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Determinants of Local Government
Fragmentation**

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An International Perspective on the Determinants of Local Government Fragmentation¹

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Introduction

Subnational government fragmentation, associated with the small size of jurisdictions to take advantage of economies of scale in service delivery, is a commonly perceived problem in many decentralized systems around the globe. Subnational government fragmentation typically takes the form of an excessive number of subnational jurisdictions at any level of government, most often at the local or municipal level. But fragmentation may also have other manifestations, including in particular the number of tiers or levels of subnational governments.

As is to be expected, however, the degree of jurisdictional fragmentation varies widely from country to country and through different regions of the world. In order to examine the extent and determinants of jurisdictional fragmentation in this paper, we will use the most recent available, information for a sample of 197 countries. The analysis of the raw data shows considerable diversity in terms of jurisdictional fragmentation. In terms of the number of tiers of government (in addition to the central government tier), as shown in Figure 1, in our sample 10 countries report having four tiers of governments, while 50 countries report three. On the other hand, more than 50 percent of the countries in our sample have only two levels of government, including countries vastly different in terms of population, ethnic composition, etc.

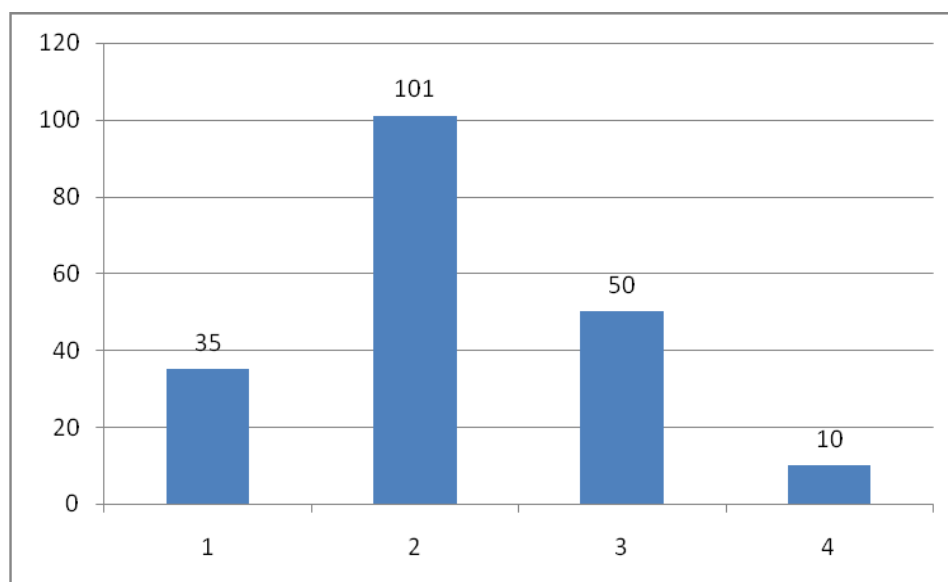


Figure 1. Sub-national Government tiers per country.

Equally, the absolute number of subnational jurisdictions per country ranges widely in the sample, from a minimum of 0 in tiny island nation of Kiribati (only a central level government) to a maximum of over 240,000 in India (including the Gram panchayat or village level of government). The median value of the number of subnational jurisdictions is situated at 194. Figure 2 offers information on the distribution of the sample in terms of the absolute number of jurisdictions per country. A total of 42 countries in our sample report more than one thousand subnational jurisdictions including all subnational tiers of government. A similar number of countries (51) report less than 50 jurisdictions in total.

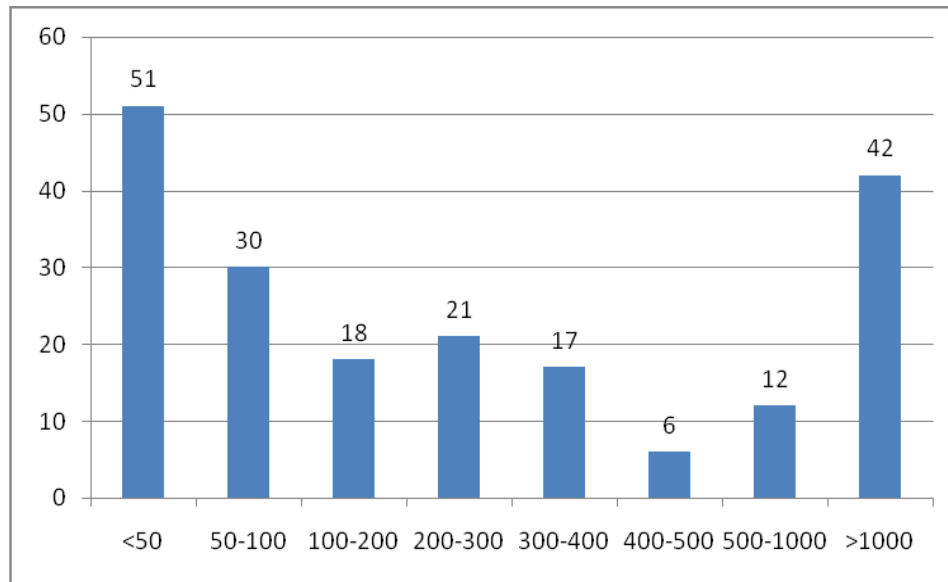


Figure 2. Number of subnational jurisdictions per country.

As is suggested by the simple correlations presented in Table 1, the total number of jurisdictions is strongly correlated with the country's population, but, and a bit surprising, only weakly so with the geographical area of the entire country. As a rough initial approximation to what other factors may play a role in determining the number of subnational jurisdictions per country, in Table 1 we also show the simple correlation coefficients of the absolute number of subnational jurisdictions with GDP per capita, the Gini measures of income inequality, and the human development index. None of these variables appears to be correlated with the number of subnational jurisdictions across countries.

Table 1. Correlations: Number of jurisdictions and selected sample variables.

| | Number Jurisdictions | Population | Area | Gini Coefficient | GDP pc | HDI |
|--|---------------------------------|-------------------|-------------|-----------------------------|---------------|------------|
| Number of Jurisdictions | 1 | | | | | |
| Population | 0.74 | 1 | | | | |
| Area | 0.25 | 0.44 | 1 | | | |
| Gini | -0.04 | 0.02 | 0.09 | 1 | | |
| GDP pc | -0.02 | -0.06 | 0.08 | -0.48 | 1 | |
| Human Development Index | -0.01 | -0.03 | 0.09 | -0.41 | 0.76 | 1 |

The issue of jurisdictional fragmentation is one of considerable current policy relevance. The problem of suboptimal scale, real or perceived, continues to lead to significant policy actions in many countries around the world in terms of forced amalgamation programs or simply to the elimination of a variety of subnational governments, as witnessed by the very recent decisions taken by the governments of Greece and Italy in a drive to reduce public sector deficits. These programs of jurisdictional consolidation across the world could be questioned considering the limited (and service-specific) evidence on economies of scale on local service delivery available from the empirical literature (Gomez-Reino and Martinez-Vazquez, 2011). Forced consolidation programs appear to have yielded mixed results in terms of cost savings (Dollery and Robotti, 2009; Dowding & Mergoupis, 2003).² The international experience seems to show that many other countries around the world, often times facing stiff political difficulties,³ are opting instead for adapting to high levels of jurisdictional fragmentation while encouraging the creation of new institutional modes for service delivery (e.g. special districts, inter-municipal cooperation, etc.)

² Experiences in some countries (e.g., Canada) show that total government costs after consolidation may actually have increased, at least in the short term (Sancton, 2008; Deller, 1998). Several reasons are behind those results: difficulties in retrenching public servants due to labor agreements or salaries that are brought up (or equalized) to the higher level observed pre-merger,

³ Political opposition and institutional friction may help explain why voluntary merger programs in countries like Peru and Spain have failed to produce substantial results (Herrero et al. 2009, and Bosch and Suarez-Pandiello, 2008).

The main questions addressed in this paper are the identification of the main determinants of jurisdictional fragmentation as presently observed across countries and how well those findings line up with the predictions of the expanded standard model of optimal jurisdiction size. To our knowledge, to date, there does not exist a rigorous study analyzing the cross-country determinants of fragmentation in the way this issue has been previously analyzed for some particular countries.

At the outset, country fixed effects can be expected to loom large and powerful. Each country with its own history conditioned by a myriad of details, including colonial legacies, geography or ethnic and linguistic fragmentation, are likely to have contributed to heterogeneous levels of fragmentation. These factors could all be summarized in what is often termed the long shadow or the “dead hand” of history. Indeed, some countries may still have the same vertical structure of government that they had many decades ago. But there are also many countries that have changed their governmental structures over the years. So in this paper we would like to find out what may the common determinants that have led to those changes, and also perhaps to help us better understand if those common determinants can also be used to explain why other countries have changed so little.

The rest of this paper is organized as follows. In section 2 we offer a simple extension of the conventional model for optimal jurisdiction size. In section 3 we review the literature on government fragmentation and its impact. In section 4 we outline the empirical model proposed for the analysis of jurisdictional fragmentation. In section 5 we present the results from our estimations. We conclude in section 6.

A simple model of optimal jurisdiction size

The standard economic model by Oates (1972) defines the problem of optimal jurisdictional size in the provision of services as consisting of two main tradeoffs. First, the tradeoff exists between the welfare gains expected from smaller governments (better placed to match expenditure allocation to local preferences) and economies of scale (or associated lower average costs) expected from the delivery of services at larger jurisdictional sizes. On that basis, optimal size and therefore equilibrium in the number of jurisdictions would be reached when the

difference between the marginal welfare gains from more efficient provision and the marginal costs derived from foregone economies of scale is maximized. The second critical tradeoff determining optimal jurisdictional size is that between the closer accountability offered by smaller governments to their citizens and the higher management, administrative, and information costs associated with multiple jurisdictions for service delivery.

In the mathematical appendix to his seminal work on fiscal decentralization, Oates (1972) derives the equilibrium quantity that minimizes the welfare loss incurred from providing a common level of production (as opposed to that preferred by single individuals) *for a given group* of people. Therefore, his solution does not incorporate economies of scale or the role of accountability. In this section, we provide an extension of Oates' (1972) basic model using Buchanan's (1965) formulation of a theory of clubs and Alesina and Spolaore's (2003) uni-dimensional linear model where losses of welfare are measured as the distance between the individual's preferred consumption level of the public good G and the level provided as a result of the collective decision. Otherwise we maintain the customary assumptions of a constant and immobile population, zero transaction costs for collective decision-making and that the financing of the public good provision is efficiency-neutral (i.e. lump sum taxation).

We assume that individuals have a quasi-linear utility function of the form:

$$U_i = y_i + F_i(DG_i),$$

where DG_i is equal to the difference, in absolute value, between the level of public good provided and the level that would maximize individual welfare, for each individual. Following Oates' original formulation, the sum of the differences between the level of public good provided and that which would maximize the individuals' utility is likely to increase with the size of the jurisdiction (measured in population terms), and so,

$$DG_i = DG(G(N), G_i^*).$$

Thus, the larger the difference between the level of public good provided and the individual's equilibrium quantity (G_i^* , signaling the heterogeneous preferences), the larger the loss in welfare, and the larger the amount by which overall individual utility would be reduced. Additionally, such distance to the individual optimum will be a function of the size of the jurisdiction in population terms N , as the level of G is a collective decision that will vary with population size. For simplicity, we assume that the utility decreases in an increasing way from larger distances

from the individual's optimal level of G , and that equal distances to the individual optimum, be G above or below G^* , translate into identical losses in welfare:

$$\partial U_i / \partial DG_i < 0, \text{ and } \partial^2 U_i / \partial DG_i^2 > 0$$

$$\partial U_i / \partial DG_1 = \partial U_i / \partial DG_2, \text{ for each } DG_1 = G_i^* + \zeta, \text{ and } DG_2 = G_i^* - \zeta,$$

We define t (the tax price paid for the public good) as equal to the average cost of provision, or total cost (C) of production divided by the size of the population served. In turn, the total cost is defined as a function of the quantity produced:

$$t = C/N; \text{ where } C=C(G)$$

As the size of the jurisdiction (N) increases, the average cost of provision of the public good (G) decreases, improving the individual's welfare level. The individual's utility from lower taxes (or average production costs), increases however in a decreasing way, represented by the positive value of the second derivative.

$$\partial U_i / \partial t < 0, \text{ and } \partial^2 U_i / \partial t^2 > 0$$

An additional member to the jurisdiction adds another person to the collective decision-making mechanism for the determination of G . Thus the sum of the distances between individual preferences of G (G_i^*) and the effective level finally provided increases, decreasing overall utility:

$\Sigma \partial U_i / \partial N < 0$. The budget restriction of the individual is:

$$M_i = y_i + t$$

Thus the individual's income (assumed exogenously determined) is spent on consumption of the private good y and the public good G for which he pays a price equal to t . From the individual maximization problem we obtain the individual's most preferred level of public good provision (G_i^*), which is the level of public good that would maximize the individual's utility given a set of prices.

Lastly, the transformation function for the economy is of the form

$$F(G, y, N) = 0,$$

meaning that the production cost depends on the quantity produced and on the quantity of private good required that has to be surrendered for its production. We further assume that the production cost for the public good presents economies of scale up to a certain range, after which it exhibits decreasing returns to scale later, thus giving us a U-shaped cost function. This assumption is later on relaxed and its implications explored further.

The individual faces the following maximization problem:

$$\begin{aligned} \text{Max } [y_i + U_i(DG_i(G(N), G^*_i))] \\ \text{s.t. } M_i = y_i + t \end{aligned}$$

By assuming a quasi-linear utility function, social welfare changes are equal to the summation of changes in welfare of all the individuals due to variations in t . Thus, if the government behaves as a benevolent planner, it will try to maximize social welfare, defined as the sum of all individual utilities (again assuming the quasi-linear form of the utility functions), solving for the optimal size of the group for service provision.

Thus we have a social welfare function (SW):

$$SW = \sum U_i = \sum y_i + \sum U_i(DG_i(G(N), G^*_i))$$

With the constraint for the entire economy given by the transformation function:

$$F(G, y, N) = 0$$

The optimal jurisdictional size can now be found from maximizing:

$$\mathcal{L} = \sum y_i + \sum \{U_i(DG_i(G(N), G^*_i))\} - \lambda F(G, y, N)$$

with the first order conditions (FOC):

$$\partial \mathcal{L} / \partial y_i = 1 - \lambda (\partial F / \partial y_i) = 0$$

$$\partial \mathcal{L} / \partial G = \sum \{(\partial U_i / \partial DG_i) * (\partial DG_i / \partial G)\} - \lambda (\partial F / \partial G) = 0$$

$$\partial \mathcal{L} / \partial N = \sum \{(\partial U_i / \partial DG_i) * (\partial DG_i / \partial G) * (\partial G / \partial N)\} - \lambda (\partial F / \partial N) = 0$$

From which we obtain

$$\Sigma (\partial U_i / \partial DG) * (\partial DG / \partial G) = (\partial F / \partial G) / (\partial F / \partial y_i)$$

This says that the sum of the marginal rates of substitution between the public good (G) and the private good (Y) equals the marginal rate of transformation between the public and the private good:

$$\Sigma MRS_{G,y}^i = MRT_{G,y}$$

which is the well-known Samuelson condition, also reached in Buchanan's (1965) theory of clubs.

The optimal size of N can also be obtained from the FOC as:

$$\Sigma \{ (\partial U_i / \partial DG_i) * (\partial DG_i / \partial G) * (\partial G / \partial N) \} = (\partial F / \partial N) / \Sigma (\partial F / \partial y_i)$$

also known as the "membership condition" in Buchanan's (1965) theory of clubs.

We can re-write the equilibrium condition as:

$$\Sigma MRS_{N,y}^i = MRT_{N,y}$$

where the RHS of is the change in the average cost of provision from adding additional individual to the population sharing the cost of provision. So we have that

$$MRT_{N,y} = \partial(C/N) / \partial N = -C/N^2$$

The optimal N^* is given by:

$$N^* = \sqrt{(-C / (\Sigma MRS_{N,y}^i))}$$

Thus, the optimal size of the jurisdiction is positively related to the size of the economies of scale and negatively related to the welfare costs derived from heterogeneous preferences.

This model can now be easily expanded to take into account preferences for political representation/accountability, which, although not considered either in Oates (1972) model, have the potential to significantly affect optimal jurisdiction size. Arguably, as population increases (i.e. jurisdictional size), the relative power of the individual to influence government decisions (i.e. political accountability) is diluted (Seabright, 1996; Tommasi and Weinschelbaum, 1999). Additionally, in the absence of a decentralized system of government, local political representatives may simply be central government appointees with vertical accountability to their

superiors but no horizontal accountability to the jurisdiction's residents. But even if political representatives are elected locally, they may be transfer-dependent and not enjoy sufficient fiscal autonomy to significantly determine expenditure and revenue patterns in their local governments. Higher accountability of local officials may also be increased by their physical proximity to the citizens (Ostrom, Schroeder, and Wynne, 1993) and by citizens' ability to compare government's performance against other local governments engaging in yardstick competition (Besley and Coate, 1995).

We can model accountability by introducing a new variable for political accountability (P), affecting the way preferences are reflected into a government's level of provision of the public good G . In particular we now define:

$DG = DG(G(N), G^*_i, P)$, whereby
and $(\partial DG / \partial P) < 0$

So the new representative individual's utility function would be:

$U_i = y_i + U_i(DG(G(N), G^*_i, P))$, and as described:

Note that P is defined as $P = P(N, D, FA, CP)$, where D represents the existence of a decentralized government with locally elected representatives, FA reflects the degree of fiscal autonomy, and CP is a measure of citizen representation in government decision-making (i.e. such as the existence of participatory budgeting systems, etc.). Since an increase in jurisdictional size is related to lower individual capacity to influence the decisions of the politicians, we have $(\partial P / \partial N) < 0$.

The maximization problem faced by the benevolent planner of the jurisdiction now becomes:

$$\text{Max } \mathcal{L} = Y + \sum U_i [DG(G(N), G^*_i, P(N))] - \lambda(F(G, Y, N))$$

And as before we can obtain the Samuelson condition from the FOC

$$\sum \text{MRS}^i_{G,Y} = \text{MRT}^i_{G,Y}$$

and Buchanan's "membership condition" as

$$\sum \text{MRS}^{iP}_{N,y} = \text{MRT}_{N,y}$$

where the superscript P denotes the marginal rate of substitution once political accountability is included in the individual utility function.

By definition, as $(\partial U_i / \partial P) > 0$ and $(\partial P / \partial N) < 0$, then $(\partial U_i / \partial P) * (\partial P / \partial N) < 0$.

As $\Sigma\{(\partial U_i / \partial DG) * (\partial DG / \partial G) * (\partial G / \partial N)$ is, by definition, negative (loss in social welfare from the addition of one more member to the jurisdiction), with the addition of $(\partial U_i / \partial P) * (\partial P / \partial N)$ we conclude that

$$/\Sigma MRS_{N,y}^{iP} / > / \Sigma MRS_{N,y}^i /$$

The absolute value of the loss in social welfare from one additional member to the jurisdiction is greater once we include a preference for political accountability in the individual's welfare function. Not only does utility decrease due to the addition of a new consumer's welfare loss in the form of $G - G^*_i$, but now citizens also lose individual capacity to influence the decision over G .

Finally, solving for the optimal N , we obtain:

$$N_p^* = \sqrt{(-C / \Sigma MRS_{N,y}^{iP})}$$

From the above we can conclude that $N_p^* < N^*$. That is, the optimal jurisdictional size for the provision of the public good is smaller once we introduce preferences for political accountability in the individual's utility function.

In summary the creation of a new level of government would be theoretically justified if overall welfare is improved (considering losses from economies of scale, gains from tailoring preferences to citizens, and preferences for political accountability) by assigning the provision of public goods and services from the central (or other subnational) level of government to a new jurisdiction.

A review of the literature on government fragmentation and its implications

Although this paper is about the determinants of jurisdictional fragmentation as opposed to the impact of fragmentation, it is important to briefly note this latter issue. In reality, the level of government fragmentation has potential important implications for an array of issues. So we start this review section by looking at some of those issues. Next, we review how in reality

fragmentation has been measured in the literature. Third and last, we review what is known so far on the determinants of jurisdictional fragmentation.

On the impact of jurisdictional fragmentation

From a theoretical angle, public choice scholars have associated subnational government competition, supposedly enhanced by jurisdictional fragmentation, with the containment of bureaucracy and a Leviathan public sector. Greater competition in this view leads to an overall more efficient government with essentially leaner budgets (Niskanen, 1975; Brennan & Buchanan, 1980). The theoretical foundations for the potential benefits to be derived from subnational government fragmentation can be traced back to Tiebout's (1956) seminal proposition that citizens “vote with their feet” and choose the mix of services and taxes that best represent their preferences. Assuming adequate supply of local governments (which assumes away the problem of fragmentation but it implies it), a Tiebout equilibrium is reached when each citizen maximizes the welfare obtained from the mix of goods and services provided by the local government, net of tax payments. Thus, a sufficient number of governments offering distinguishable tax and expenditure packages would be required for this efficient sorting of individuals. From this point of view, a certain level of fragmentation would be efficiency-enhancing, since a diversity of preferences requires a diversity of government service packages.

Empirical evidence on this issue is mixed. Some early papers, for example Sjoquist (1982), find that expenditures per capita in metropolitan regions of the USA decrease as the number of jurisdictions increases. More recently, Feld, Kirchgässner, & Schaltegger (2003) find no evidence that fragmentation affects the size (in terms of expenditure budgets) of Swiss cantons. Earlier contributions of the literature have tended to suggest that augmenting the number of governments may lead to increases in the overall size of the public sector. This is likely to occur especially if economies of scale in public administration are foregone with greater decentralization (Oates, 1991), or if citizens' control over local bureaucracies translates into a wider range of services being provided (Zax, 1989). Among other reasons, this “larger public sector” result has been justified under the assumption of a lower quality of bureaucrats at the local government level, leading to poorer expenditure management and higher costs for services (Prud'homme, 1995). Another aspect affecting overall expenditures is public employment. In a recent cross-country study, Martinez-Vazquez & Yao (2009) find that total public sector

employment grows with fiscal decentralization, as increases in employment at the sub-national level more than offset declines at the central government level. In practice, recent government policy measures across the world have been inspired by the belief that higher jurisdictional fragmentation leads to larger expenditures. For example, pressure to reduce government spending seemed to be behind recent drives for municipal amalgamation in Canada (Sancton, 2008). Similarly, the recent drives toward the elimination/forced amalgamation of local government in the Euro zone in countries such as Greece and Italy have been based on the same beliefs that subnational government fragmentation is associated with larger expenditures.

From an equity point of view, higher fragmentation has been suggested to lead to the separation of tax bases among rich and poor. Richer areas (such as suburban residential areas) have a clear incentive to separate from impoverished urban areas that are subsidized with the revenues collected from their tax bases. The end result of such motivated fragmentation may be higher inequalities in the provision of services. A highly fragmented local government level may also lead to more self-centered governments in term of policy issues; reducing the incentives for coordination among jurisdictions to maximize overall welfare levels (Lewis, 1998). Earlier contributions seem to show, however, that higher income voters may be supportive of redistributive programs if they expect to obtain long term utility gains, such as overall increases in property values in the jurisdiction (Martinez-Vazquez, 1981).

The literature is fairly rich in contributions exploring the effect of fragmentation on economic growth and urban sprawl. For example, Nelson & Foster (1999) argue that in the framework of metropolitan areas in the US, as decision making becomes more fragmented (more local governments are present), growth in personal income declines. This is related to the fact that annexation of suburban areas is largely behind the increase in income growth of metropolitan areas, which are favored by their consolidation with affluent suburbs. Measures of sprawl used in the literature, very concentrated in the U.S. experience on the other hand, include population density (as an indication of low-density development), the percentage of dwellings in single-unit detached houses, or housing units per square kilometer. In one of the few studies that analyzes the plausible reverse causation between fragmentation and urban sprawl, Razin & Rosentraub (2000) conclude that residential sprawl impacts positively on fragmentation, but fragmentation does not have a predictable effect on sprawl. Stansel (2005) finds a direct

relationship between the number of local governments in the US relative to population, and the level of economic growth. If greater fragmentation is related to greater decentralization, this finding is related to a larger literature on decentralization and growth.⁴

On the measurement of jurisdictional fragmentation

The concept of jurisdictional fragmentation is not easily made operational. The literature has favored overall a measure of the number of local governments relative to the size, either in terms of land area or in terms of population (Nelson, 1990). However, the range of overlapping authorities over the same territory (as ultimately, the institutional form chosen to deliver public services may take several forms) adds an extra complication to the estimation of government fragmentation levels. Optimal government size, as Ostrom, Tiebout, & Warren (1999) argued, may depend on the nature of the public good provided and not just on the preferences of local consumers, leading to “polycentrism”, or a system of multiple collective decision-making mechanisms. Socio-spatial studies have termed this process “state rescaling”, a redefinition of the role of government at all levels, including the involvement of non-governmental agencies in public service delivery, the allocation of further competencies through decentralization to subnational levels of government, and the assumption of former national competencies by supra-national institutions. In line with this argument, Martinez-Vazquez & Timofeev (2008) find that the trend towards decentralization observed over the last decades has not affected, on average, the size of government, and offer empirical evidence of significant and positive relationships between globalization, decentralization and government size.

On the determinants of jurisdictional fragmentation

Generally, there is a shortage of contributions exploring the determinants of the observed high fragmentation of local governments across the world. Most of this evidence comes from studies for the U.S. with some experiences also from Canada and Australia. In what follows we review that evidence categorized by type of determinant.

⁴ However, the theoretical linkages between economic growth and the decentralization of expenditure still await more conclusive empirical evidence (see Martinez-Vazquez & McNab, 2003).

Do heterogeneous local preferences lead to greater fragmentation? As briefly discussed in the introduction, Oates' (1972) seminal contribution proposed a fundamental trade-off in the determination of government jurisdiction size between the efficiency gains attained from tailoring local public good provision to local preferences, which is likely enhanced by government fragmentation, and economies of scale in service delivery, which is largely hurt by government fragmentation. We examine first what the empirical evidence is that heterogeneous preferences are actually behind the observed fragmentation of local governments.

The measurement of preferences has traditionally been more difficult than the measurement of costs. However, there have been some successes in the attempt to make operational the heterogeneity of preferences in the economic literature. In his seminal contribution to the study of the determinants of government fragmentation in the U.S.A., Nelson (1990) shows that the number of jurisdictions is positively correlated with the degree of heterogeneity of individual preferences, measured by income dispersion and age dispersion (i.e. more income and age dispersion leads to a higher number of governments).⁵ This finding aligns well with Oates' (1972) decentralization postulates. Nelson's analysis uses all types of governments from the U.S. Census, including both elected general purpose governments (counties, cities, municipalities, etc) and special districts. He finds that the correlation between heterogeneity and fragmentation is stronger in the case of special districts than for general purpose governments. Since, in general, special districts are easier to create and modify, the findings lend support to the argument that heterogeneity of local preferences leads to smaller jurisdictions.

In a somewhat related fashion, using a sample of Californian cities, Musso (2001) finds that more affluent communities (with income as a proxy for diverse preferences) in fast-growing counties are more likely to form new cities. Conversely, Burns (1994) argues that changes in the level of access and quality of local services do not explain local government formation, but instead tax avoidance and racial exclusion are found to be the most significant determinants. In line with Burns' findings, Martinez-Vazquez, Rider, & Walker (1997) find that increasing racial heterogeneity of a state population increases the number of school districts, supposedly in order to satisfy their preference for disassociation.

⁵ Contrary to his expectations, Nelson also finds that greater racial homogeneity (assumed to be a reflection of lower preference heterogeneity) leads to higher fragmentation, a surprising result.

A related line of work has linked heterogeneity in preferences to further decentralization, which, of course, does not necessarily mean further fragmentation. Shelton (2007), using data from a wide sample of countries, finds that heterogeneity in preferences (measured by an index of ethno-linguistic fractionalization) leads to further decentralization, measured as the share of local government expenditure in total government size. Decentralization is greater, Shelton shows, in the education and health sector, where one is more likely to find higher diversity of preferences due to social and demographic factors.

Do economies of scale in service delivery lead to less fragmentation? The evidence of the presence of economies of scale in the delivery of certain public services is solid and largely non-controversial, although not always well understood in political and even policy circles. In a recent meta-analysis study involving the evidence collected in many previous studies, Gomez-Reino and Martinez-Vazquez (2011) conclude that education, urban transportation, garbage collection and water and sanitation, in that order, are the services that display the largest potential for economies of scale. Although the theoretical case that the presence of economies of scale should lead to less fragmentation is a solid one, the available empirical evidence on this link is quite scarce. Nevertheless the real, or otherwise perceived, presence of substantial economies of scale has led to important policy decisions involving the forced amalgamation of local governments in a large number of countries, many of them in Europe. These policies by themselves offer some sort of an exogenous link between economies of scale and jurisdictional fragmentation. However, analytical evidence on this link between economies of scale and fragmentation is very scarce or non-existent. This, we believe, is due to the difficulties of measuring economies of scale in a sample of countries, which may be the best setting to explore the importance of this phenomenon versus other forces as determinants of fragmentation. The difficulties of measuring economies of scale consistently across countries are addressed below in the discussion of our empirical model.

Economies of scope and demands for local accountability. A second major trade-off critical in the definition of the optimal jurisdictional size is that between administrative costs and local government accountability.⁶ If economies of scope are present, the joint delivery, for example,

⁶ It is argued that local government production functions present economies of scope, that is, that the output from the joint production of local public goods or services is greater than the output obtained with two separate processes, using the same amount of input (Panzar & Willig, 1977).

of solid waste collection and water services by a supra-local level of government offers cost savings over their separate provision by two or more local governments. This consolidation of services would reduce fragmentation but it may also decrease accountability of governments to citizens. Evidence of economies of scope exists, especially for private sector production, but it is scant with reference to local government production processes. Sharing production inputs was shown to be a source of scope economies in the health care services sector (Grosskopf, Margaritis, & Valdmanis, 1995; Dollery & Fleming, 2006). Equally, Callan & Thomas (2001), in their estimation of a multi-product cost function for municipal waste services, find evidence of significant cost savings from the joint provision of recycling and disposal services; whereas Wolff (2004) argues that substantial economies of scope are found in the integrated management of River Basin systems in the US, as opposed to functional specialization. Although scarce, this empirical evidence extends across very different local government services, providing some ground to expect lower fragmentation of government due to the cost savings offered by joint production.

Can demand for greater political accountability lead to higher fragmentation? Several dimensions of the concept of political accountability need to be distinguished. We may define political accountability as the voter's capacity to influence the election (and actions) of their local representatives (Seabright, 1996). Such ability is expected to affect the political responsiveness to local preferences in the mix of public goods and services provided. This responsiveness is largely dependent on fiscal authority aspects such as whether powers to spend and tax have been devolved to subnational governments. It also depends on whether elections are being held at the subnational tiers of government and on the quality of the election systems. Thus, for heterogeneous preferences to lead to distinguishable mixes of public goods provided across jurisdictions, certain institutional foundations must be in place linking citizens with policy makers.

The expected greater responsiveness of representatives from smaller—more fragmented—jurisdictions to the preferences of their constituents is not an aspect explored by Oates in the theory of optimal jurisdictional size. His model is anchored in a “direct democracy system”, whereby local citizens “vote” effectively on the level of public good to be provided.

If representative democracy models are the setting for public good provision, then the principal-agent aspects of the relationship between constituents and representatives come into play. In this regard, Tommasi & Weinschelbaum (1999) identify four channels through which smaller jurisdictions are able to exert improved control over their political representatives (and thus ensure their priorities are acted upon). First, in line with Olson's (1965) theory of collective action, smaller jurisdictions reduce the incentives to free-riding (which is rendered more visible in smaller groups). Second, the existence of yardstick competition introduces additional benchmarks for political performance not easy to manipulate by local representatives. Linked to this aspect, policy diffusion models (Berry & Berry, 1990) would argue that local experimentation and the diffusion of best practices across jurisdictions may also introduce incentives and benchmarks for government performance. A third channel is the fact that physical proximity to local representatives allows easier access to them (i.e. reduced transaction costs) even when demands are not related to policy changes but simply to quick, expedited action on issues of citizens interest.⁷ In a game theoretic setting, physical proximity increases the probability of interacting in multiple venues, which allows for opportunities for punishment (Tommasi & Weinschelbaum, 1999) and thus introduces incentives for politicians to comply with citizens' demands.⁸ It is important to distinguish among these possible determinants of jurisdictional fragmentation if we attempt to explain the mounting anecdotal evidence of citizens' resistance to jurisdictional consolidation in the presence of nearly identical preferences for public goods and certain potential for economies of scale.

⁷ County formation in several of the U.S. States, for instance, has been particularly determined by this. Historical records from Kentucky and Georgia for instance would show that county boundaries were drawn ensuring no citizen resided more than a day's ride from the county seat. Considering the strong historical inertia of jurisdictional formation, constituents' proximity to local governments may have been the single most important determinant of jurisdictional fragmentation.

⁸ A preference for proximity to institutions governing the management of common services may be behind, for example, the widespread creation of home-owner associations in the U.S. The latter are truly miniature local private governments providing services traditionally under the responsibility of county governments (such as water supply, garbage collection, etc.). Although the creation of such associations is due often to legal requirements to urban site development, they also arise spontaneously and in any case, have expanded enormously over the last 20 years, representing now nearly 20% of the American dwellers. Across the board, the services provided by these associations, and the characteristics of such services do not differ greatly from those previously offered by elected governments, and although differences can be found at the margin.

These aspects may be more important than any perceived gains on the (statistical) importance of individual votes in smaller jurisdictions. Even in small constituencies, the probability that a single vote will be decisive is minute.⁹

Such demand for political accountability may not even translate into greater citizen participation in government, even though proximity to representatives may reduce the cost of collecting information about local policies. Although direct citizen involvement in participatory planning, budgeting or evaluation process may not depend on the level of government analyzed, the use of citizen satisfaction surveys does seem to assist budget development processes (Jordan & Hackbart, 1999; Melkers & Willoughby, 2005), informing governments' decision on new expenditure programs (Riverbank & Kelly, 2006). Along those lines, there seems to be substantial evidence from international surveys that residents show higher levels of satisfaction from the services received from local governments than those received from the central government (CIS, several years, or Dasgupta, Narayan, & Skoufias (2009) for the case of Indonesia).

The literature on performance budgeting provides an alternative avenue to explore how accountable and responsive local governments are to citizens' preferences and whether size affects the level of accountability. By explicitly defining indicators and performance benchmarks in their budgets, governments not only change the technology of accountability, but may offer a critical instrument to evaluate how close government actions are to local preferences. A recent review of the literature by Gomez and Willoughby (2008) shows that the widespread implementation of performance budgeting measures at different levels of government in the US does not seem to have translated into significant changes in inter or intra-sectoral allocation. This may reflect a lack of flexibility in adjusting expenditure patterns to local preferences due to largely committed, politics-driven budgets, or simply that actual budgets may be closer to what is desirable. But, it could also be a reflection of how time-consuming it is for citizens to collect and process government budgetary information and act upon it. In this direction, Melkers and Willoughby (2001) found that in the U.S., budget officials at the state level were more positive

⁹ In light of the small statistical significance of a single vote, a large literature has developed attempting to explain why individuals vote at all (especially considering the cost of voting is not negligible), the so-called "voting paradox". Explanations have included a desire to maintain democracy (Downs, 1957), or even the exercise of a sense of duty (Riker & Ordeshook, 1968). The general conclusion of this literature is that, despite the weight carried by the alternative explanations, the paradox remains largely unresolved (Blais & Young, 1999).

about the impact of results-based budgeting on states' budgetary appropriations if the performance measurement was a requirement of the legislature (and not just of the executive).

Thus far there is no clear evidence that the impact of performance measurement on budget formulation is different—one would expect larger—for lower tiers in the government hierarchy. (Melkers and Willoughby, 2005) These authors find, again for the U.S., that the use of performance measures is more common at the county than at the municipal level. However, they warn that this cannot be taken as an indication that smaller governments are less accountable to their citizens. In fact, the opposite may be possible, that the higher accountability of smaller governments lowers the need for the implementation of performance measures.

Summarizing, the evidence so far on economies of scope is largely concentrated in the area of private sector production processes. At this point there is no solid evidence on a relation between jurisdiction size and budgetary processes, including higher citizen participation.

Equity and fragmentation in local government structure. In the absence of proper fiscal equalization mechanisms, fragmentation of the local government structure may make the delivery of public services less equitable (Warner and Hefetz, 2002). In addition, a commonly shared hypothesis is that fiscal fragmentation may be favored as a strategy to avoid inter-jurisdictional redistribution of local fiscal bases (Ellickson, 1971; Lewis, 1998). On the other hand, government fragmentation may allow for better access of the poor and rural population to services tailored to their needs, thus making the system of government more equitable.

Academic contributions to this debate have focused on the analysis of metropolitan areas and especially on the fiscal comparison between central metropolitan and sub-urban areas, mostly in the U.S. As Razin (2000; p.28) puts it, changes in local government organization “re-shape the rules of the game of local development and influence inter-local disparities”. However, Schneider (1986), in his study of metropolitan disparities in access to services, does not find support for the hypothesis that fragmentation results in higher service inequality; Morgan and Mareschal (1999) do not find either any effect of metropolitan fragmentation on fiscal health.

Fragmentation and institutional, demographic, and geographical issues. Certain institutional aspects that may affect (restrict or encourage) further local government fragmentation have been explored in the empirical literature. Nelson (1990), focusing on the U.S. case, finds that tax and

expenditure limitations (TELs) increase the number of special districts, which may be created as a way to circumvent tax limits imposed upon state and local governments via referendum. However, he does not find evidence that other self-imposed limits to local debt or home rule clauses have any significant impact on fragmentation.¹⁰ However, contrary to Nelson's findings, Bowler and Donovan (2004; p.194) most recently qualified this finding, arguing that, "absent the pressure of ballot initiatives, TELs do not lead (in the U.S.) to an increase in the formation of new local governments". In the same vein, Lewis (1998) argues that the implementation of Proposition 13, which imposed severe limits to the rise of property taxes in California, did not lead to an increase in the level of local government fragmentation in the form of additional special districts.

The impact of the overall size of the public sector on fragmentation has not been fully explored in the literature, in part perhaps due to the endogeneity involved in its testing. On the other hand, the form of financing does appear to have an effect on fragmentation. Kenny and Schmidt (1994) find that state aid to school districts was an important determinant of the great consolidation of school districts observed between 1950 and 1980 in the U.S. A larger role of the state in the financing of local schools reduced the capacity of districts to differentiate the education services provided and to sort themselves on the basis of average income in their jurisdictions.

Outside the main economic arguments, jurisdictional fragmentation may also be affected by a myriad of institutional features such as the form of the state (federal versus unitary), a history of decentralized government or secession of certain regions, cultural and ethnic issues, civil or armed conflicts, and so on. But to date no empirical research has been done on these issues. More recently, and particularly with regard to urban municipal consolidation processes, the desire to compete in a "global city" environment may be affecting metropolitan consolidation processes.¹¹

On the other hand, demographic and geographical variables have traditionally been used as controls in the empirical analysis of local government fragmentation. Metro area population and

¹⁰ Home rule is defined in (Nelson, 1990) as the allocation of significant autonomy to local governments in carrying out local functions.

¹¹ See, for example, the case of Toronto discussed in Sancton (2008).

land area are positively correlated and statistically significant determinants of the number of governments in Nelson (1990), a result partially supported in Bowler and Donovan (2004). The hypothesis behind the inclusion of these variables is that large demographic or geographical areas may be more difficult to manage and thus fragmentation would be efficiency enhancing. Nelson's analysis includes additionally US-specific institutional explanatory variables not necessarily applicable to cross-country analysis.¹²

In summary, as we have reviewed in this section, numerous factors may play a role explaining the level of government fragmentation encountered in a particular country. Our challenge is now to develop an empirical model that allows exploring the relative influence of these explanatory variables, a task approached in the next section.

Hypotheses and Empirical Approach

The prevailing theory on optimal government size implies that the number of jurisdictions is a function of several factors, including importantly, the cost of production of services (and thus the potential for economies of scale), the heterogeneity of preferences, and preferences for political accountability. All other things equal, optimal jurisdictional size is smaller when preferences for political accountability are taken into account. In addition, we have discussed additional determinants of jurisdictional fragmentation, including institutional, geographical and demographic variables.

Generically, we can represent the relationship between optimal jurisdictional size and this set of relevant variables as:

$$N = N(C, U(DG), P, Z) ,$$

where, where N is the jurisdictional size, C represents a measure of economies of scale, $U(DG)$ depicts the level of heterogeneity of preferences, P represents preferences for political accountability and Z is a vector including other institutional, geographic and demographic factors affecting jurisdictional size.

¹² These include whether a referendum or majority approval is required for a territory to be annexed to a city or for the consolidation of two or more jurisdictions.

As discussed in previous sections, the expected sign of the partial derivatives is as follows:

$$\frac{\partial N}{\partial C} > 0, \quad \frac{\partial N}{\partial U} < 0, \quad \text{and} \quad \frac{\partial N}{\partial P} < 0$$

Our first task in the definition of our empirical model is to further clarify our dependent variable. As already noted above, operationalizing the level of government fragmentation is a complex task. The literature has favored absolute measures, such as the total number of governments, over scaling indicators, such as the average population or geographical area by jurisdiction. Conversely, the number of local governments for a certain population size could be used as a relative measure of fragmentation. In his study of U.S. government fragmentation Nelson (1990) uses the number of governments per metro area, while Bowler and Donovan (2004) use the number of governments (again both general and special-purpose governments) in a state at the time of a census. In exploring the effect on fragmentation of Proposition 13 in California (which importantly limited revenue collections from the property tax), Lewis (1998) also uses total number of governments as his variable of interest.

The use of absolute measures of government fragmentation (i.e. total number of governments) may be a reasonable empirical strategy when a certain level of jurisdictional homogeneity can be assumed within the sample, as in country case-studies. Our aim however is to explore these relationships within the context of as large as possible a sample of countries. This therefore requires a relative measure of fragmentation that helps homogenize to the extent possible the individual values of our dependent variable.

First, we should clarify what is understood as “government” or jurisdiction in this context. In short, we include in our estimations all levels of government with service delivery responsibilities and all jurisdictions within each level. The rationale behind this selection is that we are interested in exploring whether heterogeneity of preferences for public services may lead to further fragmentation in order to allow a better matching of preferences with service delivery. Arguably, a country may be divided into a large number of jurisdictions, but in the absence of elected governments with some authority over their budgets, public service delivery may not differ much in that system from a fully centralized service delivery system. The level of discretion or authority over local expenditure and revenue sources is in reality very hard to

measure. In fact, fiscal decentralization experts around the world have identified this as a major obstacle in the analysis of the impact of fiscal decentralization on economic growth, quality of service delivery, and so on. Acknowledging that the level of fiscal autonomy of sub-national government around the world varies widely, it is to be expected that a jurisdiction with a locally elected government will have larger authority over its budget than a similar territorial unit with de-concentrated units of the central government. Accordingly, our analysis will attempt to control for this.

Our estimation strategy is to try different specifications of the dependent variable. First, in line with previous contributions to the literature, we will use the total number of jurisdictions (from elected levels of government) as our dependent variable. In addition, as just discussed, the heterogeneity of jurisdictions and different sizes across the world requires the use of a relative indicator of fragmentation that allows homogenizing the values of our dependent variable. Thus, in the subsequent model specifications we will use as dependent variables the ratios of population and area size to the total number of jurisdictions. To that end, all jurisdictions from elected levels of government (including the central government) are added, and the values of the above mentioned ratios are calculated for each country.

Lastly, we will also include in our estimations the number of levels of government. This is an aspect of jurisdictional fragmentation that has been largely ignored in the literature, and thus we provide a first exploration into this issue.

The difficulties of measuring economies of scale in a sample of countries

In line with the standard model of optimal jurisdictional size, we would expect that the potential for economies of scale to be, other things equal, a deterrent to high government fragmentation.¹³ The literature has traditionally approximated the measurement of economies of scale in various ways. Earlier studies used population as a proxy for economies of scale, while more recent contributions have used either expenditure or production cost data. As shown in the meta-

¹³ We must note here that there should be a certain degree of endogeneity between observed levels of fragmentation and economies of scale. If economies of scale should be expected to lead to lower fragmentation, it is also true that higher fragmentation should lead to observed lower economies of scale. Potentially, the endogeneity problem is properly addressed by using instrumental variables for economies of scale, as those discussed in this section, that can be considered truly exogenous.

analysis results in Gomez-Reino and Martinez-Vazquez (2011), using population as a measure of potential, economies of scale can lead to their underestimation.

In the context of our analysis of jurisdictional fragmentation, using population as our measure of economies of scale introduces additional problems. For example, considering China and Luxemburg side by side, we would have to expect (if population were our proxy for economies of scale) lower relative levels of government fragmentation in China than in Luxemburg, since China's large population would signal the largest international potential for economies of scale. That is, obviously, not a reasonable assumption. Population would seem to be therefore naturally and directly related to the level of jurisdictional fragmentation, and it is discarded as a valid proxy for economies of scale. This approach is also consistent with Nelson's (1990) analysis of jurisdictional fragmentation in metropolitan areas of the U.S., whereby population is included solely as an environmental, control variable.

Given the existence of economies of scale in services such as urban transportation, garbage collection or water and sanitation, ideally, one would want to explore the functional assignments of our sample of countries and ascertain in which of them are these functions decentralized to sub-national levels of government as an indication of potential for economies of scale. Regrettably, few countries have formal statements of expenditure assignments and even where they exist, they are often no more than broad lists of functional responsibilities with great overlap across tiers of government. In addition, collecting data on the cost elasticity of production from service delivery at sub-national levels of government for a sample of close to 200 countries is, simply, unrealistic.

We are left with few straight-forward options for variables approximating the potential for economies of scale in public service delivery. The most comprehensive analysis of the determinants of fragmentation in the U.S. by Nelson (1990) does not include a measure of economies of scale, a clear signal of the difficulties encountered in operationalizing this variable even in the context of a single country case-study. The Global Competitiveness Index (Schwab, 2010) may offer a possible avenue. Among the index sub-components, a measure of technological readiness is included. Since the sources of economies of scale are mostly of a technological nature, they may originate in gains from more efficient division of labor (internal economies of scale), or can be derived from an expansion in the industry where the company

operates, leading to increased leverage power with suppliers. Economies of scale may also be due to the use of more specialized inputs of production. The latter technological dimension is measured by the GCI Technological readiness sub-index, which approaches the capacity of an economy to adopt new technologies in order to improve the productivity of the national private sector.¹⁴ The use of this measure implies assuming that if such technologies are available to the private sector, it would be more likely that the public sector is also introducing them in its production processes, thus increasing their productivity.¹⁵ But we must note that even in this case the direction on optimal scale is not necessarily clear; in particular, the introduction of technological advances may allow cost reductions even in specialized production, thus making possible the efficient delivery of public services at smaller scales.

Allowing for heterogeneous preferences

The second set of variables aims to test the hypothesis that heterogeneous preferences lead to greater jurisdictional fragmentation. This hypothesis is derived from Oates' standard postulate that greater preference heterogeneity leads to smaller optimal group size for service delivery. Heterogeneous preferences have been operationalized in practice via measures of income, race and age dispersion. In terms of income dispersion, higher values of the Gini income inequality index should lead to diverse preferences and thus to a higher level of jurisdictional fragmentation.

Equally, a measure of ethnic dispersion (taking into consideration race, language, and religious dimensions) has been used to approximate heterogeneous preferences derived from varying ethnic compositions.¹⁶ Greater ethnic diversity is also expected to translate into a more fragmented government system that allows reflecting the preferences of the minorities. First, we use the data in a recent contribution by Alesina, Devleeschauwer, Easterly, Kurlat, and Wacziarg

¹⁴ The measure is a composite one, including values on aspects such as availability of new technologies, firm-level technology absorption, legal ICT framework, FDI and technology transfer, mobile and internet coverage, and personal computers per capita.

¹⁵ . However, there can be important differences between the private and public sectors in their ability to incorporate new technologies. In particular, the public sector may suffer from Baumol's disease due to the over presence of labor intensive production processes, and simply witness rise in salaries in response to productivity increases in the private sector.

¹⁶ For example, Martinez-Vazquez et al. (1997) use the share of minorities over the total population in their analysis of the impact of race dispersion on school district consolidation in the U.S.

(2003), which provide recalculated measures of the Easterly and Levine (1997) data on disaggregated indexes of fractionalization. To conduct a sensitivity analysis, we also construct our own Herfindahl ethnic and linguistic fractionalization index on the basis of data on ethnic composition collected from Population Statistics (Table 2). Both indexes are highly correlated and their alternative inclusion in the model estimations renders no significant differences in the results.

We also include an additional measure of heterogeneity of preferences as an index of age dispersion. The rationale behind it is that senior citizens may be assumed to display differentiated sets of preferences (e.g., they may favor higher expenditures in health and lower expenditure in education as they do not have school-age children).¹⁷

Measuring Political Accountability

Our variable of interest, political accountability, is operationalized in various forms. The existence of elected government representatives at the sub-national levels of government (as opposed to appointed by central government authorities) can be taken as a critical indicator of political accountability since sub-national officials can be removed from office if their policies do not reflect the needs and preferences of the majority. However, the existence of sub-national elections is a necessary but not sufficient condition for true accountability to be present. Several pseudo-democracies and even dictatorships around the world hold sub-national “elections”. In these countries, the range of candidates is severely limited to those of the party in power or political allies, and no credible political alternatives are offered to citizens. To take into account the democratic status of countries around the world, we interact our dummy variable measuring the presence of sub-national elections with an index of legislative competitiveness from the Political Institutions Database (World Bank, 2006).

In addition, we include in our model the World Bank’s Governance Index sub-component of “voice and accountability”. This indicator (with a minimum value of 0 and a maximum of 5) aims to measure the “extent to which citizens of a country are able to participate in the selection

¹⁷ But these issues are not necessarily well defined. For example, senior citizens should care about their house values and in general one may expect a link, as has been found in the U.S., between school quality and housing values; senior citizens may also care for the quality of education received by their grandchildren attending local schools.

of governments” (Kaufmann, Kraay, and Mastruzzi, 2008). The governance indicators collected by the World Bank include an additional indicator, “Government Effectiveness”, which aims to measure the capacity of subnational bureaucracies to provide quality public services and its independence from political pressures. Both measures cover aspects of our variable of interest (political accountability) and offer the opportunity to reduce the endogeneity of the model by using them as a proxy for the latter. Arguably, the “voice and accountability” indicator represents more closely citizens’ capacity to elect and exercise control over their political class, the very essence of accountability.

A third dimension of accountability that is explored is the authority of local representatives over tax collection and spending policies. It may be the case local authorities are elected but still budgets are “conditional” in their use so that in reality no spending discretion is allowed. Additionally, local authorities may not enjoy revenue raising autonomy, which would also limit their ability to respond to local needs. We measure this dimension in two ways, first, we include a variable measuring the share of total expenditure conducted at the subnational level, a traditional indicator of fiscal decentralization. Second, we include a dummy variable with a value of 1 if the subnational governments have authority over taxing, spending or legislating (World Bank, 2006). Unfortunately, this variable is only available for a limited number of countries, reducing the number of observations importantly.

We also consider other variables that may influence the level of jurisdictional fragmentation. One such variable is the share of public expenditure in GDP. However, this variable presents a clear problem of endogeneity, as more fragmented systems of government are also more likely to show also a higher government share in GDP (Martinez-Vazquez and Yao, 2009). Therefore this variable was not used in our final model specification. A second variable is the existence of constitutional provisions guaranteeing the provision of social services as a right of the citizenry (with obvious fiscal and governmental implications) which may affect the level of public sector expenditure and potentially fragmentation. At the end we were not able to code the information for the large number of countries in our sample from the available constitutional texts in English.

Additional Institutional Hypotheses

An array of institutional variables may also affect the level of fragmentation of a country. The available data on political institutions offers interesting alternatives for testing the role of institutions on jurisdictional fragmentation. Arguably, the impact of institutional variables is likely to extend beyond any single year and, as such, a cross-sectional analysis for a single year will not capture the full implications of maintaining or changing any critical aspect of the institutional fabric of a country. Our results in this area should therefore be interpreted with caution.

First, we test the impact of presidential electoral arrangements (presidential, parliamentary or assembly elected president) on jurisdictional fragmentation. Second, we test whether the existence of a nationalistic party in power (arguably an advocate of unitary systems) may lead to lower levels of fragmentation.¹⁸ As additional tests to the quality of democracy, we introduce a variable measuring whether there is a constitutional limit on the number of years an executive can serve before elections are called. Ideally, following Nelson (1990), we would have liked to include in our analysis whether provisions exist for minimum population sizes for new jurisdiction creation. We were unable to collect this variable for a large enough number of countries.

Finally, anecdotal evidence seems to suggest that movements from autocratic to democratic systems of government release pent up pressure for jurisdictional fragmentation. Indonesia may be a good example where the advent of democracy unleashed a process of fragmentation (*pemekaran*) that translated into almost the doubling of sub-national level jurisdictions supposedly in search of democratic spaces of representation (Imansyah and Martinez-Vazquez, 2010). The end of armed conflicts may also lead to such a process of new jurisdiction formation. We measure these dimensions with a single dummy variable with value one when either a significant transition to a more democratic system of government (measured by an increase in the Polity IV project index of 3 or more points) occurred in the country over the last 10 years.

¹⁸ As an example of the inter-temporal caveat mentioned above, if a nationalistic party has just been elected, despite its ideological leanings, it might not be able to affect the jurisdictional organization of the country unless it remains in power for an extended period of time. From that point of view, this variable is less likely to be significant in cross-sectional analyses.

Geographic Control Variables

Arguably, country size can affect the level of government fragmentation. Difficulties in reaching isolated populations from the political center are a strong incentive to create subnational levels of government that can be closer for the delivery of public services. We use country area (in square kilometers) to measure country size. Additionally, a measure of geographic accessibility is required, as countries with small land area may still be highly fragmented if they are of mountainous territory or display other natural features that make accessibility difficult. Such lack of accessibility should lead to a preference for smaller governments that can be closer to the citizens. Absent a better measure of accessibility, we use the ratio of the highest to the lowest altitude in a country as a proxy for accessibility. Ideally, we would like to use many altitude points in every country to evaluate their dispersion, but such information could not be obtained.

We consider alternative variables in order to control for the way geographical characteristics may affect jurisdictional fragmentation. First, we consider the geographical location of a country, such as whether it is landlocked or coastal, using a dummy variable to measure this dimension. Second, we include a variable denoting the continent where the country is located. And third, we test for the impact of latitude, a geographical variable that has proved highly significant in previous economic analyses such as economic growth patterns.

Estimation Methodology and Data

Our estimation approach involves two stages. First, we approach the analysis of the determinants of the number of levels or tiers of government in a given country. Second, we test the different hypotheses on the determinants of jurisdictional fragmentation within single levels.

The rationale for such an approach is the understanding that, although certain simultaneity in the process of determination of the two stages is obvious, if presented with the opportunity to define the territorial structure of a country (for instance at the time of drafting the Constitution), the logical sequential order of events we would expect would be first to define the number of

tiers of government and, given that, to determine the number of the mechanisms for the creation of new jurisdictions (or their merger) within each of those levels.¹⁹

As discussed in the previous section, the number of tiers of government in a given country is a largely unattended dimension of jurisdictional fragmentation in the literature. By selecting the number of tiers of subnational levels of government as the dependent variable, we will observe that while some countries have two tiers or even more, there are some other countries that have only one tier or none. Thus tobit estimation appears to be an adequate estimation approach (Tobin 1950). Because the variable is censored at 0, in its standard mathematical expression, in terms of a latent variable y^* (Baum, 2006):

$$y_i^* = X_i' \beta + \mu$$

$$y_i = \begin{cases} 0 & \text{if } y_i^* \leq 0 \\ y_i^* & \text{if } y_i^* > 0 \end{cases},$$

where X_i' is a row vector of explanatory variables, β is a vector of parameters to be estimated, and $\mu \sim N(0,1)$ is the error term.

In our sample, this variable either shows zeros for those countries with no subnational levels of government or a positive integer between 1 and 4. Arguably, there are other alternatives to operationalize this aspect of jurisdictional fragmentation. For instance, we could have collapsed all positive values and turned this censored variable into a binary one, but at the cost of losing important information on the different number of tiers of subnational governments. Alternatively, we could have counted all levels of government in the variable, including the central one, thus allowing for the use of an ordered probit model fit, an alternative maximum likelihood estimation method. However, the cardinal nature of the variable in the ordered probit estimation suggests that this is a less preferred approach²⁰. Last, truncated data estimation

¹⁹ For example, the 1978 Spanish Constitution only defined the different levels of government (regional, provincial, municipal). The Organic Law regulating this constitutional aspect established that in instances where regions are formed by just one province, the provincial level of government is subsumed into the regional one as there is perfect overlap. The number of regions eventually created, and the number of municipalities existing currently in Spain is the result of an institutional process where most forces considered in this paper were at play. To date the Constitution in Spain has not been amended to include the names of the regions in its articles.

²⁰ We would expect that the number of subnational tiers of government in a given country also depends on the number of tiers that already exist. It would become more difficult to add another tier if a relatively high number of subnational levels of government already exists. Thus, the variable is non-ordinal in nature.

methods were deemed not appropriate since the data generation process did not present this characteristic. We also could perhaps convert the variable into a truncated one by discarding all observations with a value of zero (Baum, 2006), but again at the cost of degrees of freedom and loss of information.

In order to explore the determinants of the number of subnational tiers of governments across countries, we believe a first in the literature, we estimate the following equation:

$$\widehat{L}_i = \alpha_0 + \beta_1 C_i + \beta_2 U_i + \beta_3 P_i + \sum_{j=1}^M \phi_j Z_{ji} + \mu_i$$

where L is the number of levels of government, C_i represents economies of scale, U_i reflects the impact of heterogeneous preferences on over all welfare, P_i is our measure of political accountability, and Z_{ji} is a vector of other institutional and geographical variables. The marginal effects on the observed value L can be obtained as the product of the individual coefficients times the probability that the latent variable value is between a certain interval. Our interpretation of results will focus of the statistical significance of the coefficients and the direction (sign) of the relationships found.

In the second stage of our estimation we turn to the analysis of the more conventional question of jurisdictional fragmentation: explaining the determinants of the number of jurisdictions, normalized or not by population and land area. Here we use standard OLS estimation with three alternative dependent variables: the total number of jurisdictions, the average population per jurisdiction, and the average land area per jurisdiction. For simplicity, initially we assume a linear functional form for the basic specification:

$$\widehat{N}_i = \alpha_0 + \beta_1 C_i + \beta_2 U_i + \beta_3 P_i + \sum_{j=1}^M \phi_j Z_{ji} + \mu_i$$

where N is the number of jurisdictions (or the average population or area per jurisdiction, depending on the specification), C_i represents economies of scale, U_i reflects the impact of heterogeneous preferences on over all welfare, P_i is our measure of political accountability, and Z_{ji} is a vector of other institutional and geographical variables.

At the outset, and considering the multiple avenues through which the levels of fragmentation of a country can be determined, our model may leave out, due to lack of available data, critical explanatory variables and thus suffer from omitted variable bias that leads to higher standard errors. To explore this aspect we will conduct standardized Ramsey tests. Moreover, the size of our sample (effectively around 143 observations) limits the number of variables than can be included in the analysis. However, regional dummy variables are introduced to account for regional unobserved fixed effects on fragmentation patterns.

In order to test for the appropriateness of the linearity assumption for the basic specification, we plot the residuals against the suggested predictors in early model specifications to explore for possible deviations from linearity. This analysis suggests the need to transform several of the variables into logarithmic form, and to opt for a quadratic form in the relationship between population and jurisdictional fragmentation.

Both the White and Breusch-Pagan tests showed a certain amount of heteroskedasticity as was to be expected from the nature of our cross-section sample. Accordingly, robust standard errors are calculated to correct the heteroskedastic errors.

Summary statistics and sources for the data used in this analysis are provided in Table 2. The data have been collected from a wide variety of sources for a cross-section of around 200 countries.

Table 2. Summary Statistics for the Dataset

| Variable Name | Max | Min | Mean | Standard Deviation | Obs. | Description | Source | Year |
|-----------------------------|---------------|-------|------------|--------------------|------|---|--|---------------|
| Population | 1,330,044,605 | 5,079 | 30,724,686 | 123,328,416 | 218 | Total Country Population | International Database, US Census Bureau | 2008 |
| Domestic Market Size | 6.93 | 1.3 | 3.78 | 1.18 | 132 | Sum of GDP plus imports, minus exports, normalized on a 1-7 scale | World Economic Forum | 2008 |
| Techno Readiness | 6.15 | 2.19 | 3.80 | 1.09 | 132 | Composite Index of Technological Capacity | World Economic Forum | 2008 |
| Age014 | 50.00 | 13.40 | 28.89 | 10.45 | 218 | Percentage of Population under 15 years of age | International Database, US Census Bureau | 2008 |
| Age1564 | 79.90 | 47.80 | 63.51 | 6.75 | 218 | Percentage of Population between 15 and 64 years of age | International Database, US Census Bureau | 2008 |
| Age65+ | 22.80 | 0.90 | 7.60 | 5.11 | 218 | Percentage of Population over 64 years of age | International Database, US Census Bureau | 2008 |
| AHV | 0.67 | 0.46 | 0.51 | 0.03 | 218 | Age Herfindahl Country Value | | |
| AleELF | 0.93 | 0 | 0.44 | 0.26 | 187 | Ethno linguistic Fractionalization Herfindahl Index | Alesina et al | 2003 |
| AleLin | 0.92 | 0.00 | 0.39 | 0.28 | 192 | Language Fractionalization Index | Alesina et al | 2003 |
| AleRel | 0.86 | 0.00 | 0.44 | 0.23 | 202 | Religion Fractionalization Index | Alesina et al | 2003 |
| Country Area | 16,995,800 | 2.00 | 597,974 | 1,774,385 | 218 | Total Country Area in square kms | International Database, US Census Bureau | |
| Gini | 74.61 | 24.00 | 40.88 | 9.91 | 151 | Income/Expenditure Inequality | U.N. Wider Database | Several Years |
| ConIneq | 1.00 | 0 | | | 151 | Dummy variable with value 1 for Consumption inequality data | | |
| GDPpc | 85,382 | 298 | 13,259 | 15,704 | 182 | Purchasing Power Parity GDP Data | United Nations HDR | 2007 |
| VAI | 4.07 | 0.19 | 2.49 | 1.00 | 205 | Voice and Accountability Index | World Bank | 2007 |
| GEI | 4.91 | 0.15 | 2.48 | 1.00 | 209 | Government Effectiveness Index | World Bank | 2007 |

| Variable | Mean | Std. Dev. | Min | Max | Observations | Description | Source | Year |
|-----------------------|---------|-----------|--------|--------|--------------|---|---------------------------------|---------------|
| SubDem Status | 2 | 0 | 1.1 | 0.882 | 190 | Interaction term; Sub-national Elections*Democratic Status (0=Dictatorship, 1=Pseudo Democracy, 2=Electoral Democracy) | Own Calculations | 2009 |
| SubDem Status2 | 0 | 7 | 5.08 | 2.93 | 171 | Interaction Term: Sub-National Elections *Index of Legislative Competitiveness (0=No legislature – 7=Multiple parties got seats in Parliament) | World Bank and Own Calculations | 2006 |
| Finite Term | 1 | 0 | 0.894 | 0.308 | 170 | Existence of a Finite Term for the Legislature | World Bank | 2006 |
| Change Polity4 | 1 | 0 | 0.21 | 0.41 | 171 | Dummy variable with Value 1 if increase in the Democratic Polity IV project index of 3 or more points occurred in the country over the last 10 years. | Polity IV | 2008 |
| Level2 | 118 | 2 | 17 | 18 | 211 | Number of Jurisdictions in Level # | Several | Several Years |
| Level3 | 14,000 | 5 | 442 | 1,352 | 164 | Number of Jurisdictions in Level # | Several | Several Years |
| Level4 | 240,073 | - | 7,237 | 31,144 | 62 | Number of Jurisdictions in Level # | Several | Several Years |
| Level5 | 42,008 | 432 | 14,822 | 17,954 | 10 | Number of Jurisdictions in Level # | Several | Several Years |
| Pop/Juris | 577,674 | 542.9 | 56,736 | 86,057 | 212 | Average Population per jurisdiction | Own Calculations | Several Years |
| Area/Juris | 76,501 | 0.18 | 1,981 | 6,261 | 212 | Average Area per Jurisdiction | Own Calculations | Several Years |
| Sublevels | 4 | 0 | 1.944 | .772 | 196 | Number of Sub-national Levels of Government | Several | Several Years |

Estimation Results

We now turn to the analysis of the results for the two sets of estimations.

Tiers of government

The results of the estimation for the number of subnational tiers using maximum likelihood estimation for the tobit regression model are presented in Table 3. From our results, it would appear that the vertical structure of government (number of tiers) might be solely related to “size” variables, with other institutional and preference-related variables playing no distinctive role. In particular, we find a strong positive relationship between population and fragmentation, defined as the number of sub-national tiers of government. Equally, a large country area seems to increase the probability of having more subnational levels of government. Both results are robust to the different model specifications, even after regional dummy variables are included.

Of the set of variables measuring heterogeneity of preferences, it would not seem that any of them plays a significant role in this aspect of fragmentation. We could not find either any significant relationship between our set of institutional variables, such as ethnic fractionalization, etc., and the number of tiers of subnational government. Geographical fixed effects, as captured partly by the regional dummies, show countries in other continents than Europe to have a lower probability, all other things equal, of vertical fragmentation.

Table 3. Results from the Tobit Model for tiers of government

| | Dep. Variable: Number of Sub-national Levels of Government | | |
|------------|---|------------------|------------------|
| | Model 1 | Model 2 | Model 3 |
| Population | .091** (.041) | .086** (.042) | .092** (.042) |
| Area | .064** (.031) | .060* (.031) | .055* (.029) |
| AleELF | -.361 (.224) | -.364 (.228) | -.281 (.229) |
| Gini | -.004 (.005) | -.004 (.005) | .006 (.006) |
| ConIneq | .144 (.139) | .141 (.145) | .196 (.165) |
| GDPpc | -.058 (.058) | -.048 (.063) | -.049 (.062) |
| AHV | -.024 (1.785) | .188 (1.894) | .022 (1.817) |

| | | | |
|---|-----------------|-----------------|--------------------|
| Sub National Elections*Dem Status 2 | | .006 (.021) | .001 (.022) |
| VAI | | -.037 (.057) | -.084 (.058) |
| Oceania | | | -.089 (.183) |
| South America | | | -.383* (.205) |
| Central America | | | -.535*** (.157) |
| North America | | | -.684*** (.217) |
| Asia | | | -.386** (.174) |
| Africa | | | -.379 (.213) |
| Constant | .673 (1.221) | .682 (1.269) | .733 (1.192) |
| Number of Observations | 144 | 141 | 141 |
| Pseudo R-squared | 0.1358 | 0.1259 | 0.1684 |
| Log Pseudo-Likelihood | -114.65 | -113.25 | -107.75 |
| Sigma | .536 (.034) | .540 (.033) | .519 (.034) |
| Probability > F | 0.000 | 0.000 | 0.000 |
| Notes: MLE estimation. Robust standard errors reported in parenthesis. Population, GDPpc and Area are in logarithmic form. Europe is the reference group for the regional dummy variables. ***, **, and * denote significance at the 1, 5 and 10% level respectively | | | |

Number of governments

The estimation for three alternative measures of jurisdictional fragmentation (total number of jurisdictions, population average and area size average per jurisdiction) are presented in Table 4. For each of these variables, we estimate three sets of model specifications.

In the first one (Models 1, 4 and 7 respectively), we test the standard economic hypotheses of fragmentation based on the impact of economies of scale and of heterogeneity of preferences in the level of jurisdictional fragmentation. For this first set of models, we run Ramsey tests to search for possible omitted variable bias.²¹ In addition, significant correlation was found among

²¹ We used both linktest and ovtest Stata commands, with both tests supporting the hypothesis of no omitted variables in the model.

some variables (especially between population and area as it was to be expected), leading to a certain level of multicollinearity. However, most of our estimated coefficients are individually and jointly significant and very robust to different model specifications, both in terms of their size and signs, so no further attention was given to this issue. We also applied the Breusch-Pagan test to our initial model specification, with the results suggesting the presence of a certain amount of heteroscedasticity (confirmed by the plotting of residuals against some of the quasi-ordinal variables in the sample, such as sub-national democratic status). As a result, our final estimations calculated and reported robust standard errors.

The second set of specifications (Models 2, 5 and 8 respectively) includes proxy variables attempting to measure demand for political accountability. From the basic theoretical framework we anticipate that, all things equal, demand for political accountability should translate into a smaller optimal jurisdictional size, and thus lead to higher fragmentation. Finally, in the third set of specifications (Model 3, 6 and 9 respectively) we add a vector of geographical and institutional control variables meant to test the robustness of the findings.

Note that none of the specifications in Table 4 includes a variable for economies of scale. Regrettably, “technological readiness,” the proxy for potential for economies of scale, proved to be insignificant and did not add to the overall explanatory power of the models; therefore the variable was discarded from the final specifications. As previously discussed, the difficulties in appropriately measuring this potential dimension of fragmentation seem insurmountable at this time.²² Of course, absent the direct measurement of economies of scale, the variation in the level of jurisdictional fragmentation across countries due to the different potential for economies of scale is left in the error term, reducing the explanatory power of the model and possibly biasing our estimates for the role by other variables of interest. Note, however, that these effects may be minimized to the extent that economies of scale are technologically driven and that technology may be similarly available across countries.

In terms of the remaining set of hypotheses, we still are able to draw important conclusions, as outlined in what follows. First, the results in Table 4 show that, as expected, population and land area are positively correlated with the level of jurisdictional fragmentation across countries.

²² Ideally, future research will include information on the “true value” of economies of scale for local services, that is, the true value of the cost elasticity of production.

In addition, the impact of population appears to follow a non-linear pattern. Higher population leads to increasing levels of fragmentation, but at a decreasing rate. This relationship holds both for absolute measures of fragmentation (total number of jurisdictions) or relative ones (ratio of area to number of jurisdictions). The maximum level of fragmentation is reached at a population level of around 1 billion people, a level that only India and China have reached. An alternative model specification was tested whereby population was included as explanatory variable in the model in a logarithmic (as opposed to quadratic) form. The estimation of this specification showed that a 1 percent increase in population led to a 0.68 percent increase in the total number of jurisdictions, a less than proportional increase. The relationship between area and fragmentation is equally significant. A 1 percent increase in country area leads to a 0.3 percent increase in the total number of jurisdictions in the full model specification. In summary, the level of fragmentation is inelastic with respect to population and land area, and more so for the latter than for the former.

The set of variables measuring heterogeneity of preferences also offers statistically significant and sizable results. Our measure of ethno-linguistic fragmentation suggests, perhaps counter-intuitively, that greater dispersion on ethnic and linguistic groups leads to lower jurisdictional fragmentation, both in terms of smaller number of jurisdictions and higher average area. The result is very robust across model specifications and to alternative measurements of ethno-linguistic fragmentation. A possible explanation for this result is that ethno-linguistic fractionalization is more prevalent in poorer, low-growth countries with lower quality of government (Alesina and Spolaore, 2003). Also Aghion, Alesina, and Trebbi (2002) find that ethnic fractionalization is inversely related to quality of democracy. It would follow then that countries with lower quality of government (less democratic societies) and high ethno-linguistic fractionalization would be less likely to create spaces for democratic representation with new jurisdictions. However, these are aspects which we already control for in our model however, so we are left wanting an alternative explanation. Perhaps ethno-linguistic fragmentation historically leads to resistance against further fragmentation to preserve national or group identities. But at this stage we have no means to validate this conjecture.

Our second variable approximating heterogeneous preferences, the age dispersion index, displays the hypothesized sign, but it is not robust across specifications. It would seem that

greater age dispersion leads to a smaller average jurisdictional size, but we find no statistically significant evidence of the variable affecting the total number of jurisdictions or average population size. This result may be due to the fact that age dispersion may not be that stable over time in each individual country.

Two other variables with unanticipated results are per capita GDP and income inequality measured by the Gini coefficient. Our results indicate that higher per capita GDP leads to lower levels of fragmentation in the sample. Representation and democracy, as perhaps proxied by fragmentation, are expensive endeavors and one would anticipate that they exhibit a positive income elasticity, the opposite of what we find. However, the result may be explained in two different ways. First, to the extent that overall increases in per capita income tend to homogenize preferences for public services, this result may be a reasonable one to expect. Second, a somewhat long list of countries have introduced forced local government amalgamation programs in recent times,²³ and most of these countries tend to be countries with high GDP per capita. Second, the relationship between jurisdictional fragmentation and inequality shows that increases in inequality may lead to lower jurisdictional fragmentation overall; this is counterintuitive to the extent that higher income groups may seek separation or fiscal protection through jurisdictional fragmentation. However, these results are not robust to the insertion of regional dummies in the model; certain world regions, such as Central America and South America have notorious unequal income distributions.

Our variables approximating preferences for political accountability are significant and display the hypothesized sign. The interaction term formed by the existence of sub-national elections and a measure of democratic status or legislative competitiveness proved to be significant and robust to different model specifications. The positive sign for this coefficient indicates that increased demand for political accountability leads to higher jurisdictional fragmentation, both in terms of a greater number of jurisdictions or smaller average area per jurisdictions.²⁴ The World Bank Voice and Accountability Index, a “measure of the extent to

²³ Among other countries, that list includes Denmark, Sweden, Poland, Chile, Czech Republic, South Korea, United Kingdom, and most recently Greece and Italy.

²⁴ It could be argued that this relationship may be endogenous, and that in more jurisdictionally fragmented countries citizens are more participative and more likely to demand enhanced political accountability. However, that may not necessarily be the case. As already mentioned above, Lowery and Lyons (1989) find no evidence of better information levels of citizens at lower levels of government. In any case, it would seem that the construction of the

which citizens are able to participate in the selection of governments”, displayed the identical sign as the earlier measure of democratic quality but it was only statistically significant when average area per jurisdiction was selected as the dependent variable.²⁵

We explored several other avenues through which institutional aspects related to demand for political accountability could have impacted the level of jurisdictional fragmentation. First, we included the number of subnational levels of government as an additional explanatory variable. We may expect that more fragmentation -- a larger number of jurisdictions-- is likely to be found in countries with more tiers of government. The reason behind it is that intermediate levels of government are able to deliver services to local or municipal governments unable to do so due to their small size. Lack of resort to such intermediate levels of government (i.e., county governments in the U.S., regional districts in British Columbia, or provincial governments in Spain) would introduce incentives for local mergers, and thus reduce jurisdictional fragmentation. This relationship proved to be highly significant. As hypothesized, more levels of government led to an increase in the overall number of jurisdictions. The results, however, do not suggest that a similarly strong statistical relationship exists between the number of tiers of government and the average jurisdictional size in terms of population or land area.

Second, we tested a set of several institutional aspects that may reasonably affect the level of fragmentation and that are proxies for democratic quality. These included 1) the number of years of the executive in office (signal of quasi-democratic systems when its value exceeds 8); 2) the constitutional existence of a finite term in office before new elections are called; 3) whether a nationalist party is in power (more likely to advocate for a less decentralized state and possibly a less fragmented one); and 4) the parliamentary system of the country. Of this set of variables, only the existence of a finite term in office seemed to significantly affect the total number of jurisdictions, but not their average size.

Third, we introduced in the analysis several available indicators measuring the size of the public sector in the GDP, the share of subnational expenditure over the national total, and a

interaction term should help dispel doubts on the possible endogeneity. The use of an independent assessment of democratic quality and of an index of legislative competitiveness also independent from the territorial organization of the country should diminish the possible problem of double causation.

²⁵ Note that the variable approximating built up demands for jurisdictional fragmentation that may have been released via recent advances to the democratic quality of system of government proved to be non-significant.

variable measuring whether fiscal authority existed over expenditure or tax policies at the local level (for which only 29 observations were available). We could not find significant relationships between these variables and the level of jurisdictional fragmentation and these variables were dropped from final model specifications.

Finally, in order to partly account for country fixed effects, we introduced regional dummy variables. Using Europe as the group of reference (arguably the most fragmented region together with North America), the dummy variables for other regions typically showed significant lower levels of fragmentation. The inclusion of the regional dummies did not affect the estimates of our main variables for the different hypothesis and added importantly to the overall explanatory value of the model.

Table 4. Results from the OLS Estimation for the number of jurisdictions

| | Dep. Variable: Log of Total Number of Jurisdictions | | | Dep. Variable: Log of Area to Jurisdictions Ratio | | |
|-------------------------------------|---|---|---|--|--|--|
| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
| Population (Millions) | .020*** (.003) | .021*** (.003) | .019*** (.003) | -.006** (.003) | -.006** (.003) | -.006* (.003) |
| Population Squared | $-.1 \times 10^{-4}$ *** (0.02×10^{-4}) | $-.1 \times 10^{-4}$ *** (0.02×10^{-4}) | $-.1 \times 10^{-4}$ *** (0.02×10^{-4}) | 0.04×10^{-4} * (0.02×10^{-4}) | 0.04×10^{-4} * (0.02×10^{-4}) | 0.04×10^{-4} * (0.02×10^{-4}) |
| Area | .384*** (.061) | .266*** (.060) | .292*** (.057) | | | |
| AleELF | -1.899*** (.583) | -1.380** (.539) | -1.392** (.565) | 2.851*** (.711) | 2.553*** (.692) | 2.251*** (.745) |
| Gini | -.024** (.011) | -.024*** (.009) | -.006 (.011) | .033** (.015) | .0362** (.014) | .007 (.016) |
| ConIneq | -.235 (.279) | -.407 (.250) | -.211 (.273) | .166 (.345) | .141 (.323) | -.056 (.348) |
| GDPpc | -.140 (.146) | -.249** (.128) | -.324*** (.138) | .181 (.192) | .401** (.186) | .413* (.212) |
| AHV | -4.590 (4.513) | -6.348 (4.095) | -5.529 (4.317) | -11.641* (6.507) | -14.552** (7.041) | -11.792 (7.119) |
| Sub National Elections*Dem Status 2 | | .145*** (.035) | .137*** (.038) | | -.132** (.055) | -.123** (.059) |
| VAI | | .118 (.121) | .099 (.127) | | -.333** (.157) | -.333* (.170) |
| Sub Levels | | .907*** (.199) | .806*** (.201) | | -.238 (.198) | -.235 (.203) |
| Oceania | | | -1.531*** (.387) | | | 2.614*** (.822) |
| South America | | | -.875** (.431) | | | 1.892*** (.521) |

| | | | | | | |
|------------------------|------------------|--------------------|--------------------|--------------------|-------------------|-------------------|
| Central America | | | -.805*** (.369) | | | .305 (.565) |
| North America | | | .206 (.713) | | | .856 (.728) |
| Asia | | | -.568 (.388) | | | .701 (.572) |
| Africa | | | -.935** (.442) | | | 1.229** (.624) |
| Constant | 1.553 (2.467) | 6.131** (2.762) | 6.208** (2.841) | 7.949** (3.612) | -4.936 (4.137) | -3.118 (4.236) |
| Number of Observations | 144 | 141 | 141 | 144 | 141 | 141 |
| R-squared | 0.58 | 0.67 | 0.71 | 0.26 | 0.31 | 0.39 |
| Probability > F | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 | 0.000 |

Notes: OLS estimation. Robust standard errors reported in parenthesis. GDPpc and Area in logarithmic form.
 Europe is the reference group for the regional dummy variables.
 ***, **, and * denote significance at the 1, 5 and 10% level respectively

Table 10. Results from the OLS Estimation (Cont.)

| | Dep. Variable: Log of Population to Jurisdictions Ratio | | |
|-------------------------------------|---|--------------------|--------------------|
| | Model 7 | Model 8 | Model 9 |
| Area | -.015 (.055) | .017 (.054) | .026 (.059) |
| AleELF | 1.178 (.547) | .826 (.529) | .884 (.562) |
| Gini | .013 (.011) | .017 (.012) | .003 (.015) |
| ConIneq | .157 (.275) | .241 (.247) | .026 (.264) |
| GDPpc | -.062 (.139) | .071 (.137) | .187 (.146) |
| AHV | 2.635 (4.474) | 3.932 (4.177) | 4.362 (4.281) |
| Sub National Elections*Dem Status 2 | | -.143*** (.037) | -.128*** (.041) |
| VAI | | -.116 (.133) | -.072 (.131) |
| Sub Levels | | -.427** (.195) | -.357* (.204) |
| Oceania | | | .789** (.382) |
| South America | | | .677 (.492) |
| Central America | | | .724* (.396) |
| North America | | | -.598 (.751) |
| Asia | | | .794* (.417) |

| | | | |
|--|---------------------|---------------------|--------------------|
| Africa | | | .948* (.498) |
| Constant | 8.569*** (3.067) | 8.362*** (2.958) | 6.724** (2.941) |
| Number of Observations | 144 | 141 | 141 |
| R-squared | 0.13 | 0.23 | 0.28 |
| Probability > F | 0.005 | 0.000 | 0.000 |
| Notes: OLS estimation. Robust standard errors reported in parenthesis. GDPpc and Area in logarithmic form. Europe is the reference group for the regional dummy variables. ***, **, and * denote significance at the 1, 5 and 10% level respectively | | | |

Conclusion

In this paper we use a large cross-section of countries to analyze the determinants of jurisdictional fragmentation along two dimensions: the number of tiers of government and the number and average size of all subnational government units. The analysis has allowed us to test the traditional hypotheses in the literature on optimal jurisdictional size related to the heterogeneity of preferences and economies of scale, and also the implications of preferences for political accountability.

Overall, the vertical structure of government- the number of tiers of government- is mostly related to “size” variables and not to other institutional or preference-related aspects. Both population and land area size are positively related with the number of tiers of government in a country. This result is robust to all model specifications and dependent variables used as measures of fragmentation.

One main additional finding from our analysis is that, in line with the predictions of our theoretical framework, preferences for political accountability lead to smaller jurisdictional size and a larger number of governments. These results are robust across different model estimations. These results strongly suggest that accountability needs to be added to the list of critical dimensions in the theory of optimal jurisdictional size beyond the two arguments of economies of scale and heterogeneity of preferences emphasized in Oates’ model.

We also find strong evidence that a higher number of tiers of government leads to overall higher jurisdictional fragmentation. We hypothesize that this is the case because when

intermediate levels of government assume subsidiary responsibilities for local governments, the smaller local governments have less of an incentive to consolidate into larger jurisdictions. This finding has immediate policy consequences for countries (like, for example, Spain) that are reconsidering the elimination of some tier of government (the province level in Spain) and are struggling with the administrative burdens and costs of highly fragmented local governments (with average size under 10,000 residents.)

In our empirical analysis we do less well in testing the validity of the two traditional arguments behind optimal jurisdiction size of economies of scale and heterogeneity of preferences. Despite the strong theoretical case, the set of variables used to approximate heterogeneous preferences lead to mixed results regarding the level of fragmentation. However, in some cases, although the variable proposed may be certainly reflective of heterogeneous preferences, other interfering variables may affect the causality of the relationship sought, as seems to be the case with ethno-linguistic fragmentation. Of course, the results may also hide the inherent difficulty with measuring heterogeneous preferences correctly. More acute measuring difficulties actually have barred us altogether from testing the role of economies of scale in jurisdictional fragmentation.

To conclude we must note that our cross-sectional analysis is limited in several other respects. For example, many of the explanatory variables we use may actually exert their influence over the process of creation or merger of jurisdictions over time, and thus the observed influence is likely to depend on whether enough time has passed since the change in the explanatory variable. These processes could be observed in a panel dataset but remain hidden in cross-sectional analysis. Thus, ideally, future research will revisit many of the questions examined in this paper using panel information. Our analysis underlines also the need to continue to explore new avenues for the measurement of economies of scale on subnational service delivery, a critical aspect that the empirical literature, including our contribution, has not yet been able to address adequately.

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