World 1995-96 from Freedom House.



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**Table 1. Share of Central Government in Total Current Government Consumption**

	Random Effects				
	(1)	(2)	(3) (full)	(4) (Tobit)	(5)
ln(GDP per capita)	-.107** (.0245)	-.148** (.0257)	-.143** (.0224)	-.136** (.0155)	-.114** (.0259)
ln(total population)	-.0108 (.0252)	-.116** (.0355)	-.104** (.0320)	-.0717** (.0164)	-.112** (.0349)
ln(land area)	-.0300* (.0178)	-.0348** (.0178)	-.0304** (.0170)	-.0287** (.00802)	-.0247 (.0178)
primacy	.400** (.167)	n.a.	n.a.	n.a.	n.a.
ln(pop. of largest metro area)	n.a.	.115** (.0426)	.0992** (.0260)	.0623** (.0225)	.119** (.0410)
Muslim percentage	.00398** (.00146)	.00432** (.00145)	.00339** (.000705)	.00489** (.000444)	.00361** (.000146)
state election or not	n.a.	n.a.	n.a.	n.a.	-.130** (.0314)
year dummies	yes	yes	yes	yes	yes
N [countries]	101 [46]	101 [46]	113 [52]	113 [52]	101 [46]
R <sup>2</sup>	.536	.563	.636	n.a.	.582

Means [and s.d. of variables] are respectively starting with dependent variable, ln(GDP per capita), and ending with democracy 0.61 [0.23], 8.7 [0.90], 9.8 [1.4], 12.9 [1.72], 0.27 [0.15], 7.8 [1.0], 4.7 [15.9], and 5.9 [6.2].

\*, \*\* significant at 10 and 5% levels, respectively.



**Table 2. Share of Central Government in Total Current  
Government Consumption**

	IV Estimation <sup>1</sup>				
	(1)	(2)	(3)	(4)	(5)
			GMM (full)	2SLS	GMM
ln(GDP per capita)	-.132** (.0275)	-.199** (.0247)	-.193** (.0238)	-.190** (.0214)	-.230** (.00660)
ln(total population)	-.00878 (.0322)	-.145** (.0379)	-.121** (.0390)	-.128** (.0271)	-.153** (.0547)
ln(land area)	-.0391* (.0148)	-.0580** (.0142)	-.0534** (.0144)	-.0511** (.0128)	-.0595** (.0172)
primacy	.592** (.259)	n.a.	n.a.	n.a.	n.a.
ln(pop. of largest metro area)	n.a.	.179** (.0538)	.152** (.0537)	.155** (.0369)	.184 (.117)
Muslim percentage	.00379** (.00531)	.00415** (.000474)	.00250** (.000889)	.00414** (.00107)	.00446** (.00197)
state election or not	n.a.	n.a.	n.a.	n.a.	.0650 (.302)
year dummies	yes	yes	yes	yes	yes
N [countries]	94 [42]	94 [42]	102 [45]	94 [42]	94 [42]
R <sup>2</sup>	n.a.	n.a.	n.a.	.552	n.a.
Sargan p-value	.171	.246	.184	n.a.	.204

Means [and s.d. of variables] are respectively starting with dependent variable, ln(GDP per capita), and ending with democracy 0.61 [0.23], 8.7 [0.90], 9.8 [1.4], 12.9 [1.72], 0.27 [0.15], 7.8 [1.0], 4.7 [15.9], and 5.9 [6.2].

\*, \*\* significant at 10 and 5% levels, respectively.

<sup>1</sup>Instruments are 1965 values of ln(GDP per capita), ln(population), ln(land), primacy or ln(pop of largest metro area), investment, life expectancy, average years of high school for women, latitude, and Muslim.

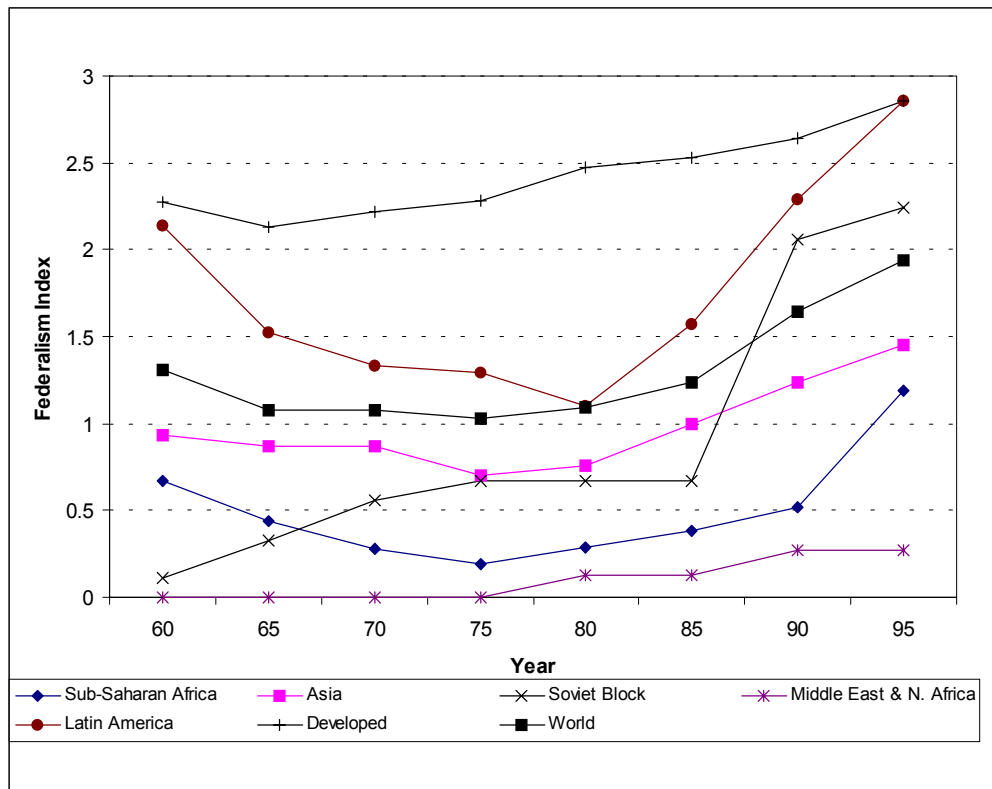
**Table 3. Federalism Index**

	Random Effects	IV Estimation
	(1)	(2) GMM
ln(GDP per capita)	.565** (.125)	.964** (.134)
ln(total population)	.136 (.174)	.345 (.219)
ln(land area)	.150 (.094)	.224** (.0842)
ln(pop. of largest metro area)	-.0324 (.188)	-.228 (.267)
Muslim dummy	-.00928** (.00354)	-.00988** (.00350)
democracy index	n.a.	n.a.
year dummies	yes	yes
N [countries]	170 [46]	121 [43]
R <sup>2</sup>	.532	n.a.
Sargan <i>p</i> -value	n.a.	.278

The mean and standard deviation of fed6 are 1.44 and 1.32.

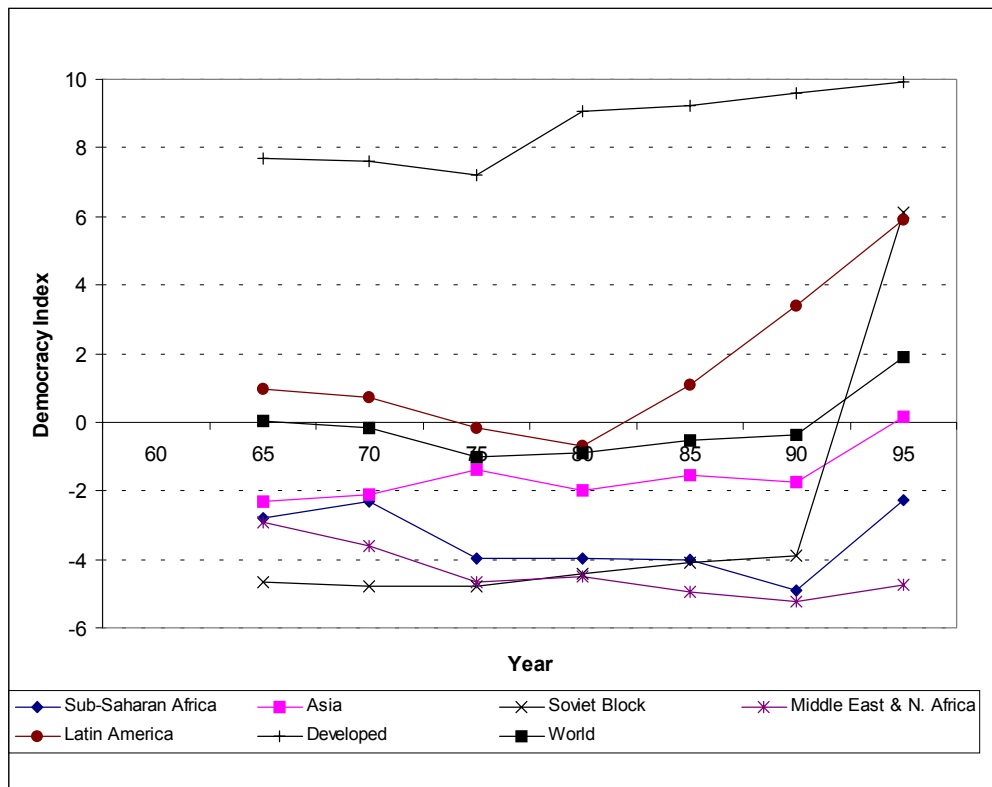
\*, \*\* significant at 90 and 95% level, respectively.

Federalism pattern around the world, 1960-95.





Democracy pattern around the world, 1965-95.



Share of the central government in total government expenditures, 1975-95.

